SLOPE STABILITY EVALUATION

RIFLE GRAVEL PIT #1
GARFIELD COUNTY, COLORADO

January 20, 2025

Prepared By:

RJ Engineering & Consulting, Inc.

PO Box 1080
Silt, CO 81652

3082 Evergreen Pkyway, E
Evergreen, CO 80439

Prepared For:

Western Slope Materials LLC
PO Box 1319
Carbondale, CO 81623

Project No. 21-010R-C2

TABLE OF CONTENTS

LIST OF ATTACHMENTS

1.0 PROJECT INFORMATION

1.1 Purpose and Scope

This report presents the results of our slope stability evaluation for the south side of the proposed Rifle Gravel Pit #1 in Garfield County, Colorado. The investigation consisted of field reconnaissance and review of existing exploratory drilling information for the subject site. We were requested to conduct this stability evaluation to address concerns that the mining operation would adversely affect the permanent structures which includes:

- Last Chance Ditch tailwater channel
- Last Chance Ditch irrigation lateral
- Colorado River floodplain
- Non-potable URSA Resources water lines (supply and return)
- URSA Resources gas line
- CDOT CR 346 and culverts
- CDOT I-70 Westbound Traffic Lanes
- CDOT Wildlife Fencing (I-70 Westbound ROW)
- Private Fencing East (Shidelerosa LLLP)
- Private Fencing North (Colorado River Ranch, LLC)
- Private Fencing South (Scott)

Our analysis was conducted to substantially address section *6.5 Geotechnical Stability Exhibit of the Division of Reclamation, Mining and Safety for a Construction Materials permit application and subject to C.R.S. 34-32.5-101 et seq*.

1.2 Site Conditions

The subject site is located adjacent to County Road 346 about a mile east of the Mamm Creek Road intersection. The site is relatively flat with marshes and wetlands. The site is generally vegetated with shrubs, bushes and grasses.

2.0 SUBSURFACE INFORMATION

HP Geotech previously conducted a subsurface investigation for the site under their project number 108 354A. Based on our review, Boring 3 is the nearest test hole to the southeast portion of the site, and Boring 4 is nearest to the northeast portion of the site where our analyses were performed. The test holes consisted of 1 to 7 feet of clay and silt over 20 to 21

feet of gravel underlain by claystone/siltstone bedrock to the maximum explored depths of 25 to 30 feet. The approximate elevations used in our analysis are presented in the table below.

Subsurface Conditions	Boring 3 Appx. Elevation (ft)	Boring 4 Appx. Elevation (ft)
Ground Surface at Boring Location	5388	5385
Gravel Surface	5381	5384
Bedrock Surface	5361	5363
Bottom of Boring	5358	5360

3.0 SLOPE STABILITY ANALYSES – PROPOSED CONDITIONS

Slope stability modeling was conducted to evaluate the factor of safety with respect to slope geometry and subsurface conditions to address potential damage to all structures listed in Section 1.1 above. We were provided with development plans for the Rifle Gravel Pit #1 prepared by SGM. Based on our review of the plans, we believe the Phase 1 conditions with the berm in place would be the more conservative condition and will reflect the mining through Phase 4 (final reclamation). The addition of the berm to the top of the slope will increase driving forces, which would be present during mining operations, and reduce the global factor of safety for the slope.

We selected three locations along the south and north side of the project to conduct slope stability evaluations. The section locations are presented on the attached sheet. The section geometry and water surface elevation were based on proposed grading from the SGM plans. The stability was modeled using limit equilibrium (LE) method of slices using the shear strength methodology. The configuration and assumptions for each section is as follows:

Section	High Wall Height	Slope Gradient	Groundwater
Section A West Section	22 feet	3H:1V (18.4 degrees)	Analysis assumed a wet mining operation and water will be maintained at about elevation 5380.5
Section B East Section	22 feet	3H:1V (18.4 degrees)	Analysis assumed a wet mining operation and water will be maintained at about elevation 5380.5
Section C North Section	21 feet	3H:1V (18.4 degrees)	Analysis assumed a wet mining operation and water will be maintained at about elevation 5380.5

The LE method uses the slope profile to divide the model into vertical sections with each section contributing to the driving and resisting forces. The forces are summed, and a factor of safety is calculated as the ratio of the sum of resisting forces to the sum of driving forces. A factor of safety (FS) of 1.0 can be interpreted as the resisting forces equal the driving forces and the overall slope is at equilibrium. A less than 1.0 indicates the resisting forces are less than driving forces, or a slope below the limit of equilibrium (the slope is failing). A FS greater than 1.0, for example a FS of 1.30, indicates the total resisting forces are 30% higher than total driving forces. A FS of at least 1.50 is typically a target design value for critical structures.

3.1 STABILITY MODEL

Figure 1 depicts the slope stability model for the west section (Section A). The section profile was estimated from the plans prepared by SGM. The model suggests a FS of 2.0 which is well above the minimum typical standard of 1.5 for critical structures. In addition, the theoretical failure surface is at least 85 feet from the nearest permanent facility.

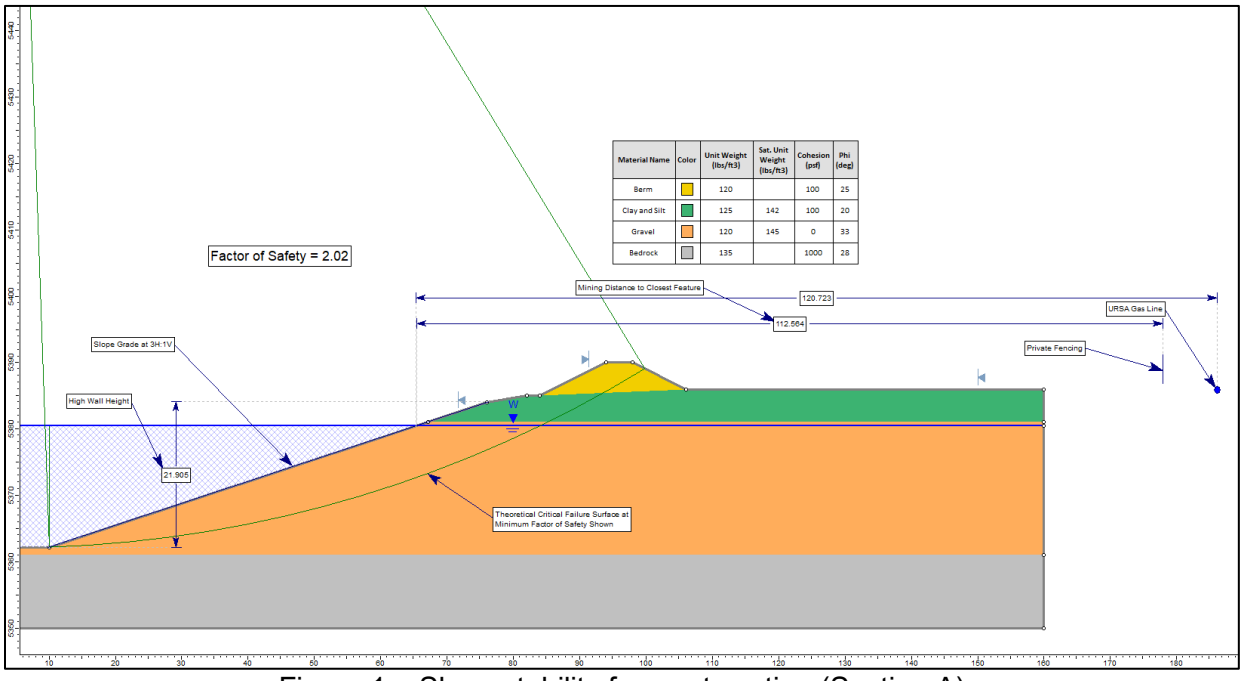

Figure 1 – Slope stability for west section (Section A)

Figure 2 depicts the slope stability model for the east section (Section B). The model suggests a FS of 1.9 which is well above the minimum typical standard of 1.5. In addition, the theoretical failure surface is at least 77 feet from the nearest existing permanent facility.

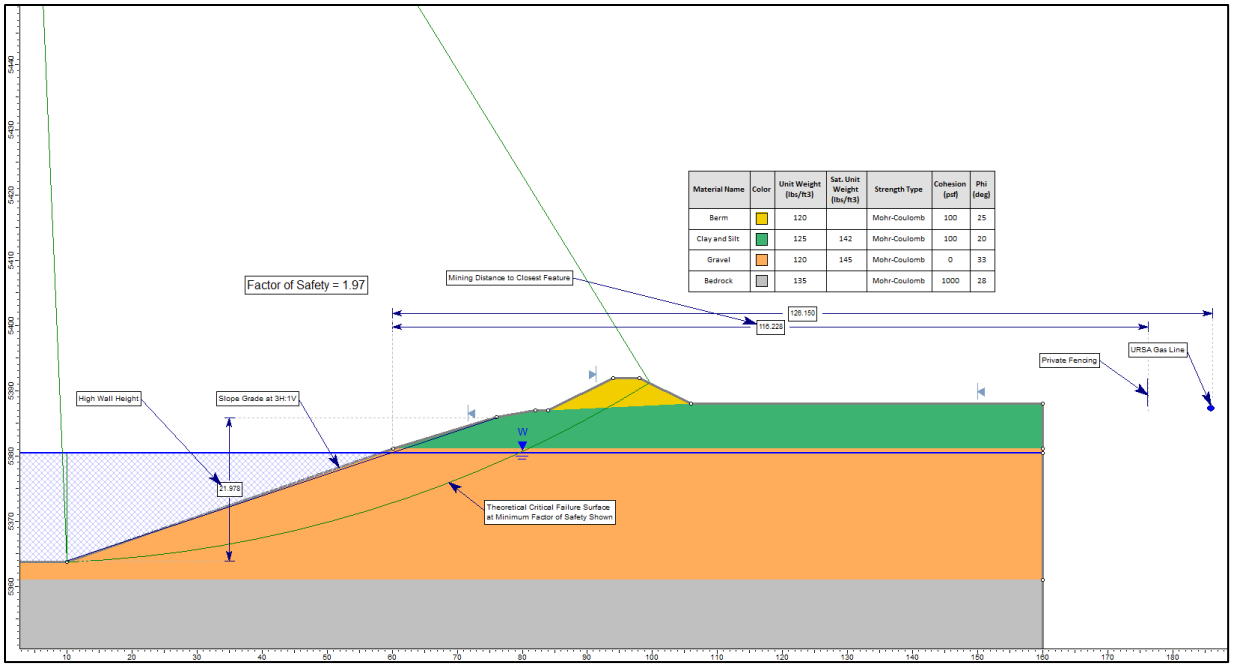

Figure 2 – Slope stability for east section (Section B)

Figure 3 depicts the slope stability model for the north section (Section C). The model suggests a FS of 2.1 which is well above the minimum typical standard of 1.5. In addition, the theoretical failure surface is at least 75 feet from the nearest existing permanent facility.

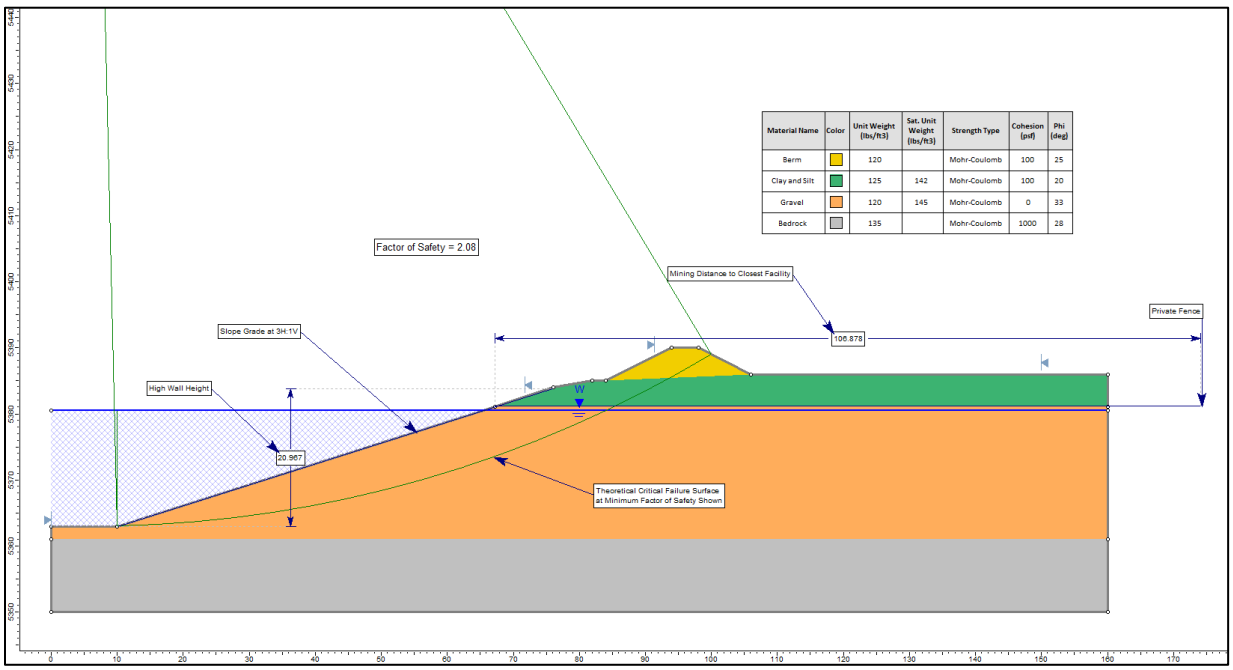

Figure 3 – Slope stability for north section (Section C)

4.0 SUMMARY

RJ Engineering conducted a global stability evaluation where we believe proposed mining could impact existing structures. Based on our evaluation, the factor of safety for the final slope configuration is well above industry standards. Our analyses indicate that all permanent structures should not be damaged by proposed mining activities. We believe the slopes and mining as proposed should be stable and should not affect the existing permanent structures. The structures and minimum mining distance to maintain stability include:

Permanent Structure	Minimum Distance to Mining	Actual Distance to Mining
Last Chance Ditch Tailwater Channel	NA	NA
Last Chance Ditch Irrigation Lateral	NA	NA
Colorado River Floodplain	NA	NA
Non-potable URSA Resources Water Lines (supply and return)	100 feet	136.1 feet
URSA Resources Gas Line	100 feet	120.7 feet
CDOT CR 346 and Culverts	40 feet	276.6 feet
CDOT I-70 Westbound Traffic Lanes	100 feet	276.6 feet
CDOT Wildlife Fencing (I-70 Westbound ROW)	100 feet	223.3 feet
Private Fencing East (Shidelerosa LLLP)	NA	NA
Private Fencing North (Colorado River Ranch, LLC)	100 feet	106.9 feet
Private Fencing South (Scott)	100 feet	112.6 feet

5.0 LIMITATIONS

This study was conducted in accordance with generally accepted geotechnical engineering practices in this area for use by the client for design purposes. The conclusions and recommendations submitted in this report are based upon the data obtained from exploratory test holes and field reconnaissance. The nature and extent of subsurface variations across the site may not become evident until excavation is performed. If during mining operations, conditions appear to be different from those described herein; this office should be advised at once so reevaluation of the analysis may be made.

The report was prepared in substantial accordance with the generally accepted standards of practice for geotechnical engineering as exist in the site area at the time of our investigation. No warranties, express or implied, are intended or made.

Respectfully Submitted,

RJ Engineering & Consulting, Inc.

Richard D. Johnson, P.E.
Principal

Graphic Scale
0 75 150 300
In U.S. Feet : 1" = 150'

RECLAIMED POND WATER SURFACE (SOLID BLUE LINE) AND RECLAIMED WETLAND SLOPE AREA (SOLID GREEN HATCH) PER GARFIELD COUNTY LUDC 7-1002.H

REVEGETATED EARTHEN BERM (SOLID GRAY HATCHING)

LONG-TERM EQUIPMENT STORAGE

EX. PRIVATE FENCE OUTSIDE OF PROPERTY LINE AND INSIDE 200' BUFFER ZONE (SEE STABILITY SECTION C)

EX. PRIVATE FENCE OUTSIDE OF PROPERTY LINE AND INSIDE 200' BUFFER ZONE NO STABILITY SECTION NEEDED FOR THIS FENCE DUE TO DISTANCE FROM MINING EXCAVATION

EX. FENCE INSIDE OF PROPERTY LINE

200' OFFSET OF AFFECTED LAND (TYP)

EX. PRIVATE FENCE OUTSIDE OF PROPERTY LINE AND INSIDE 200' BUFFER ZONE. NO STABILITY SECTION NEEDED FOR THIS FENCE DUE TO DISTANCE FROM MINING EXCAVATION

200' OFFSET OF AFFECTED LAND (TYP)

MINE ENTRANCE
LAT 39.533805°
LONG -107.692804°

EX. CDOT WILDLIFE FENCE AND UTILITY LINES OUTSIDE OF PROPERTY LINE AND INSIDE 200' BUFFER ZONE (SEE STABILITY SECTIONS A & B)

CR 346

I-70 WESTBOUND

LEGEND
- EX. WETLANDS
- EX. WETLAND AND BUFFER
- EX. GRAVEL
- PROP. PAVEMENT
- PROPERTY BOUNDARY
- 100YR 100 YR. FLOODPLAIN
- SURFACE WATER

SGM
118 West Sixth Street, Suite 200
Glenwood Springs, CO 81601
970.945.1004
www.sgm-inc.com

IHC Scott, Inc.

Rifle Pit Gravel Pit #1

#	Revision	Date	By:
1	Permit Set	4/14/22	RPF
2	Revision B	8/11/22	RPF
3	Revision C	8/31/22	CMP
4	Revision M	1/4/23	RB

Project Milestone: Permit Set (Not For Construction)

Job No.	2019-341.002
Drawn by:	RPF
Date:	03/28/2023
QC:	XX PE: RPF
File:	RiflePit-Design

Title:
Stability Sections

Dwg No.
15
Of : 14

I:\2019\2019-341-RiflePit1\002-Permitting\H-Dwgs\Civil\PS-SheetSet\Mining\RiflePit-Design.dwg Plotted: 3/28/2023 5:36 PM By: Richard Saindon