



COLORADO
**Division of Reclamation,
Mining and Safety**
Department of Natural Resources
1313 Sherman Street, Room 215
Denver, CO 80203

August 27, 2020

Chris Zadel
Northern Colorado Constructors
9075 Weld County Road 10
Fort Lupton, CO 80621

**Re: Northern Colorado Constructors, Inc., Bennett Pit, Permit No. M-2016-085,
Hydrologic Analysis Review**

Mr. Zadel:

The Division of Reclamation, Mining and Safety (Division/DRMS) reviewed of the content of the J&T Consulting, Inc. stormwater runoff hydrologic analysis dated July 20, 2020 for the Bennett Pit, Permit No. M-2016-085. A copy of the hydrologic analysis review memo from Tim Cazier, P.E. dated August 19, 2020 is attached for review.

The Operator stated in the report they are willing to add five additional 36 inch CMP culverts in the entrance road to pass the 25-year peak flow event. Please install the culverts and notify the Division when the installation is complete.

If you have any questions, please contact me at peter.hays@state.co.us or (303) 866-3567 Ext. 8124.

Sincerely,

Peter S. Hays
Environmental Protection Specialist

Enclosure – Review Memo

Ec: Jared Ebert; Division of Reclamation, Mining & Safety
Rob Lousberg, Property Owner at rob@lousbergcontracting.com





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MEMORANDUM

To: Peter Hays

From: Tim Cazier, P.E. 

Date: August 19, 2020

Re: **Bennett Pit – Permit No. M-2016-085;**
Response to Inspection Report for CT-1; Preliminary Adequacy Review

The Division of Reclamation, Mining and Safety engineering staff (DRMS) has reviewed the Response to Inspection Report for CT-1 dated July 20, 2020 for Permit M-2016-085, prepared by J & T Consulting, Inc.

1. Hydrologic Analyses – The submittal documented the use of the Colorado Urban Hydrograph Procedure. The hydrologic analyses appear adequate as submitted.
2. Culvert Analyses (36-inch CSP) – The submittal documented the use of Hydraflow Express Extension for Autodesk to analyze culvert performance. The DRMS is not familiar with this particular software, and given some input parameters do not appear to be the most appropriate, we evaluated the culvert performance using the Federal Highway Administration's HY-8 software. The submitted 36-inch CSP analyses used a Manning's n value of 0.020 and a "mitered to slope" culvert entrance. The industry standard for CSP culvert Manning's n is 0.024 and based on site photos, the DRMS considers a "thin edge projecting" culvert entrance to be more appropriate. The tailwater elevation in the submittal was set at $(dc+D)/2$. No explanation of this parameter was provided, but based on the graphical output, the tailwater assumption appears reasonable. The DRMS check of the 36-inch CSP analyses submittal using HY-8 and more appropriate Manning's n and culvert entrance assumptions still resulted in an inlet control flow regime with negligible difference in performance assuming $n = 0.024$ with a thin edge projecting inlet. No response is necessary.
3. Culvert Analyses (20-inch DR17) – Again, the submittal documented the use of Hydraflow Express Extension for Autodesk to analyze culvert performance. We evaluated the culvert performance using HY-8 software. The submitted 20-inch DR17 analyses used a



August 19, 2020

Manning's n value of 0.015 and a "rough tapered inlet throat" culvert entrance. The DRMS considers a "thin edge projecting" culvert entrance to be more appropriate. The tailwater elevation in the submittal was set at "normal", which we assumed to be normal depth. However, no outlet channel geometry was provided, so it is unclear how the tailwater depth was arrived at. The DRMS check of the 20-inch DR17 analyses submittal using HY-8 and more appropriate culvert entrance assumption still resulted in an inlet control flow regime with negligible difference in performance assuming a thin edge projecting inlet. No response is necessary.

Given these culverts drain a slough, the tailwater depth will likely control the performance of any installed culverts. A backwater analyses using a 1D flow model such as the Army Corps of Engineers HEC-RAS may be more useful in determining culvert performance. At any rate, additional culverts will likely result in some reduction of upstream flooding.

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