LITHOS ENGINEERING

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June 26, 2020
Project No.: 19125

Aggregate Industries – WCR, Inc
1687 Cole Boulevard, Suite 300
Golden, CO 80401

Attention: Jeremy Deuto, PE, PG
Regional Land and Environment Manager

Regarding: Daniels Sand Pit 2, Permit No. M-1973-007-SG
Response to TR-09 Second Adequacy Review

Mr. Deuto,

In response to Timothy Cazier's April 14, 2020 Technical Revision (TR-09) Second Adequacy Review, this letter provides responses to DRMS comments. Mr. Cazier's comments pertain to a letter dated March 30, 2020 from Lithos Engineering to Aggregate Industries.

Comment No. 2 – Factors of Safety Requiring Mitigation

Comment: *The response is not adequate. Additional clarification is required. First, there are two sections in this response, but both are labeled "Fountain Mutual Ditch Above the Recharge Pond". Based on the narrative, the DRMS assumes the first section should be labeled "Fountain Mutual Ditch Above the New Wash Fines Pond". The narrative in the first section discusses the intent to buttress the slope with recycled concrete and stockpiled sand. Plate 1 indicates the base of the buttress will be recycled concrete overlain by Mirafi's woven 600x geotextile before placing potentially as much as 60 feet the sand fill on top of the geotextile. This configuration raises several questions:*

Response: Correct, as the narrative states the first section should have been labeled "Fountain Mutual Ditch Above the New Wash Fines Pond".

Comment a) *The geotextile is a potential slip plain and is not modeled in the Slope/W stability analysis. Please add this layer in the model with appropriate friction values for the geotextile or provide justification for why the geotextile is not addressed.*

Response: Correct, we are aware of the potential weakened slip plane. A geotextile layer was added to the model, the friction angle between the geotextile and soil interface was obtained from the Fundamentals of Geotechnical Engineering book authored by Das and Designing with Geosynthetics book authored by Koerner. Nonwoven needle punched geotextiles have higher interface friction compared to woven or heat bonded geotextiles. A Slope/W analysis was performed with the geotextile which resulted in a Factor of Safety (FOS) of 3.8. Slope geometry and geotechnical parameters used in the analysis are shown in Figure 2.1. Figure 2.2 presents the critical failure surfaces and calculated FOS

for the proposed construction. Figure 2.3 presents the factor of safety of 2.2 if we force failure along the geotextile interface.

Figure 2.1 Geometry and Material Properties for the Fountain Mutual Ditch Above the New Wash Fines Pond

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	Buttress Fill	Mohr-Coulomb	110	50	27	0	1
	On-Site Sand	Mohr-Coulomb	110	0	31	0	1
	Recycled Concrete	Mohr-Coulomb	130	0	38	0	1
	Wash Fines	Mohr-Coulomb	105	50	25	0	1

Color	Name	Type	Interface Adhesion (psf)	Interface Shear Angle (°)	Surface Area Factor	Pullout Resistance Reduction Factor	Tensile Capacity (lbf)	Tensile Capacity Reduction Factor	F of S Dependent	Force Distribution	Face Anchorage	Factored Tensile Capacity
	Mirafi S1600	Geosynthetic	12	23	2	1	425	4	No	Distributed	Yes	106.25 lbf/ft

CROSS SECTION D-4

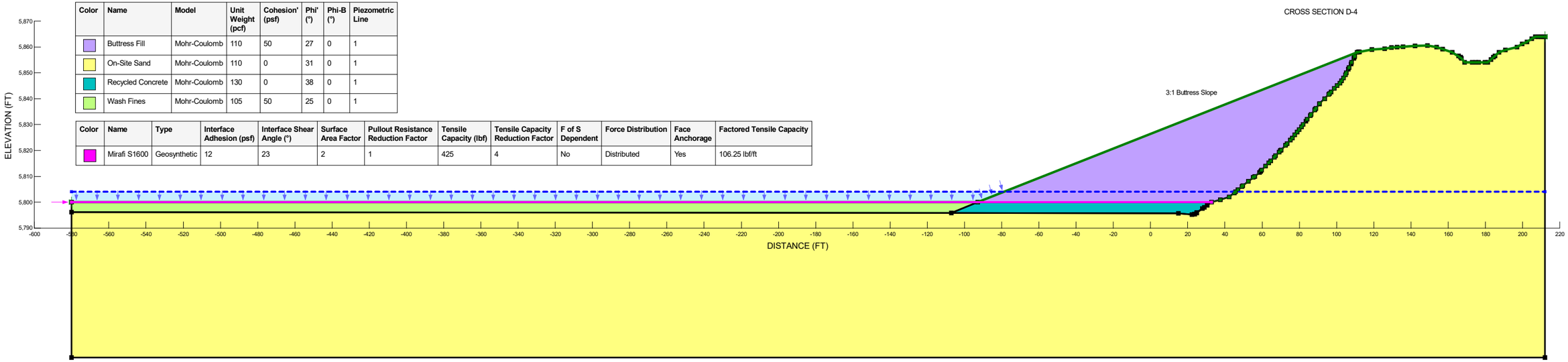


Figure 2.2 Analysis Results for the Fountain Mutual Ditch Above the New Wash Fines Pond

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	Buttress Fill	Mohr-Coulomb	110	50	27	0	1
	On-Site Sand	Mohr-Coulomb	110	0	31	0	1
	Recycled Concrete	Mohr-Coulomb	130	0	38	0	1
	Wash Fines	Mohr-Coulomb	105	50	25	0	1

Color	Name	Type	Interface Adhesion (psf)	Interface Shear Angle (°)	Surface Area Factor	Pullout Resistance Reduction Factor	Tensile Capacity (lbf)	Tensile Capacity Reduction Factor	F of S Dependent	Force Distribution	Face Anchorage	Factored Tensile Capacity
	Mirafi S1600	Geosynthetic	12	23	2	1	425	4	No	Distributed	Yes	106.25 lbf/ft

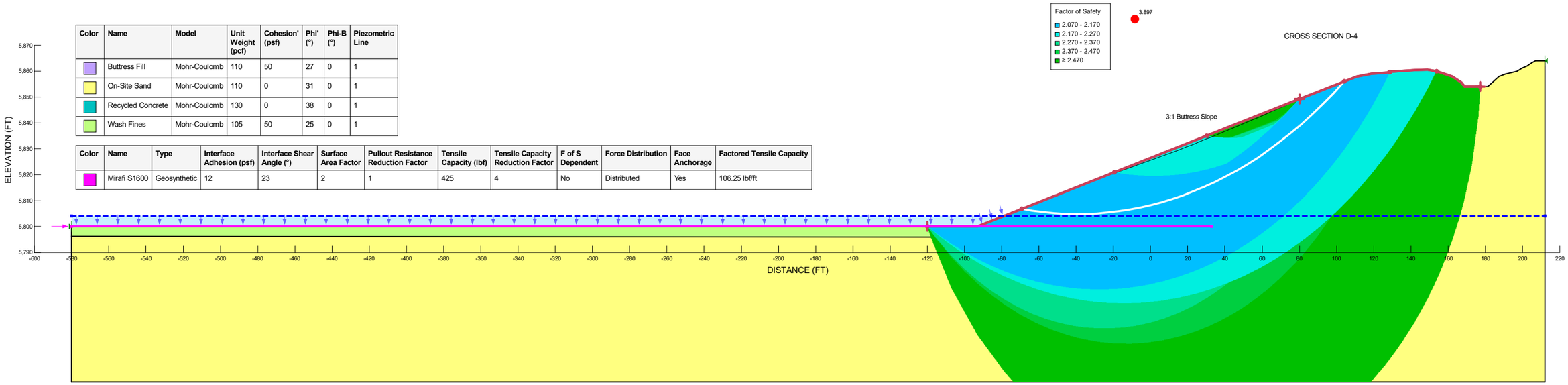
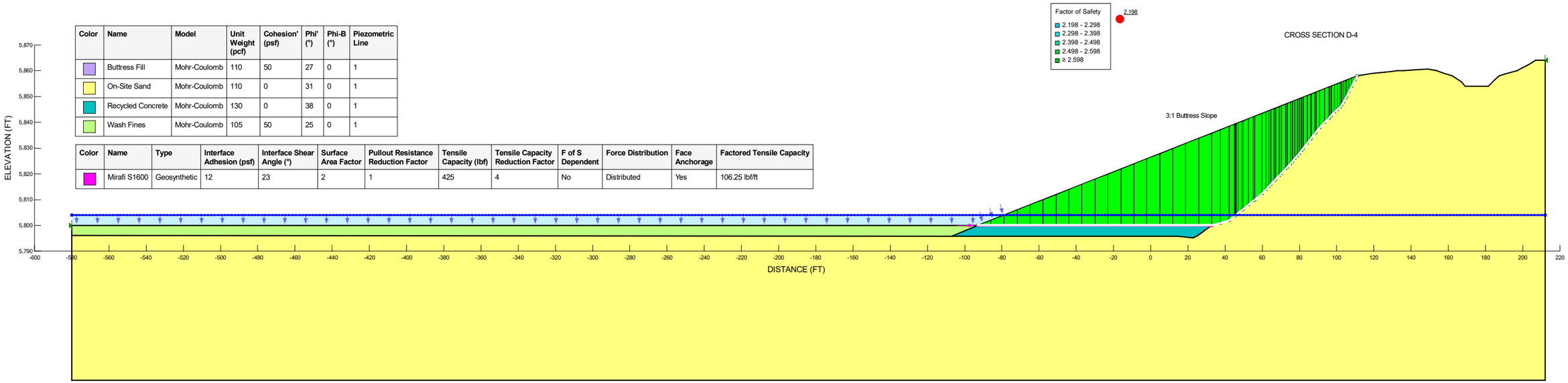


Figure 2.3 Analysis Results for the Fountain Mutual Ditch Above the New Wash Fines Pond (forced failure along the geotextile interface)

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)	Piezometric Line
	Buttress Fill	Mohr-Coulomb	110	50	27	0	1
	On-Site Sand	Mohr-Coulomb	110	0	31	0	1
	Recycled Concrete	Mohr-Coulomb	130	0	38	0	1
	Wash Fines	Mohr-Coulomb	105	50	25	0	1

Color	Name	Type	Interface Adhesion (psf)	Interface Shear Angle (°)	Surface Area Factor	Pullout Resistance Reduction Factor	Tensile Capacity (lbf)	Tensile Capacity Reduction Factor	F of S Dependent	Force Distribution	Face Anchorage	Factored Tensile Capacity
	Mirafi S1600	Geosynthetic	12	23	2	1	425	4	No	Distributed	Yes	106.25 lbf/ft



Comment b) *The Mirafi 600x product appears to be intended as a pavement underlayment. Their website states: "TenCate Mirafi® X-Series woven slit film polypropylene geotextiles provide separation for good subgrades by preventing mixing of subgrade soils and base aggregates." In addition, the website suggests the use is intended for roadway/railway construction, roadway and railway stabilization and reinforcement, parking lots, residential streets, and roadways. Furthermore, the 600x specification states its maximum opening is 0.425 mm (No. 40 sieve) for which 77% of the sample passed in the laboratory gradation results provided for the "Bags-Stockpile". It is not clear the intent of the geotextile, presumably it is to prevent the fine sands from migrating into the large voids expected in the recycled concrete fill, leading to prolonged settlement of the sand fill. If this is the purpose, the DRMS questions the use of this material.*

Response: Correct, the purpose of the geotextile is separation. The Mirafi 600x was originally selected for its high grab tensile and puncture strengths, separation function and cost effectiveness. However, to ease concerns, the recommended geotextile is replaced with the Mirafi S1600 or equivalent. The TenCate Mirafi S1600 is a needle punched nonwoven geotextile composed of polypropylene fibers and is inert to biological degradation and resists naturally encountered chemicals/alkalis/acids. Geotextile selection followed the "Design by Function Approach" laid out in Koerner Designing with Geosynthetics 6th edition. Pending availability and cost, equivalent geotextiles that meet the following criteria are acceptable for use during construction: needle punched nonwoven, minimum puncture strength of 1,200 lbs and maximum apparent opening size of #100 sieve. Due to the angular nature and diameter of the recycled concrete (12-inch minus), a "cushion" is recommended underneath the geotextile. This entails an 18-inch layer of 6-inch minus recycled concrete to avoid punctures due to impact. Plate 1 located at the end of this letter presents the updated typical section and construction procedure.

Comment c) *The second section labeled "Fountain Mutual Ditch Above the Recharge Pond" states "Construction will follow standard reclamation procedures and a specific mitigation plan is not needed." Reclamation plans in both amendments 2 and 3 (approved in 2005 and 2008, respectively) assume the Fountain Mutual Ditch has been either removed or realigned. The reclamation contours indicate the 3H:1V slope is perpendicular to the axis of the ditch. As such an alternative mitigation plan appears to be in order. Please explain what reclamation plan approved by the DRMS will provide stabilization of the slope above the Recharge Pond.*

Response: The slope will be flatten to 3H:1V as part of the mines standard reclamation requirements. A grading plan was created by the Aggregate Industries and is attached to the end of this letter.

Comment No. 3 - Cross Section D-3 Cohesion

Comment: *The response is not adequate. Additional clarification is required. The DRMS accepts the differentiation between effective stress and total stress, but that does not explain why effective stress was used for section D-3 and total stress for the other three sections. Furthermore, the argument implies the Factor of Safety would be lower for section D-2 if effective stress was used. Please provide a rationale explaining the different approaches and what the factor of safety would be for section D-2 if effective stress was used.*

Response: Table 1 in the Brierley letter dated October 14, 2019, is in error. The effective stress and total stress columns should be identical and should show 50 psf cohesion and phi of 33 degrees. The table should have appeared as follows:

Table 1 Slope Stability Analysis Parameters

Material	Moist Unit Weight (pcf)	Effective Stress Analysis		Total Stress Analysis	
		Cohesion, C' (psf)	Friction Angle, ϕ' (degrees)	Cohesion, C (psf)	Friction Angle, ϕ (degrees)
Coarse Alluvium	115	50	33	50	33

For the case of a free draining sand, total stress and effective stress analyses will have the same result because there is no buildup of excess pore pressures. To be consistent with the other sections, cross section D-3 was reanalyzed and determined to have an acceptable factor of safety of 3.4 as shown in Figure 3.1.

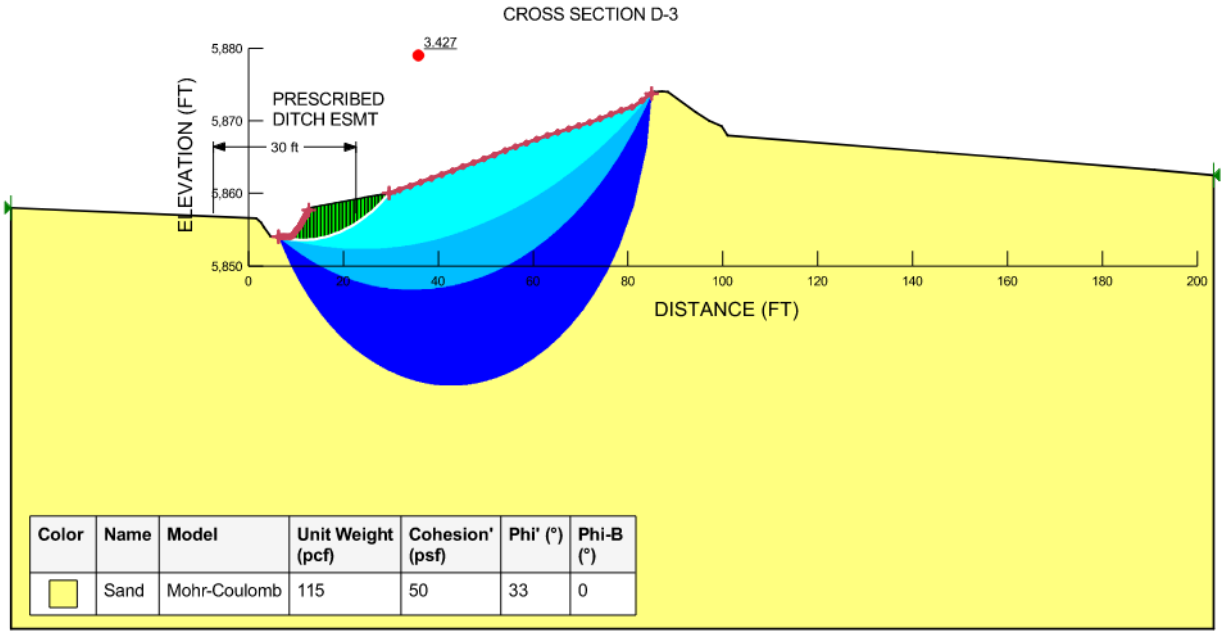


Figure 3.1 Analysis Results

Comment No. 6 - Schedule

Comment: *The schedule in the cover letter proposes extending the start schedule to spring of 2021 due to the Covid-19 situation. Perhaps the DRMS is too optimistic, but we'd like to see a schedule beginning around September 2020. If we approach that time frame and things have not improved, we would consider an additional extension at that time. Please provide a schedule for the construction effort.*

Response: Aggregate Industries intends to develop a Request for Proposal to seek bids from qualified earthmoving contractors. They anticipate receiving bids in August 2020. Assuming that responsive bids are received Aggregate Industries plans on issuing a Notice to Proceed in September such that work can begin before the end of September 2020. If Aggregate Industries chooses to self-perform the work, it will also begin before the end of September 2020.

Comment No. 7 - Monitoring

Comment: *The last paragraph in the cover letter states, "we will perform frequent monitoring of the areas in question, and if signs of instability and/or movement are noted, we will implement emergency stabilization". Please provide the DRMS with:*

a. *The intended type(s) of monitoring,*
b. *The frequency for each type(s) of monitoring,*
c. *What level or sign of movement would trigger the emergency stabilization? And*
d. *What might be the emergency stabilization approach?*

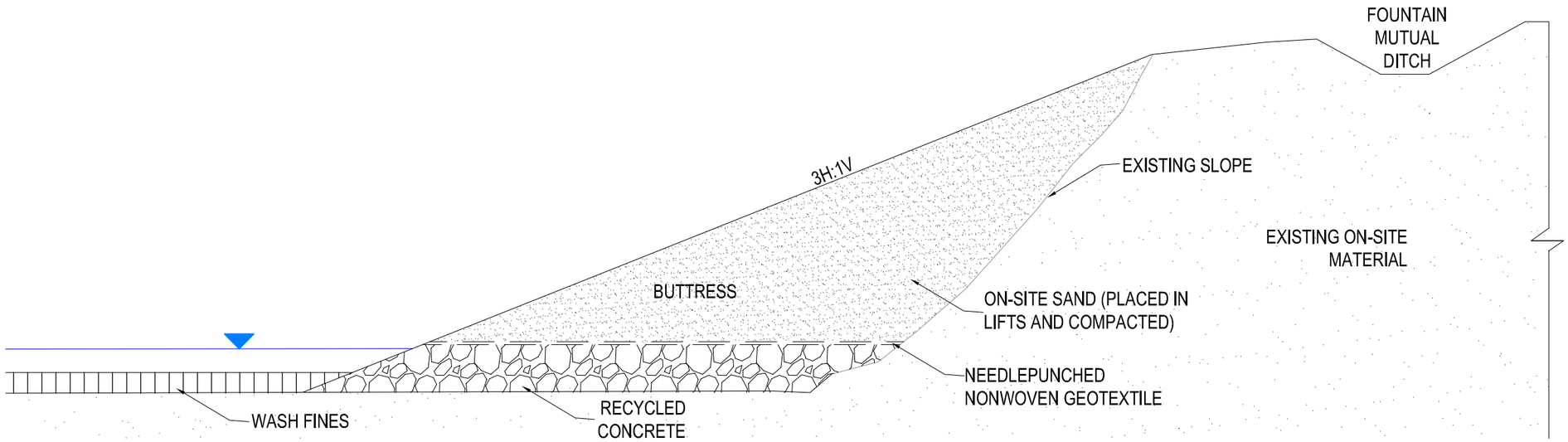
Response: Visual observation by qualified personnel will occur monthly. During this inspection, evidence of movement/signs of slope instability will be documented. The inspector will note any potential warning signs including but not limited to visual tension cracks, toe erosion, moisture changes, and sloughed slope surface. If any evidence of movement is reported, monitoring frequency will increase to weekly. Aggregate Industries has experienced and qualified engineers and geologists to assess these situations and recommend a course of action. Emergency stabilization will depend on the level of slope instability, the rate of movement, and the possible consequences of progressing instability. Engineering judgement will dictate the emergency stabilization approach. This involves an engineering assessment of the conditions and experience with similar projects in similar soil conditions. Emergency stabilization could include slope grading, stability buttresses and surface and groundwater management. The site has equipment available to move material and regrade if necessary.

If you have any questions regarding the contents of this letter, please contact Aggregate Industries or Lithos Engineering.

Sincerely,
Lithos Engineering

Steve Kuehr, PE
Senior Consultant

Sarah Myers, EIT
Project Engineer



1 / -- TYPICAL CROSS SECTION
NTS

FOUNTAIN MUTUAL DITCH ABOVE THE WASH FINES POND, EXISTING CONDITIONS AND CONSTRUCTION SEQUENCE:

1. THE BUTTRESS IS INTENDED TO FLATTEN THE EXISTING STEEP MINE SLOPE TO 3H:1V. THE BUTTRESS FOOTPRINT EXTENDS INTO THE WASH FINES POND IN AN AREA WITH APPROXIMATELY 4 FT OF WATER OVER APPROXIMATELY 4 FT OF WASH FINES (VERY LOOSE SATURATED SILT).
2. UTILIZING EXISTING ACCESS RAMP AT NW CORNER OF WASH FINES POND, PUSH RECYCLED CONCRETE (12-INCH MINUS) INTO POND ALONG TOE OF MINE SLOPE UNTIL IT DAYLIGHTS ABOVE WATER LEVEL. TOP 18 INCHES (IN CONTACT WITH GEOTEXTILE) WILL BE 6-INCH MINUS RECYCLED CONCRETE.
3. USE PREVIOUSLY PLACED RECYCLED CONCRETE AS ACCESS RAMP TO CONTINUE PLACEMENT ACROSS ENTIRE TOE OF MINE SLOPE.
4. STRIP VEGETATION FROM THE EXISTING STEEP MINE SLOPE.
5. INSTALL NEEDLEPUNCHED NONWOVEN GEOTEXTILE (MIRAFI S1600 OR EQUIVALENT) OVER THE RECYCLED CONCRETE. OVERLAY ADJACENT PANELS OF GEOTEXTILE MINIMUM OF 2 FT.
6. PLACE FILL MATERIAL (ON-SITE SAND) IN MAXIMUM 12-INCH THICK HORIZONTAL LOOSE LIFTS.
7. USING RUBBER-TIRED EQUIPMENT SUCH AS SCRAPERS, WATER WAGONS OR LARGE LOADERS, COMPACT EACH LIFT WITH FULL COVERAGE.
8. PLACE CONSECUTIVE LIFTS UNTIL FULL HEIGHT IS REACHED AND VERIFY BUTTRESS IS NO STEEPER THAN 3H:1V.
9. VEGETATE COMPLETED SLOPE PER RECLAMATION PLAN.

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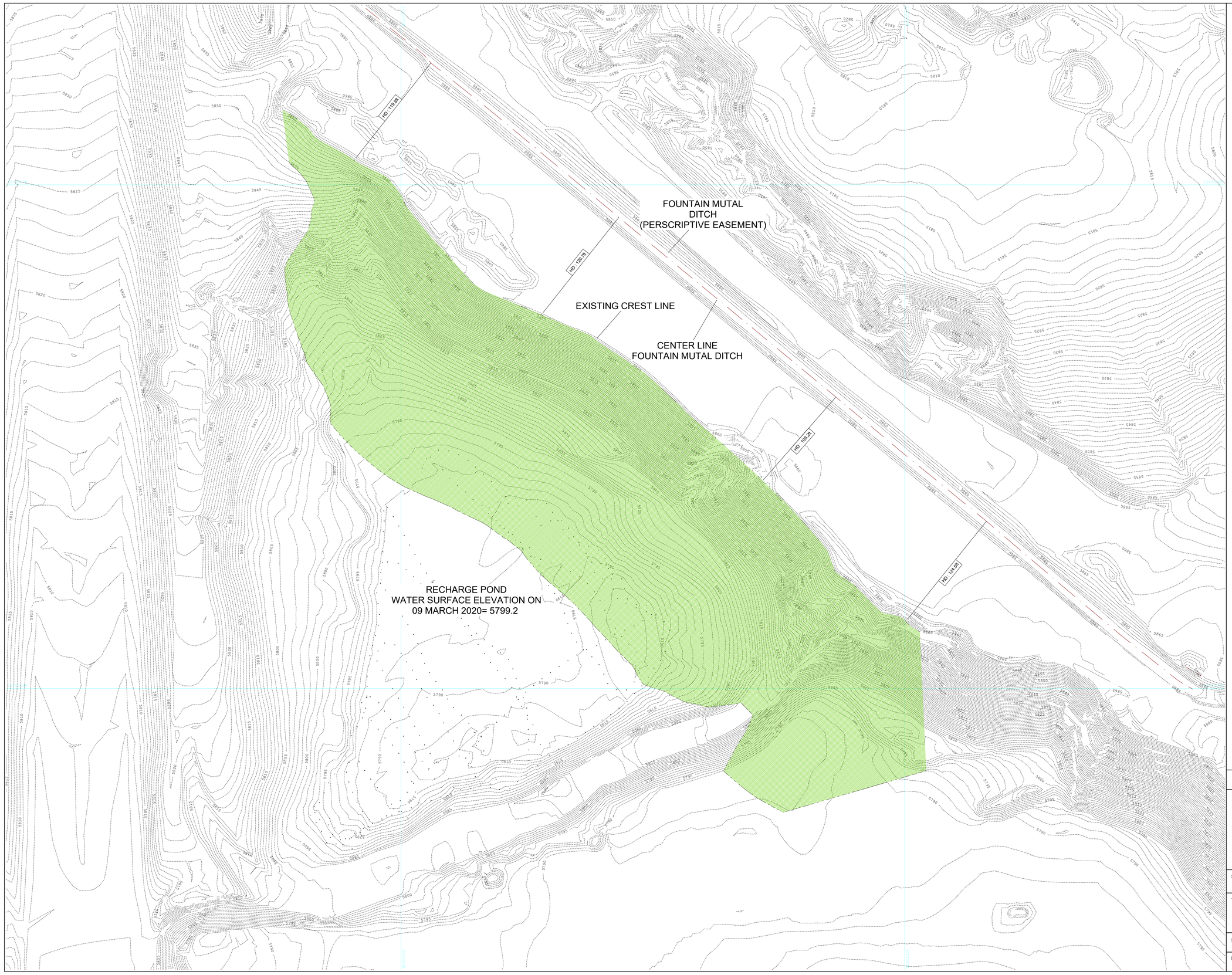
PROJECT TITLE	DANIELS SAND PIT 2
DRAWING TITLE	TYPICAL CROSS SECTION & CONSTRUCTION SEQUENCE
OWNER	AGGREGATE INDUSTRIES
CLIENT	TRANSIT MIX
PROJECT NO.:	19125
DRAWN BY:	SM
LOCATION:	COLORADO SPRINGS, CO
DESIGNED BY:	SM
DATE:	6/24/20
CHECKED BY:	SK
PLATE	1



DANIELS SAND AND GRAVEL
RECHARGE POND
REGRADING

ORIGINAL TOPO
DATE OF TOPO: 11 MAY 2018

AREA TO BE RECLAIMED

N

AGGREGATE INDUSTRIES

AI Geological Services - US
West Central Region

1707 Cole Boulevard, Suite 100
Golden, CO 80401
Tel 303-985-1070

email: adrian.charters@aggregate.com

Site	DANIELS SAND AND GRAVEL
Title	RECHARGE POND REGRADE TOPO DATE 11 MAY 2018

Scale: 1 : 500	Date: JUL 2020	Drawing No.
Drawn By: k. THULLEN	Checked By	07 DS 01 JULY 2020 REGRADE

DANIELS SAND AND GRAVEL
RECHARGE POND
REGRADING

ORIGINAL TOPO
DATE OF TOPO: 11 MAY 2018

AREA TO BE RECLAIMED

N

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email: adrian.charters@aggregate.com

Site	DANIELS SAND AND GRAVEL
Title	RECHARGE POND REGRADE TOPO DATE 11 MAY 2018

Scale 1 : 500	Date JUL 2020	Drawing No. 07 DS 01 JULY 2020 REGRADE
Drawn By k. THULLEN	Checked By	

STATE OF COLORADO

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

Daniels Sand Pit 2 (M-1973-007-SG) TR-09 Second Adequacy Response

1 message

Sarah Myers <Sarah@lithoseng.com> Thu, Jul 2, 2020 at 2:21 PM
To: "Tim.cazier@state.co.us" <Tim.cazier@state.co.us>
Cc: Jeremy DEUTO <jeremy.deuto@lafargeholcim.com>, Steve Kuehr <Steve@lithoseng.com>

Hi Tim

On behalf of Aggregate Industries please see attached response letter for Daniels Sand Pit 2 (M-1973-007-SG) TR-09 Second Adequacy Review. If you have any questions or concerns please contact those addressed in the email

Thanks and have a great holiday weekend!

Sarah

Sarah Myers, EI

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