COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

April 27, 2021

Jeremy Deuto
Aggregate Industries – WCR, Inc.
1687 Cole Blvd
Suite 300
Golden, CO 80401

RE: Lyons Quarry, Permit No. M-1977-141, Technical Revision No. 5 (TR-05), Adequacy Review No. 2

Mr. Deuto:

The Division of Reclamation, Mining and Safety (Division) has identified the following additional adequacy items that must be addressed before an approval of TR-05 can be issued:

1) Please address the adequacy items identified in the enclosed letter from Tim Cazier, P.E., DRMS.

This completes the Division's 2nd adequacy review of the materials submitted for TR-05. The decision date for TR-05 is currently set for **May 5, 2021**. If additional time is needed to address the adequacy items, an extension request must be received by our office prior to the decision date.

If you have any questions, you may contact me by telephone at (303) 866-3567, ext. 8129, or by email at amy.eschberger@state.co.us. You may also contact Tim Cazier by telephone at 303-866-3567, ext. 8169 or by email at tim.cazier@state.co.us.

Sincerely,

Amy Eschberger

Amy Eschberger
Environmental Protection Specialist

Encl: TR-5 review letter from Tim Cazier, P.E., DRMS, dated April 23, 2021

Cc: Travis Snyder, HDR
Chance Allen, Aggregate Industries - WCR, Inc.
Tim Cazier, DRMS
Michael Cunningham, DRMS

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Date: April 23, 2021

To: Amy Eschberger

From: Tim Cazier, P.E.

RE: Lyons Quarry, DRMS File No. M-1977-141;
TR-5, Review of March 2021 Attachment E, Rule 6.5 – Geotechnical Stability Exhibit generated by HDR

The Division of Reclamation, Mining and Safety (DRMS) engineering staff has reviewed the March 2021 Attachment E, Rule 6.5 – Geotechnical Stability Exhibit generated by HDR. The review consisted of comparing Attachment E with Rule 6.5, the geotechnical stability approach approved as part of the review of TR-02 and the Mined Land Reclamation Board Policy No. 30. The following concerns were identified during the review and need to be clarified or corrected prior to DRMS approval of the Geotechnical Stability Exhibit.

Geotechnical Stability Related Comments

1. Rock Anchors: A comment was raised by the DRMS during the review of TR-2 concerning the lack of inclusion of rock anchors and shotcrete details from the 2008 Kleinfelder report. The response was that as the dacite highwalls were to be backfilled, the rock anchors were not necessary. Now that these northeast facing dacite highwalls are not to be backfilled, please respond to this comment from our January 4, 2017 "Adequacy No. 3" letter (*your response should address the reference to "rock bolt support utilizing adequate safety factors" in Section 3.3 on p. 9 in compliance with MLRB Policy No. 30*):

   The 2008 Kleinfelder Report recommends the use of rock anchors and shotcrete to reinforce the northeast facing slopes against wedge failure. The revised HDR Report does not include any discussion regarding the use of rock anchors or shotcrete. In addition, the Reclamation Cost estimate does not include any costs associated with reinforcing the northeast facing slopes. Please clarify if the recommendations in the 2008 Kleinfelder Report regarding the stabilization of the northeast facing slopes will be followed. If so, the design specifications for the placement of the rock anchors and shotcrete must be provided to the Division for review. If the Operator will not follow the recommendations in the 2008 Kleinfelder Report, then additional stability evaluation may be required.

2. Site Grading Plans: Another comment was raised by the DRMS during the review of TR-2 concerning the use of rock anchors and shotcrete, on the northeast facing slopes where potential wedge failures are likely. The response was that as the

dacite highwalls were to be backfilled, and a 2–foot layer of talus/riprap would protect the sedimentary rock that the comment was not relevant. Now that neither of these approaches are planned to be implemented, please respond to Comment No. 8 from our January 4, 2017 "Adequacy No. 3" letter:

> Based on the site grading plans, it appears that the Template 1 (Section 7.1.1) has been the selected for the final highwall configuration. The recommendations for Template 1 in Section 8 include rockfall catchment berms located at the toe of the Fountain Formation and on top of the dacite sill contact and reinforcement, using rock anchors and shotcrete, on the northeast facing slopes where potential wedge failures are likely.
>
> a) *A long-term catchment berm maintenance plan should be developed to provide guidance for periodic inspection, cleaning out, and maintenance of the berms.*
> b) *Determination of the responsible entity to conduct the catchment berm inspection, cleanout, and maintenance should be included.*
> c) *Areas that will be reinforced should be shown on the grading plan and reclamation plans.*

3. Northeast HIghwall Catchment Berm: Section 3.0 Results (third paragraph) indicates this berm is to be 20 feet high. Section 3.4 states this berm will be 30 feet high. Assuming the contours on this berm are five feet apart as the rest of the contour intervals on the Civil Final Grading Plan, Sheet 01C-02, this berm is between 30 and 35 feet high. Please confirm the height of this berm.

4. Catchment Berm Stability: The catchment berms are proposed to be constructed with 1H:1V side slopes. Slopes this steep are notoriously difficult to vegetate and are steeper than what is typically considered to be geotechnically stable. Please demonstrate these catchment berms will be both erosionally and geotechnically stable. (*Please provide design cross-sections, construction methods, confirmation of material used for construction, stability analyses, and other documentation as necessary*).

5. Increasing Berm Functionality Factor of Safety: Section 5.0 Conclusions in Attachment E - Rule 6.5 – Geotechnical Stability Exhibit staes the factor of safety "could be increased by filling the catchment area with water and maintaining a pond at the base of the highwall or placing a layer of loose sand or pea gravel at the base of the highwall to reduce the rockfall energy". Storing water behind the swale berm could be considered a jurisdictional dam and would need approval from the Colorado Office of the Sate Engineer Dam Safety Division. The use of sand or pea gravel seems as it could dissipate some energy, but only until the sand or pea gravel is covered with fallen rock. This approach would require maintenance (see Comments 2a and b above.

Stormwater Related Comments

6. Swale Berm Culvert: Related to the stability of the swale berm, what criteria were used to size the culvert proposed through the large swale berm?

7. Quarry 2 Swale: The Civil Final Grading Plan, Sheet 01C-02 shows 2H:1V slopes above the swale in the Quarry 2 backfill (gray-shaded area). There is a riprap-lined channel depicted to receive stormwater from this swale, but it does not appear the swale in the gray-shaded area is armored. If this is backfill, rather than competent rock, it will scour and eventually over steepen the adjacent 2H:1V slopes. Please describe how this swale will be protected from scour.
8. Northwest HIghwall Catchment Berm: Similar to the two previous comments there appears to be a potential erosion/scour problem with the northwest highwall catchment berm. Civil Final Grading Plan, Sheet 01C-02 shows a significant downward gradient towards the northeast along the uphill side of the northwest highwall catchment berm. Given this is to be constructed at a 1H:1V slope, stormwater flowing along the bench adjacent to the berm has the potential to scour the toe on the uphill side to the berm, thereby undermining it and causing it to fail. How is this scenario to be prevented?

The DRMS is planning a site visit on April 28th. Based on site observations, we may have additional comments on TR-05.