

STATE OF
COLORADO

Cazier - DNR, Tim <tim.cazier@state.co.us>

Geotechnical Analysis for Penrose Pit M1987-131

1 message

Jodi Schreiber <jodi@arycorp.com>

Tue, Dec 21, 2021 at 4:34 PM

To: "Cazier - DNR, Tim" <tim.cazier@state.co.us>

Tim,

Please see the attached report for the final deliverable on the Penrose Pit Amendment application. If you need anything further, please let me know.

Thank you!



Jodi Schreiber

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"Success is not final, failure is not fatal; it is the courage to continue that counts. "

-Winston Churchill



21.6198 Penrose Pit Letter 12.21.21.pdf
3093K



December 21, 2021

Ms. Jodi Schreiber
Ary Corporation, Inc.
839 Mackenzie Avenue
Cañon City, CO 81212

Subject: Geotechnical Engineering Consultation
Penrose Pit
Permit #M-1987-131
Portion of Sections 11, 12, 13, 14, and 15, T19S, R69W of the 6th PM
Fremont County, Colorado
Project No. 21.6198

Dear Ms. Schreiber:

At Ary Corporation Inc.'s (Ary) request, Cesare, Inc. (Cesare) is providing this letter in response to an inquiry from the Colorado Mined Lands Reclamation Board (CMLRB) regarding slope stability in a localized area of the Penrose Pit in Fremont County, Colorado. Specifically, the CMLRB asked for an engineering opinion regarding whether the existing configuration of a portion of the existing mined area poses a stability concern for the existing bluff that extends below the mesa top where mining has occurred. The area of interest is located in the southeastern corner of the Mining/Stock Pile Area shown on Exhibit C.2, attached (i.e., gray color with red cross hatch).

The southerly end of the existing Mining/Stock Pile Area is atop of natural bluff that extends down to the Arkansas River. According to Ary, mining for sand and gravel aggregate resources has been in progress in this location for more than two decades. Mining activity has removed on average about 40 feet of material comprised of non-product overburden clay and clayey soil, along with sand and gravel product from the mined area. Exhibit 1 is an enlarged section of Exhibit C that shows the area of CMLRB interest outlined with a yellow dashed line.

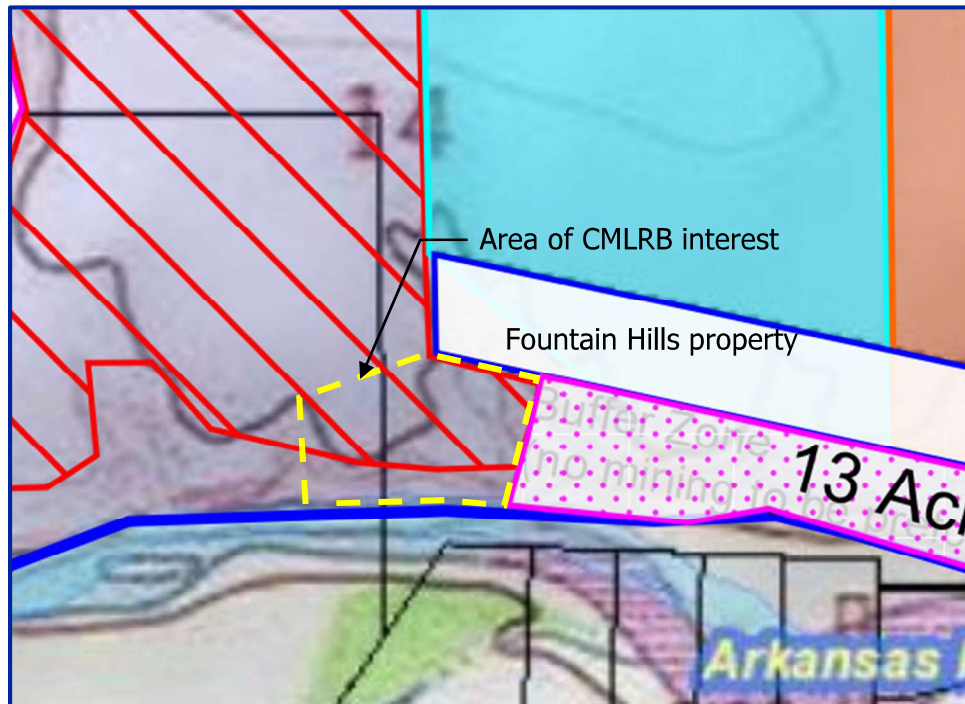


EXHIBIT 1. Area of CMLRB interest (dashed yellow line).

In the area of interest shown in Exhibit 1 Ary reports that excavation generally extended down to within a few feet of hard shale material that comprises the lower portion of the naturally occurring bluff and daylighted on the southerly facing bluff above the Arkansas River. The shale material that comprises the lower portion of the bluff was not disturbed. No mining is occurring in the area of interest, and other than some minor reclamation work, no equipment is operating in this area. Ary stated that the southerly end of the Mining/Stock Pile Area has been mined out and current/future mining is occurring north of the subject area and is progressing eastward. The attached mining plan indicates that no mining south of the Fountain Hills property, and this area will be undisturbed and managed by Ary as a protective buffer zone.

Photographs 1 through 7 were taken in the area of interest by Cesare on December 14, 2021.



Photo 1. View looking west at area of interest.



Photo 2. View looking east at area of interest.



Photo 3. View looking east at area of interest.



Photo 4. View looking east at area of interest.

On the western portion of the area of interest there is a relatively flat to gently sloping area between the silt fence at the crest of the undisturbed portion of the bluff and screening berms that are located roughly 60 to 80 feet north of the slope crest, see Photo 1. On the eastern portion of the area of interest, a reclaimed slope is present, see Photo 4. The reclaimed slope is estimated to have an inclination of about 3:1 (horizontal to vertical).

A review of published geologic mapping¹ indicates that the lower portion of the existing natural bluff above the Arkansas River is comprised of the Pierre Shale Formation in the area of interest. The description of the Pierre Shale Formation, as excerpted directly from the referenced map is:

Kp PIERRE SHALE (UPPER CRETACEOUS)--Predominantly siltstone and claystone. Contains sandstone and sandy shale near top and bottom, limestone masses forming conical buttes near middle, and fossiliferous concretions throughout. Baculites eliasi is the uppermost faunal zone at the top of the Pierre in Canon City area. Thickness in Denver basin part of quadrangle is 3,750-5,200 feet (1,125-1,560 m); near Canon City is 3,900 feet (1,170 m)

Cesare exposed the shale in the face of the bluff just below the silt fence that is visible in Photos 1 through 4. Photos 5 and 6 confirm that hard, blocky, platy, silty claystone is present in the native bluff that is consistent with the description on the geologic map.



Photo 5. View looking east at shale exposed in face of native slope.

¹ Geologic map of the Pueblo 1 degree x 2 degrees quadrangle, south-central Colorado, U.S. Geological Survey, Miscellaneous Field Studies Map MF-775, Map Scale 1:187,500, prepared by Scott, G.R., Taylor, R.B., Epis, R.C., and Wobus, R.A., 1976.



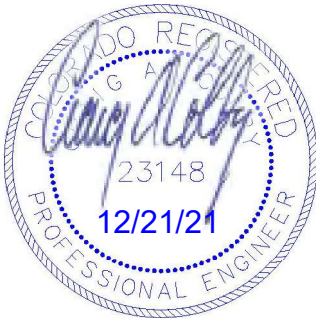
Photo 6. Close-up view of shale material.

Ary reports that, historically, no failures within the natural shale slope between the Arkansas River and mined area have occurred since mining activities began and there is no evidence of such in the subject area based on review of aerial imagery obtained from Google Earth.

It is Cesare's opinion that removal of the overburden soil (waste and sand and gravel product) from atop the mesa down to near the top of the shale and the current configuration visible in Photos 1 through 5 has not increased the risk of slope instability in the area of interest. The bench or setback from the crest of the bluff to the screening berms on the western end is favorable for stability and the flattened slopes along the eastern end also are favorable to stability of the underlying claystone bluff, compared to the slope configuration that existed prior to mining. Typically, grade flattening and removal of earthen material/load from the top of a slope inherently increases the stability of the slope.

Please contact Cesare with any questions or comments regarding this information.

Sincerely,
CESARE, INC.



Craig A. Colby, P.E.
Director of Engineering

CAC/ksm

Attachment

Scale

The current effected area will be mined out before starting east into phase 1. This will continue east through the phases until phase 4. At which point the mining operation will use the Texas crossing to begin west starting at phase 5 working through to phase 7. Phases 8 and 9 will be evaluated at a later date to see if they will or will not be mined.

