

## Interoffice Memorandum

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To: Rob Zuber  
From: Zach Trujillo  
Subject: Colowyo – TR-100 Review of Geotechnical Analysis  
Date: 9/12/2013

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Rob –

With TR-100, Colowyo Coal Company L.P. proposes to revise Colowyo Mine's mine plan to reflect highwall mining in multiple seams in the West and South Taylor Pits. The proposed TR100 has highwall mining occurring in the G7 and 8 (G78) and E/D2 seams in the South Taylor Pit. Additionally, highwall mining is proposed to occur in the West Pit in F, E, D2, and C seams. After my review of Agapito Associates, Inc. (AA) Geotechnical Design and Operational Consideration for Highwall Mining, South Taylor Pit G78 and E/D2 Seams, and West Pit F, E, D2, and C Seams (the Report), I have the following comments:

1. As part of AA's summary of findings and design recommendations within the Report, they analyzed future mining of the F Seam in the West Pit below the previously mined E seam panels. AA states in the Report that potential web pillar failure would cause an increase in stress concentration in the F Seam. With this increase in stress concentration, AA recommends avoiding the previously mined E Seam highwall miner workings when designing the F Seam panels. In AA's Report, there is no mention regarding potential impacts of highwall mining the G78 Seam under the previously mined E seam along the North End Wall in the South Taylor Pit. Please have Colowyo address any impacts that potential web pillar failure in the previously mined E Seam along the North End Wall in the South Taylor Pit may have on future G78 panels. Additionally, please have Colowyo address whether they plan on avoiding the previously mined E Seam highwall miner working when designing the F Seam panels as recommended by AA.
2. When reviewing the proposed highwall mining section in the North End Wall in the South Taylor pit, the maximum penetration distance appears to undermine a section of the temporary East Taylor Fill. In AA's geotechnical assessment, web pillars are designed based upon a range of design depth of cover. It is unclear to

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the Division that in AA's geotechnical assessment, the temporary section of the East Taylor Fill has been incorporated into the total depth when calculating web pillar widths. With the additional depth from the temporary excess spoil, designed pillar widths may change in order to comply with AA's suggested pillar width-to-height criteria and to meet the 1.5 safety factor. Please have Colowyo address whether the temporary section of the East Taylor Fill has been accounted for in AA's proposed web pillar design and whether potential web pillar failure would have any adverse effect to the East Taylor Fill.

3. Reviewing lithology logs for selected boreholes, multiple seams that are proposed to be mined have carbonaceous mudstone/mudstone as its immediate roof, floor or both. In AA's Report, they state that previous highwall mining experience within Colowyo Mine has shown weak mudstone roofs tend to fall when exposed and soft floor conditions could hinder trafficability. Please have Colowyo address whether they plan on leaving a 4 inch coal roof/floor barrier as recommended by AA when encountering weak mudstone to prevent roof falls and any other issues that may occur.
4. As part of AA's design, to ensure that panels can be laid out independently, interburden thickness-to-lower seam mining height ratio needs to be 2.0 or greater. On Table 2 – Characteristics of the Target Seams in the West Pit, the West Pit show interburden thickness-to-lower seam mining height ratios to be less than 2.0 for the E and F Seams. It is only assumed in AA's Report on how Colowyo is accounting for this. Please have Colowyo discuss on how they plan on highwall mining this section of E and F Seams with an interburden thickness-to-lower seam mining height less than 2.0 without having to columnize pillars while maintaining a safety factor of at least 1.5.

As an additional note, AA's Report lists designs and approaches which are considered "recommendations" to Colowyo. With experience of web pillar failure in the past at the Colowyo Mine, it is important that Colowyo adhere to AA's design and operational consideration to ensure global stability of the proposed highwall mining sections. Please have Colowyo add to the permit a section in which they commit to these recommendations for this highwall mining operation proposed with TR100.

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This concludes my comments regarding Shannon & Wilson, Inc.'s (S&W) Addendum No. 3 as part of Colowyo's proposed TR-100. If you have any questions, feel free to contact me.

Sincerely,

Zach Trujillo