# APPENDIX E: FURTHER INFORMATION

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28 March 2017

Anthony Ko
Planning Officer
Resource Assessments – Planning Services
GPO Box 39
Sydney NSW 2001

Dear Mr Ko

**Western Coal Services MOD 1 (SSD 5579)**
**Response to Additional Submission from the Environment Protection Authority**

I refer to your email dated 20 March 2017 and the additional submissions from a number of government agencies on the *Response to Submissions* for the Western Coal Services MOD 1. This letter specifically relates to the submission from the Environment Protection Authority (EPA). In their submission, the EPA proposes that the dewatering system using geofabric bags currently utilised for the collection of sludge from Springvale Mine's LDP009 settlement ponds be adapted for the dewatering of residuals from the water treatment plant proposed in the Springvale Water Treatment Project (SSD 7592). The EPA further propose that the dewatered residuals be either emplaced within the reject emplacement area (REA) at the Springvale Coal Services Site, or diverted from the REA completely and reused, or disposed of to a licensed waste management facility.

An options assessment has been undertaken by GHD Pty Ltd to investigate the viability of adapting the geotextile bag dewatering system for the management of residuals in the Springvale Water Treatment Project. GHD's letter report is included in **Attachment 1**.

Please contact me (nagindar.singh@centennialcoal.com.au or (02) 6355 9814 / (0407) 551 405) if you require further information.

Yours sincerely

**Nagindar Singh**
**Approvals Coordinator**

**Attachment 1**: *Residuals Management Options Assessment: Western Coal Services Project (SSD5579) Modification 1* , GHD Pty Ltd, March 2017.



Centennial Springvale Pty Limited ABN 64 052 096 812
Springvale Coal Pty Limited ACN 052 096 769

# ATTACHMENT 1

27 March 2016

Nagindar Singh
Approvals Co-Ordinator
Centennial Coal Company Limited
1384 Castlereagh Highway
Lisdale NSW 2790

Our ref: 21/25109 219547
Your ref:

Dear Nagindar

**Western Coal Services Project (SSD 5579) Modification 1**
**Residuals Management Options Assessment**

## 1 Overview

An analysis of potential alternatives for management of the residuals stream was included as part of the Western Coal Services Project Modification 1 response to submissions RTS. This letter provides a revised analysis to incorporate geotextile bag dewatering systems as part of the options assessment following EPA feedback on the submissions response.

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.

Alternatives for management of residuals involved transfer and disposal to the reject emplacement area (REA) at the Springvale Coal Services Site (SCSS) located approximately 1.5 km from the proposed water treatment plant at Mount Piper Power Station (MPPS). 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 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, dedicated sludge lagoons/drying beds, geotextile bags 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 1.

**Table 1 Residuals management alternatives**

| Alternative | Liquid Transfer | Sludge Lagoons / drying beds | Geotextile sludge dewatering bags | Mechanical dewatering |
|---|---|---|---|---|
| Residuals solids content by weight | 1.5 to 2% | 30 to 40% | 20% - 30% | 10 to 25% |
| Infrastructure requirements | As proposed in Springvale Water Treatment Project EIS | Lined sludge lagoons, lined drying beds, sludge lagoon pumping system, Supernatant return pipeline from the sludge lagoons to the head of the WTP<br>Excavator and truck access to remove dried material from drying beds, transfer of dewatered sludge to REA. | Lined residuals balancing storage pond, sludge transfer pipeline with pumping facility to fill geobags.<br>Polymer chemical storage and dosing facility.<br>Lined and bunded area with sump pump to lay out the geotextile bags, and collect drainage.<br>A number of geotextile bags in operation for filling/ draining/removal/ spare, and ongoing replacement bags.<br>Leachate/supernatant transfer pipeline to the head of the WTP.<br>Excavator and truck access to remove dewatered material and bags, transfer of dewatered sludge to REA. | Mechanical dewatering system, polymer chemical storage and dosing facilities, residuals storage tank, centrate return pipeline, transfer of dewatered sludge to REA. |

| Alternative | Liquid Transfer | Sludge Lagoons / drying beds | Geotextile sludge dewatering bags | Mechanical dewatering |
|---|---|---|---|---|
| Transfer system | Residuals transfer pipeline as proposed in the Springvale Water Treatment Project EIS | Supernatant return pipeline from the sludge lagoons to the head of the WTP, excavator access truck loading and vehicle haulage or conveyor system for dewatered sludge | Leachate transfer pipeline to the head of the WTP.<br>Excavator access, truck loading and vehicle haulage to remove the thickened sludge from the geotextile bags. | 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<br>Vegetation clearance, noise and dust impacts for sludge transfer system or additional heavy vehicle movements on public road.<br>Significant increased disturbance on the WTP site to accommodate lagoons. | Slight reduction in discharge from LDP006 compared to base case.<br>Potential release of polymer to receiving waters<br>Vegetation clearance, noise and dust impacts. Additional heavy vehicle movement on public roads.<br>Increased disturbance on the WTP site. | Slight reduction in discharge from LDP006 compared to base case.<br>Potential release of polymer to receiving waters.<br>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 | Potential 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 $6 to $12 million capital costs for dewatering options | | |
| Operational cost / GHG | Base case | Similar to base case | Higher operational cost due to chemical addition, and due to need to frequently excavate, remove and replace Geobags. | Higher energy consumption. Higher operational cost due to chemical addition and ongoing dewatering system operation. Greater GHG impact. |

## 2 Liquid transfer to Springvale Coal Services Site

The base case adopted as part of the Springvale Water Treatment Project involves a liquid transfer scheme to the Springvale Coal Services Site. 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 of 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 Springvale Coal Services Site REA. The 1800 metre 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 Springvale Coal Services site. 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. The main characteristics of the residuals stream was conservatively assessed to be a maximum flow volume of up to 0.43 ML/day at EC 2500 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. Total suspended solids (TSS) in raw mine water is typically around 30 mg/L, but can spike towards 615 mg/L following long wall moves or seismic events. The residuals stream flow will approach the maximum volume of 0.43 ML/day only 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 (circa 90%) the suspended solids 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 2500 µs/cm has also been used in the assessment of the impact of the residuals transfer on the receiving environment. However, this EC level in the residuals stream results from a summation of a conservative value for the mine water salinity of 1400 µs/cm and a conservative estimate of the required ferric chloride dose. It is noted that the ferric chloride dose rate has been based on very conservative water quality laboratory jar testing results. Typically mine water inflows will have a lower salinity and much lower suspended solids levels, requiring less ferric chloride addition. As a result a smaller incremental increase in salinity of the residuals stream resulting from the clarification process is predicted, with the typical salinity in the range of 1100 to 1200 µS/cm.

The majority of the year the residuals transfer system will therefore fall well within the parameters of 0.43 ML/day at EC 2500 µS/cm, which was 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 Springvale Coal Services site and the existing very high salinity (~5,000 µS/cm) salinity 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 for the Western Coal Services Project Modification 1.

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 Water

Treatment Project. The modification to the Western Coal Services Project consent is only required to facilitate the management of residuals for implementation of the Water Treatment Project and therefore should not be considered in isolation from the overall development. The Water Treatment Project is effectively removing all mine water discharges to the Cox River Catchment from LDP 009 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 Water Treatment Project which results in considerable overall benefits for the catchment.

## 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 Water Treatment Project. 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 3 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 plants 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:

- 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 (reference Mine Subsidence Assessment by GHD, 2016) 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

## 4 Geotextile dewatering bags

Geotextile bag dewatering systems can be another alternative for solid management of the residuals from the Water Treatment Plant. Unlike the sludge drying bed option where the sludge is spread across one or more drying beds and is then dried by natural evaporation, the geotextile bags are first filled with residuals that have been allowed to thicken in a sludge storage pond. Water then flows out through the porous geotextile fabric of the bags, while filtering any solids.

It would consist of the following components:

- Residuals sludge storage balancing pond, with a pumped feed to a number of geotextile bags.
- Polymer dosing facility, which is dosed into the feed sludge prior to the geotextile bags, to promote coagulation of the material and so stop it from simply flowing out of the bags again.
- Geotextile bags placed within a lined bunded drainage area, which is fitted with sump pump, so the leachate and rainwater can drain out and return to the storage balancing pond.
- The laydown area where the geotextile bags are placed, and then where the bag and dewatered sludge contents are removed from the bags can be loaded for disposal offsite,
- A supernatant return pipeline to transfer drainage water/ supernatant to the head of the WTP.

The residuals from the water treatment plant downstream of the lamella plate clarifier is expected to be up to 2% solid by weight. Using geotextile bags, a product sludge with 20-30% solid by weight may be produced, given sufficient drying time. It may take up to 3 to 4 months based on the local climate conditions in Lithgow NSW to reach this solids content. As such a number of geobags will need to be in operation at the same time and set out inside the bunded drainage area.

The liquid from the dewatered product would be returned to the water treatment plant requiring additional pipeline infrastructure not previously proposed. This would then result in an additional treatment volume at the WTP and additional 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.

For a geotextile bag with a nominal capacity of 2100 $m^3$, 5 geotextile bags may be required, based on a peak feed residuals flow of 430 $m^3/d$ and a drying time of 3 months. That is 1 bag is in filling, 3 bags are in drying, and 1 bag is being broken up, and the contents excavated using a backhoe. This position in the bag line is then replaced with a new bag. The excavated product sludge that would typically have 20-30% by weight solid then requires trucking off site.

Disadvantages of the Geobag dewatering approach are:

- While the geotextile bags can be filled typically up to 2.5 m high, and the required footprint can be smaller than that required for a sludge drying bed option, the complete system consisting of the sludge lagoon, and 5 geotextile bags will still require a footprint of approximately 1 ha.
- Removal of dewatered sludge and conveyance to the REA the SCSS would be labour intensive compared to the base case based on a liquid transfer option.
- High additional capital cost involved based on the need for a sludge storage pond, the size and number of operational geotextile bags involved, and the bunded drainage area required.
- High ongoing operational cost for chemical consumption, continual replacement of the geotextile bags on completion of each drying period, and more frequent truck movements to dispose of the dewatered sludge off site.

- Continued contribution to groundwater and discharges from LDP006, with the future potential of the release of polymer to the shallow groundwater table over time if solid waste is emplaced at the Springvale Coal Services REA.

## 5 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 Springvale Coal Services 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 $m^3/h$ 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 1 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 are 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 LDP 006, 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 a potential risk of the chemical finding its way to Wangcol Creek via the REA.

## 6 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 would introduce a new chemical not already in use at the REA, and the potential risk of the polymer finding its way to Wangcol Creek via the REA over time.

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.

A dewatering option utilising Geobags would provide a smaller footprint than the sludge drying bed option but brings with it a number of the environmental impacts, operational and cost issues that are a factor in the mechanical dewatering option, such as the need for polymer addition to promote coagulation. The Geobag option is therefore not considered to offer any greater beneficial outcome than either these two options and, like these options, only marginal additional benefit to the catchment at a higher cost and with a greater level of operational complexity than the base case.

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.

Regards

**Karl Rosen**
Principal – Environment

**Peter Eccleston**
Principal Water Engineer

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28 March 2017

Mr. Clay Preshaw
A/Director Resource Assessments
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Dear Mr Preshaw

**Re: Western Coal Services Project (SSD 5579) – Mod 1**

As requested at the meeting held with the Department of Planning and Environment on 16 March 2017, provided below is additional information to support the modification to the Western Coal Services Project (SSD 5579) that seeks approval to receive residuals from the Springvale Water Treatment Project SSD (16_7592).

**Options to Reduce Impact of Residuals Emplacement on LDP006 Water Quality**

The Response to Submissions for the Western Coal Services Mod 1 included the consideration of alternative options for the management of residuals from the Water Treatment Plant prior to their emplacement at the Springvale Coal Services Site. These options included the further treatment of residuals to form solids through the use of sludge lagoons/drying beds or mechanical dewatering. Neither of these options was considered to be justified given the high capital and operating cost, additional environmental impacts and minimal additional benefits for the catchment.

Subsequent to the submission of the Response to Submissions for the Western Coal Services Mod 1, additional investigations have been undertaken to consider the feasibility of a geotextile bag dewatering system as another alternative for solid management of the residuals from the Water Treatment Plant. The details of these investigations are subject to a separate report however this option is not considered feasible due to the labour intensive nature and high capital cost of implementation. Additionally, to support this management option, additional land would need to be made available and the impacts of additional land clearing and truck movements to the Springvale Coal Services Site taken into consideration.

The Western Coal Services Mod 1 Response to Submissions also investigated potential mitigation measure to cease the infiltration of the residuals into groundwater aquifers from occurring once they were emplaced within the reject emplacement area (REA) at the Springvale Coal Services Site (SCCS). This consideration included lining of the new REA and A-Pit REA. These REAs are currently unlined and retrospectively lining these REAs would be impractical and inefficient given that the REAs are currently operational and due to the extent of surface to groundwater connectivity known to exist.

Water losses from the REAs currently arise through evaporation and infiltration through the REAs to the shallow groundwater system. Lining of the REA would be expected to increase the evaporation from within the REA, however the remaining liquid stream would require management within the sites water management system.

The REA in which the residuals are to be emplaced is currently operational. Retrospectively lining this REA would require coal reject emplacement to cease, resulting in significant business interruptions. The coal reject material that has already been emplaced would need to be excavated and stored in an


Centennial Coal Company Limited ABN 30 003 714 538

alternative location while the lining of the REA occurred. No other storage options for this coal reject material currently exist.

Alternative options to reduce the potential for infiltration would be the construction of a new onsite storage dam to contain the residuals. Due to the volume of residuals received, a large area of land would be required to construct such storage, resulting in additional vegetation clearing and the potential for overflows during large rainfall events into the existing water management system at site. Limited land is available at or in proximity to the Springvale Coal Services Site to construct a new storage dam for the containment of residuals and the environmental impacts and additional operational costs outweighs any environmental benefit that would be gained. As such, additional new storages for the residuals are not considered justified.

**Long Term Objectives for LDP006 Discharges**

On 15 February 2017, representatives from Centennial met with representatives from the Environment Protection Authority (EPA) to provide them with an update on the outcomes of investigations into the issues associated with current discharges from LD006 at the SCSS.

Subsequent to this meeting, Centennial provided correspondence to the EPA in a letter dated 22 March 2017 committing to a long term beneficial reuse option for the water currently discharged through LDP006. Investigations are continuing to explore the viability of a range of beneficial reuse options which would be implemented concurrently with the grant of development consent for the Angus Place Extension Project (SSD 5602) currently planned for 2022.

**Interim Water Quality Investigation and Improvements**

While a beneficial reuse strategy for LDP006 is being developed, Springvale Coal will continue to progress with investigations to better understand the existing surface and groundwater environments at the SCSS and make progressive improvements in water management outcomes. A work plan was provided to the EPA on 15 March 2017 detailing the works proposed to be undertaken over the next 18 months. A copy of this work plan has been attached for your reference.

A key focus of the work plan is to improve the separation of clean and dirty water across the site and reduce the volume of surface water runoff reporting to the groundwater environment that contributes to the volume of water discharged through LDP006. These works will be completed by December 2018.

**Coxs River Catchment Restoration**

As part of the Springvale Mod 2 Response to Submissions, Centennial has committed to undertake extensive restoration works within the Coxs River Catchment on land owned by Centennial. The restoration areas comprise three sites referred to as:

- Wolgan Road Southern site;
- Brays Lane site; and
- Coxs River and Angus Place site.

The land management actions proposed for the three identified areas comprise the following.

- Removal of grazing pressures;
- Riparian restoration along Coxs River and drainage lines including native species planting;
- Weed removal / control; and
- Rabbit control.

The proposed restoration of riparian vegetation in all three management areas provides a number of potential benefits in Coxs River, including:

- Improved aquatic habitat and with a potential for improvements to stream health.
- Improved oxygenation of water in the river by macrophytes which will result in better dissolved oxygen (DO) levels in the river.
- Less eutrophication in the river which will result in lower nitrogen based nutrient concentrations and hence reduced propensity for algal blooms.

These catchment improvement practices will be complemented by the works that will be undertaken to improve the riparian habitat of Wangcol Creek for at least 100 m of the proposed Link Haul road bridge crossing the creek in accordance with Schedule 3 Condition 26 of Western Coal Services consent SSD 5579.

Centennial considers these restoration activities to address the WaterNSW submission to the Western Coal Services Mod 1 Response to Submission.

**Conclusion**

Centennial has investigated a number of options to reduce the potential for additional impacts that the receipt of residuals has on the quality of water discharged from the SCSS. These alternative options are not considered feasible based on the additional costs and minimal benefits on environmental outcomes. The emplacement of residuals within the REA at the Springvale Coal Services Site represent a minor detrimental effect to Wangcol Creek in the context of the overall improvements to catchment water quality achieved by the implementation of the Springvale Water Treatment Project. The modification to the Western Coal Services Project consent is only required to facilitate the management of residuals for implementation of the Water Treatment Project and therefore should not be considered in isolation from the overall development. The Water Treatment Project is effectively removing all mine water discharges to the Cox River Catchment from LDP 009 for reuse within the Mount Piper Power Station. 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 Water Treatment Project which results in considerable overall benefits for the catchment.

Additional to improvements in water quality, Centennial has committed to extensive restoration works on land owned by Centennial that will improve riparian habitat, improve visual aesthetics and indirectly, improve water quality in the Upper Coxs River catchment.

In relation to LDP006, Centennial has committed to the long term beneficial reuse of water discharged through LDP006 concurrent with the Angus Place Mine Extension Project planned for 2022. Investigations of options to achieve this have commenced. In the interim, a number of improvements will be made to the water management system at the Springvale Coal Services Site through the diversion and separation of clean and dirty water, along with additional monitoring to better understand the environment in which the SCCS operates.

If you have any questions or require any further information in regards to this matter, please feel free to contact me on my mobile 0407 207 530 or email james.wearne@centennialcoal.com.au.

Yours sincerely

James Wearne
**Group Approvals Manager**

**Attached** - WCS LDP006 Discharge Project – Work Plan

**ATTACHMENT 1** **March 2017**

**WCS LDP006 DISCHARGE PROJECT**

**WORK PLAN**

| No. | Action | Status | Date of Completion |
|---|---|---|---|
| **A. GENERAL PROJECT ACTIONS**<br>**Team Leaders: Project Manager with General Manager Safety & Environment / Group Manager Approvals / Group Manager Environment / Manager SCS** | | | |
| **1.** | **Long-term Options Study**<br>1. Develop a long term beneficial reuse options study of LDP006 discharge water. | Commenced | Within 6 months of approval of the WCS Modification<br>(expected 30 June 2017) |
| **2.** | **Risk Assessment and Cost Benefit Analysis for Long-term Options**<br>1. Complete a risk assessment and cost benefit analysis for identified long-term beneficial reuse options identified in the Options Study. | To be completed | 30-Jun-2018 |
| **B. OPERATIONAL MANAGEMENT ACTIONS**<br>**Team Leader: Site Manager SCS / Environment & Community Co-ordinator** | | | |
| **1.** | **Review and Submission of Water Management Plan**<br>1. All changes and commitments as proposed in SSD_5579 MOD 1, including;<br>a. Updated site water and salt balances.<br>b. Updated water modelling from proposed water separation activities and designs. | Commenced | Within 3 months of approval of the WCS Modification<br>(expected 30 June 2017) |

| | | | |
|---|---|---|---|
| | c. Updated monitoring requirements.<br>2. Any other initiatives and modelling or monitoring outcomes identified.<br>3. Groundwater monitoring as per item (5) below. | | |
| **2.** | **Water Diversion Stage 1 – Clean (non-coal contact) and Dirty (coal contact) Water separation at Lamberts Gully**<br>1. Establishment of a pumping system for the transfer of tailings water from the A-Pit REA to Cooks Dam was completed in 2016.<br>2. Installation of the "head of catchment" separation works to divert the upstream clean water away from the Dirty Water stream located at the Northern base of Lamberts Gully Open cut rehabilitation area adjacent to REA Access Road and tail end of Overland Conveyor 3.<br>3. Commencement of modification to critical culverts, drains, spillways, separation bunds and the regrade of the Haul Road with a cross-grade to the dirty water diversion through Lamberts Gully according to design.<br>4. Targeted manual flow and quality monitoring. | Commenced | 31-Dec-2017 |
| **3.** | **Water Diversion Stage 2 - Clean (non-coal contact) and Dirty (coal contact) Water separation at Lamberts Gully**<br>1. Completion of modification to critical culverts, drains, spillways, and separation bunds.<br>2. Installation of automated flow and quality monitoring. | Commenced | 31-Dec-2018 |
| **4.** | **Huon Gully Interception Works and transfer of intercepted clean water from the Huon Gully to the Lamberts Gully Clean Water Diversion.**<br>1. Works to divert the upstream catchment of Huon Gully around the REA to enable clean water flows down Huon Gully were completed in 2016.<br>2. A review of options for the interception and transfer clean water runoff to clean catchment prior to entering surface voids at Huon Gully. | Commenced | 30-June-2018 |

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| | 3. Automated flow and targeted manual water quality monitoring. | | |
| **5.** | **Ground water monitoring at strategic locations to capture and review data to inform the site water and salt balance and further inform the surface water and ground water interaction across site. Each of the groundwater bores will have continuous level logging and EC monitoring equipment installed at a time step of less than a day.**<br>1. Finalise a technical study for automated ground water monitoring options in accordance with WCS SSD-5579 MOD1 SoC. | Commenced | 31-Dec-2017 |