



MEMORANDUM

To: Hunter Ridley

From: Tim Cazier, P.E. 

Date: April 6, 2023

**Re: Hayden Gravel Pit – Permit No. M-1987-164; Amendment 4 (AM-4)
Exhibit G and Rule 6.5 – Preliminary Adequacy Review**

The Division of Reclamation, Mining and Safety engineering staff (DRMS) have reviewed the Hayden Gravel Pit Exhibit G and Rule 6.5 Geotechnical Stability Exhibit, provided with AM-4 and prepared by Lewicki & Associates.

The review consisted of comparing the contents of these two exhibits with specific requirements of Rules 6.4.7 and 6.5 of the Minerals Rules and Regulations of the Colorado Mined Land Reclamation Board for the Extraction of Construction Materials. Any inadequacies are identified under the respective exhibit heading along with suggested actions to correct them.

The following items must be addressed by the applicant in order to satisfy the requirements of C.R.S. 34-32.5-101 et seq. and the Mineral Rules and Regulations of the Mined Land Reclamation Board:

6.4.7 EXHIBIT G – Water Information

1. Groundwater Exposure: There appears to be a discrepancy between Sections 1 and 2 of Exhibit G. Section 1 states “Groundwater is below the bottom of mining ...” and Section 2 states “Fuel storage will be stored away from exposed groundwater ...”. Please clarify whether or not groundwater is expected to be encountered or exposed.
2. Hydrograph Reports: Several aspects of the stormwater runoff calculations were considered inadequate for the purpose of assessing appropriate stormwater controls. Please provide revised Hydrograph Reports addressing the following:
 - a. SCS Curve Numbers (CN): Three different curve numbers were used: 74 (for apparently undisturbed areas); 89 (disturbed Basin 1 areas); and 81 (disturbed



Basins 2 and 3 areas). Please provide some rationale for the selection of these three curve numbers.

- b. Time Interval: The time interval used for Hydrograph Reports 1, 2, 3, 7, 8, and 9 was 15 minutes. The SCS synthetic hydrographs are based on one tenth of an hour increments. Some software programs include interpolations between the six minute synthetic hydrograph increments. It is not known to the DRMS if this is the case for Autodesk's Hydraflow extension. Regardless, the time step for hydrograph analyses should be no greater than six minutes in order to capture the peak flow.
 - c. Times of Concentration: A basin slope and hydraulic length equal to zero was used for all nine Hydrograph Reports. This implies only direct precipitation on a ponded surface was considered. Basins 1 and 3 have significant slopes and hydraulic lengths; and those for Basin 2 are greater than zero. Basin specific slopes and hydraulic lengths should be used to predict peak runoff as stated in the second paragraph of Section 6.
3. Runoff Volume: Exhibit G is incomplete with respect to demonstrating adequate stormwater storage. Please address the following:
 - a. Underestimated Volume: DRMS engineering used equations 2-3 and 2-4 from the SCS runoff curve number method (USDA, 1986; TR-55) to check the runoff volume reported in the nine Hydrograph Reports and found the Hydrograph Reports consistently under predicting the runoff volume by about six percent. This may be related to the zero values used for the basin slopes and hydraulic lengths, or the fact the model appears to end at 26 hours (1560 minutes); or both.
 - b. Ponds: There are three Pond Reports suggesting a stormwater pond in each Pod. No pond locations are shown on the Exhibit C maps or Exhibit G maps. All ponds are only 2 feet deep, but have a very large footprints, between 35 and 52 acres. It is impractical to expect a stormwater pond of that extent to be flat enough over the entire bottom such that a two-foot depth would be available over the entire footprint to store runoff. Please provide locations of the three ponds and consider a smaller, practical footprint and a depth greater than two feet.
4. Erosion Potential: The reclamation grading for Pods 1 and 3 show steeper than existing slopes at the downgradient end of the contributing areas, with the final slope on the south side of Pod 3 being significantly steeper. Given the large contributing areas, erosion gullies are expected on these reclaimed slopes. How is stormwater to be controlled on these reclaimed slopes so as to prevent significant gullying?

Rule 6.5 EXHIBIT G – Geotechnical Stability Exhibit

5. Clarification Requested: The third paragraph states “Mining will be conducted at the active highwall angle until the highwall has reached the half-way point of the final mining slope.” Please explain what is meant by the half-way point.
6. Typo: As this is the second submittal from Lewicki & Associates citing Table 2.5 in the SME Mining Reference Handbook with author “Hoek” being misspelled in the footnote, the DRMS is pointing out the incorrect spelling as “Houk”. No response is necessary.

If either you or the applicants have any questions regarding the comments above, please call me at (303) 328-5229 [mobile #].