STATE OF COLORADO

DIVISION OF RECLAMATION, MINING AND SAFETY
Department of Natural Resources

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MEMORANDUM

To: Travis Marshall

From: Tim Cazier, P.E.

Date: February 22, 2013

Re: JD-9 Mine Drainage Design Plan – General Stormwater Comments, Permit No. M-1977-306 / AM-01

The Division of Reclamation, Mining and Safety (DRMS) engineering staff has reviewed the September 20, 2012 Drainage Design Plan (DDP), Engineered Stormwater Management Plan for the JD-9 Mine prepared by O'Connor Design Group, Inc. The following comments are posed to ensure adequate engineering analyses and design practices are implemented to eliminate or reduce to the extent practical the disturbance to the hydrologic balance expected by the mining operation with respect to water quality and quantity in accordance with Rules 3.1.6(1), 6.4.21(10) and 7.3.1. Please note, as this site is a designated mining operation (DMO), compliance with Rule 7.3.1 is applicable, thus requiring certified designs and specifications for engineered elements associated with the environmental protection plan (EPP).

1. Page ESWMP-1, first paragraph. This paragraph discusses the settling ponds on Monogram Mesa that are gravity drained through a series of pipes from uppermost to lowermost pond. The text indicates that the ponds collect onsite precipitation and that they are "designed with several inches of freeboard".
    a. It is not clear from photos 11, 13, and 15 in Appendix 1 of the "Materials Containment Plan" whether there are berms around the settling ponds. Please clarify whether or not the onsite precipitation collected in the settling ponds is only direct precipitation on the ponds or does it also include some run-on stormwater.
    b. How is water managed in the lowermost pond?
    c. Is "several inches of freeboard" in the lowermost pond sufficient to contain both pumped groundwater and collected onsite precipitation? Please provide design documents or an analysis to support your response.
2. Page ESWMP-5, section7.2. The NOAA Atlas 2, Volume III charts provided in the attachments are illegible due to the small scale. Please state the specific design storm depths used for runoff analyses for both the 10-year and 100-year, 24-hour events.

3. Page ESWMP-6, last paragraph, DDP Drawing 3 of 7, and FlowMaster output pages. It is stated the channels are "capable of transporting the 100-year flows". A Manning's n value varying from 0.030 to 0.045 is used for different channel design analyses. However, no rationale is provided for the selected roughness coefficients. Furthermore, channel roughness is seldom uniform, the DRMS requires channels be evaluated for both stability and capacity, i.e., minimum and maximum expected roughness. For example, an excavated earth channel, after weathering would be expected to have a minimum n = 0.018 (use to evaluate stability or maximum expected velocity); and a maximum n = 0.025 (use to evaluate capacity). In addition, the DRMS requires channel freeboard be evaluated for all engineered channels: channels shall be designed with a minimum of 0.5 feet of freeboard unless the velocity head ($v^2/2g$) is significant, then the minimum required freeboard is half the velocity head, or $v^2/4g$.

    a. Please provide a rationale for the selected roughness coefficients, and evaluate each designated channel/ditch design slope for both capacity and stability. **Attachment A** identifies missing design analyses.

    b. Please design all engineered ditches with the appropriate freeboard and provide channel design depths for construction.

    c. Please review **Attachment A** for additional channel segments identified by the DRMS that are not included in the analyses provided, and submit analyses for these segments.

    d. Please note that channels expecting erosive channel velocities will need to be armored with appropriately sized revetment or constructed in non-erodible material, such as bedrock.

4. Page ESWMP-7, section 7.4 paragraph and Retention Pond Drainage Design Plan (Sheet 4 of 7). The 100-year, 24-hour runoff volume criteria used for sizing storage in the pond is acceptable. However, a spillway is necessary to pass runoff from successive storms as there is no way presented in the Retention Pond design plan to drain the pond via gravity. As such, the emergency spillway for the pond needs to be designed to convey 100-year peak flow, assuming the ponds are full (to the spillway invert elevation) at the onset of the design storm. Please provide analyses and designs to demonstrate the spillway has the capacity to pass the peak flow resulting from the 100-year, 24-hour design storm. (*NOTE – The DRMS checked with the Colorado Division of Water Resources (DOWR) District 63 water commissioner (Tom Brigham) regarding the status of the Dolores River appropriations. DWR's requirement to release retained stormwater within 72 hours is seasonal and is subject to change.*) The DRMS suggests the Operator consider a low level outlet be designed into the pond in case a call is put on the Dolores River, the Operator can comply with the DOWR requirements.

5. Please address the reclamation/post mining plan for the retention pond. The DRMS strongly encourages breaching the embankment upon closure unless the landowner has a use for the pond (e.g., stock pond) and intends to maintain it.

6. Page ESWMP-25, 72" CMP analysis; DDP Drawing 3 of 7; and Figure C2. There appears to be some discrepancies in parameters such as elevations, culvert lengths and outlet conditions in the three referenced pages. The two drawings indicate elevations in the vicinity of 6460 vs. the elevations around 6390 on ESWMP-25. The drawings differ considerably in culvert length (~72 ft in the DDP drawing vs. ~58 ft in Figure C2) and

measured culvert slope (~11% in the DDP drawing vs. ~ -2% in Figure C2). The culvert outlet velocity is considerably different for these two conditions and will dictate the necessary outlet scour protection to prevent erosion. There is also a photo in Appendix 1 of the "Materials Containment Plan" (Reference photo #8 on page 4) showing a cantilevered culvert above the contact between steep fill and native terrain. This culvert outlet requires an energy dissipation to prevent scour at the outfall.

a. Please clarify whether or not photo #8 is the 72" CMP.

b. Please review the last two rows of **Attachment A** and clarify which is correct.

c. Please provide outlet protection design for the confirmed culvert condition.

d. The embankment through which this culvert conveys stormwater is not designated as a road to remain in place after reclamation. As this drainage is expected to experience significant stormwater flows, this embankment and culvert should be removed to complete reclamation. Please revise the reclamation plan and map to reflect the removal of the embankment and culvert.

7. Pages ESWMP-48 and 49, NOAA Atlas Charts. These two charts are illegible at the scale provided and appear to be identical based on the isopluvial patterns. Please state explicitly the rainfall depths used for the 10-year and 100-year, 24-hour design storms as this information is not provided in the Pond Pack computer output.

DDP Drawings:

8. Sheet 3 of 7. Please label additional channel segments analyzed as a result of Comment 3 above.

9. Sheet 4 of 7. No spillway or low level outlet is provided for the retention pond. Please provide spillway location, designs (sections and profile), and specifications sufficient to convey the design flow to the toe of the embankment.

10. Sheets 5 and 6 of 7. No water surface (W.S.) elevations or velocities are provided for these sections. The slopes are suspect. Please see **Attachment A**.

    a. Please provide water surface (W.S.) elevations for each section or eliminate reference, indicating FlowMaster results are appropriate.

    b. Please provide flow velocities for each section or eliminate reference, indicating FlowMaster results are appropriate.

    c. Please revise slopes, considering the response to Comment 3.

11. Sheet 7 of 7. Cross sections and details:

    a. Section 20-2. No analysis is provided for this swale. The 6-inch depth will not meet the minimum freeboard requirements in Comment 3. Please provide a hydraulic analysis and revise the design to meet the DRMS requirements.

    b. Section 30-2. The one-foot design depth does not meet the minimum freeboard requirements stipulated in Comment 3. Please revise the design to meet the DRMS requirements.

    c. Section 20-3. Please demonstrate the one-foot high berm has sufficient freeboard.

    d. Please provide details or sections indentified as missing in **Attachment A**.

If either you or the applicants have any questions regarding the comments above, please call me at (303) 866-3567, extension 8169.

ATTACHMENT A

Proposed Drainage Improvements Sheet 3 of 7 - Parameter/Status Check

Channel‡	Location	DRMS Derived Parameters from Sht 3 of 7				Slope on Sht 5 or 6 of 7(ft/ft)	Analysis Max. / Min. Design Slope (ft/ft)	Max. / Min. Manning's n	Status per Sht 3 of 7	Detail or Cross-Section Provided	Analysis Page ESWMP- *
		Segment length (inches on map)	Segment length (ft)	Segment drop (ft)	Segment slope (ft/ft)						
10-1	As shown on Sheet 3 of 7	1/8	12.5	5	0.400	0.0222	only 0.200	only 0.045	Existing	Sht 5 of 7	26
10-2	As shown on Sheet 3 of 7	15/16	93.8	10	0.107	0.0222	only 0.1053	only 0.045	Existing	Sht 5 of 7	28
10-3	As shown on Sheet 3 of 7	1/8	12.5	20	1.600	0.0222	only 0.200	only 0.045	Existing	Sht 5 of 7	31
10A-1	As shown on Sheet 3 of 7	5/16	31.3	1	0.032	not shown	only 0.011	only 0.040	Proposed	Missing	34
10A-1A	*drop into pond above 72" CMP*	3/16	18.8	10	0.533	not shown	*Missing*	*Missing*	*Proposed*	*Missing*	N/A
20-1	As shown on Sheet 3 of 7	1/2	50.0	5	0.100	0.0222	only 0.141	only 0.035	Existing	Sht 6 of 7	37
20-2	As shown on Sheet 3 of 7	1/2	50.0	2	0.040	not shown	Missing	Missing	Proposed	Sht 7 of 7	N/A
20-3A	*downgradient of 20-3*	7/16	43.8	5	0.114	not shown	*Missing*	*Missing*	*Proposed*	*Missing*	N/A
20-3	As shown on Sheet 3 of 7	1 5/16	131.3	3	0.023	not shown	Missing	Missing	Proposed	Sht 7 of 7	N/A
30-1	As shown on Sheet 3 of 7	13/32	40.6	5	0.123	0.0222	only 0.141	only 0.035	Existing	Sht 6 of 7	40
30-1A	*downgradient of 30-1*	5/16	31.3	15	0.480	not shown	*Missing*	*Missing*	*Existing*	*Missing*	N/A
30-2	As shown on Sheet 3 of 7	11/32	34.4	10	0.291	0.050	0.080 / 0.010	only 0.035	Proposed	Shts 6 & 7 of 7	43 - 47
30-3	As shown on Sheet 3 of 7	17/32	53.1	1	0.019	not shown	Missing	Missing	Proposed	Missing	N/A
30-3A	*drop into proposed retention pond*	5/16	31.3	15	0.480	not shown	*Missing*	*Missing*	*Proposed*	*Missing*	N/A
72" CMP	As shown on Sheet 2 of 2, Figure C2	1 5/32	57.8	-1	-0.017	N/A	0.098	0.024	Existing	N/A	25
	As shown on Sheet 3 of 7	23/32	71.9	8	0.111	N/A					

‡ Channels in *red italics* are segments identified by DRMS that should be evaluated.

* N/A = Not Available - should be provided