SLR International Corporation
20 Corporate Park, Suite 200, Irvine, California, 92606

August 4, 2023

Attention: Jaeden Mayzel
McAtee Construction Company
6215 Clear Creek Parkway
Cheyenne, WY 82007

SLR Project No.: 123.01536.00013

RE: Timnath Pit Slope Stability Evaluation

1.0 Introduction

On June 30, 2023, the Colorado Division of Reclamation, Mining and Safety (DRMS) issued an Incompleteness Notice (DRMS, 2023) to McAtee Construction Company (McAtee) that noted a slope stability analysis, including offset limits, needed to be presented for the Timnath Pit located outside of Windsor, Colorado. A copy of this letter is presented as Attachment 1.

SLR International Corporation (SLR) is pleased to present this report to McAtee that summarizes and presents the results of a geotechnical slope stability analysis for the Timnath Pit.

2.0 Background

SLR understands that McAtee is currently pursuing a Transfer of Mineral Permit and Succession of Operators from Don Kehn Construction Inc. to McAtee for the Timnath Pit. The Timnath Pit will be an approximate 15-foot-deep excavation for aggregate mining.

The DRMS reviewed the current permit application package and submitted an Incompleteness Notice dated June 30, 2023 (DRMS, 2023). Based on our review of the notice, DRMS requested that McAtee provide a slope stability analysis, including two dimensional (2D) models, offsets (in feet) from the edge of the right-of-way (ROW), or any structure to the top of the mined and reclaimed three horizontal to one vertical (3H:1V) slope (i.e., the Operator needs a buffer from any ROW or structure not owned by them to the beginning of the mined slope).

McAtee provided SLR with the following information:

- Incompleteness Notice No. 2 that requested the results from a 2D slope stability analysis (DRMS, 2023);
- Topographic files of the Project area, including alignment of utilities and irrigation ditches (date unknown); and
- Amendment to a Regular Operation (112) Mined Land Reclamation Permit (Permit Document), dated July 1992 that summarizes the general intentions of the mining activities. Information contained in this document is summarized herein (Tuttle Applegate, Inc., 1992).

3.0 Existing Conditions

3.1 Surface

The site is currently undeveloped and consists of an open field with light vegetation. The site is generally flat and gently sloping to the south, with approximate elevations of 4,755 feet (ft) at the north end, to 4,750 ft at the south end.

Based on our understanding of the requirements, the primary purpose of the stability analysis is to evaluate the proposed conditions adjacent to the existing infrastructure and to determine proper offsets (i.e., minimum distance from a specified boundary or structure), specifically at the following locations:

- The North Poudre Irrigation Company (NPIC) ditch structure and Infiltration Basin to the north,
- Colorado South County Road 5 to the west,
- Natural gas pipeline to the east, and
- Timnath Creek and Project infrastructure to the south.

A site plan and the features noted above are generally depicted in Figure 1.

3.2 Regional Geology

SLR reviewed the Colorado Geological Survey's interactive Geographical Information System (GIS) data web maps, and the Geologic Map of the Boulder – Fort Collins – Greely Area, Colorado (Colton, 1976), and this is presented as Figure 2.

Based on this mapping, the site has been characterized as Post-Piney Creek Alluvium (Qpp) of Upper Holocene period. Generally, it contains dark gray humic, sandy to gravelly alluvium containing scattered plant remains. It underlies the flood plains of major streams and terraces less than 10 ft above stream level. Its thickness varies from 5 to 15 ft.

Underlying the younger alluvium is coarser, older alluvium in the large valleys. The mapped older alluvium in this area is the Broadway alluvium (Qb) from Pinedale glaciation period of Pleistocene epoch. It generally consists of sand and gravel deposited by the South Platte River and its tributaries. It is well-sorted and well-stratified with sand and coarser materials. Locally, this unit may include some gravel of Louviers alluvium (Qlo) from Bull Lake glaciation of Pleistocene epoch. The thickness of Broadway and Louviers alluviums along South Palette River have been noted as much as 125 ft and averaging about 35 ft. These older alluvium deposits tend to be well stratified, brown to reddish brown, and ranging in particle sizes that are predominantly larger along perennial streams to smaller along intermittent streams.

3.3 Previous Geotechnical Investigations

Appendix A of the Permit Document (Tuttle Applegate, Inc., 1992) presented the results of a geotechnical investigation for the entire original Project area that was prepared by Empire Laboratories, Inc. (ELI, 1980). The report includes logs of nine boring logs in an area designated by ELI as Area I (northern part of the original Project), and 16 exploratory boring logs in Area II (southern part of the Project area). SLR understands the general area of the current stability assessment to be in Area II, and used that data as part of this stability analysis.

Based on SLR's review of the ELI report (ELI, 1980), the Project area is underlain by an upper layer of silt and clayey silt that extends approximately 2.5 to 7.5 ft below ground surface (bgs). This upper layer is underlain by sand and gravel. Standard penetration tests (SPT) were performed during sampling at three locations from Area I within the sand and gravel layer, with recorded blow counts ranging from 11 to more than 50 blows per foot. The sand and gravel layer extends to approximately 15 to 17.5 ft bgs. Sedimentary bedrock was encountered at greater depths.

Groundwater was encountered at 2.5 to 6.5 ft bgs at the time of drilling.

The local experience with the materials discussed between SLR and McAtee are in line with the general ELI observations. The anticipated depth of finer materials (less desirable for quarry mining) is on the order of 10 ft bgs. The coarser (gravelly) materials, more desirable for quarry mining, are expected at depths greater than 10 ft bgs.

3.4 Site Visit

A site visit was not made, and the data used in the analysis being either desktop based or provided by the client.

4.0 Stability Analysis

SLR performed limit equilibrium stability analyses to evaluate the integrity of the Timnath Pit slopes under static and pseudo-static (earthquake) loading conditions. Critical sections locations were selected by SLR, with the 3H:1V slope, and maximum Timnath Pit depth and phreatic conditions under steady state conditions.

Slope stability modeling was completed using a commercially available limit equilibrium stability analysis software program, Slide (developed by Rocscience), with the Spencer method to calculate minimum factors of safety (FOS).

The stability analysis is discussed below.

4.1 Excavation Geometry

The excavation depth was based on a maximum depth of 15 ft, with 3H:1V slopes, as noted in DRMS (2023).

SLR understands that the Timnath Pit will be backfilled as part of closure. Therefore, the excavation parameters noted in Sections 2.0 and 3.0 are for operations.

4.2 Material Properties

Geotechnical laboratory testing was not included in the ELI report (ELI, 1980). Therefore, our analysis used conservatively assigned strength parameters based on the reported soil type, published correlations with SPT blow counts, published typical values, groundwater levels, and our professional engineering judgement.

ELI (1980) boring logs are included in Attachment 2 and include pertinent logs from Area I that show the SPT blow count information. Limited SPT blow count information was provided in ELI (1980) for the sand and gravel layer. For the purpose of our evaluation, we have assumed that the sand and gravel layer of Area I and Area II are similar in density, with blow counts ranging from 11 to greater than 50 blows per foot. Table 1 summarizes several friction angle correlations with blow counts for the sand and gravel layer.

ELI did not provide SPT data for the upper silt/clayey silt layer, so a similar comparison could not be made.

Table 1: Estimated Friction Angle of Sand and Gravel Layer Based on Blow Counts

Boring	Depth	Field Data				Friction Angle (ϕ)				
		N_m[1]	N_{sptEq}[2]	N_{60}	$(N_1)_{60}$	ϕ'[3] *(deg)*	ϕ'[4] *(deg)*	ϕ'[5] *(deg)*	ϕ'[6] *(deg)*	Ave. ϕ'
B-2	8.5	11	11	11	19	40	31	37	40	37
B-6	13.5	50	50	51	74	59	42	54	53	52
B-8	2.5	50	50	45	77	59	42	54	55	53

Notes:

1. Uncorrected SPT values
2. California sampler blow counts converted to SPT equivalent
3. Friction angle for sandy soils. Estimated from correlations by: Hatanaka and Uchida (1996) as published in "Performance and Use of the Standard Penetration Test in Geotechnical Engineering Practice" by McGregor and Duncan, 1998 pg. 68
4. Friction angle for sandy soils. Estimated from correlations modified after Peck, Hanson, and Thornburn, 1974 as published in the US Department of Transportation Publication No. FHWA-IF-03-017 (GEC No. 7 Soil Nail Walls pg. 35)
5. Friction angle for cohesionless soils. Estimated by correlations by Hatanaka and Uchida, 1996 as published in US DOT Publication No. FHWA-IF-02-034 (GEC No. 5 Soil & Rock Properties pg. 184)
6. Friction angle for cohesionless soils. Estimated by correlations by Schmertmann (1975) as published in US DOT Publication No. FHWA-IF-02-034 (GEC No. 5 Soil & Rock Properties pg. 184)

Referenced Correlations:

3. $\phi = [20\ (N_1)_{60}]^{1/2} + 20$

4. $\phi = 26.5 + 0.4N - (N^2/500)$

5. $\phi = [15.4\ (N_1)_{60}]^{1/2} + 20$

6. $\phi = \tan^{1}[N_{60}/(12.2+20.3^{+}(\sigma'_{v0}/P_2))]^{0.34}$

SLR also reviewed published typical values for friction angle provided by the Electric Power Research Institute (EPRI), *Manual on Estimating Soil Properties for Foundation Design* based on soil type (EPRI, 1990). Table 4-1 of the EPRI document is excerpted below.

Table 4-1

REPRESENTATIVE VALUES OF $\bar{\phi}_{tc}$

Soil Material	$\bar{\phi}_{tc}$ (degrees) Loose	Dense
Sand, round grains, uniform	27.5	34
Sand, angular grains, well-graded	33	45
Sandy gravels Sand and Gravel Layer	35	50
Silty sand	27 to 33	30 to 34
Inorganic silt Silt/ Clayey Silt Layer	27 to 30	30 to 35

Source: Terzaghi and Peck (4), p. 107.

The parameters selected in our analysis are presented in Table 2, noting that the selected friction angle for each soil type is lower than the values estimated from the blow count correlations and/or the published values, and therefore are considered conservative. Cohesion values were selected based on our experience with similar soil types and our engineering judgement.

Table 2: Summary of Soil Parameters Used in Slope Stability Analysis

Material Type	Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)
Silt and Clayey Silt	115	20	200
Sand and Gravel	120	32	50

4.3 Phreatic Surface

As discussed in Section 3.3, ELI noted that groundwater was encountered at 2.5 to 6.5 ft bgs. SLR developed the stability model conservatively assuming that groundwater was at the highest level (2.5 ft bgs), and dewatering at the toe of the slope would draw the phreatic surface, as shown in Figure 5.

4.4 Peak Ground Acceleration

SLR used the ASCE 7 Hazard Tool (ASCE 7) web application to estimate the Maximum Considered Earthquake (MCE_R) peak ground acceleration (adjusted for site effects) (PGA_M) in order to determine a PGA to be used in the pseudo-static stability analysis.

ASCE 7 is a widely accepted standard used to determine design loads and has been adopted by most building codes in the United States. ASCE 7 uses U.S. Geological Survey (USGS), Federal Emergency Management Agency (FEMA), Building Seismic Safety Council (BSSC), and American Society of Civel Engineers (ASCE) mapped acceleration values for 2 percent in 50 years exceedance (1 in 2,475 years recurrence interval) events and a coefficient (FPGA) to account for site soil classification.

Using ASCE 7, SLR estimated the PGA_M to be 0.148 gravity (g). The output files are included in Attachment 3.

4.5 Geotechnical Model

SLR developed one cross section at each of the five existing infrastructure features discussed in Section 3.1 of this letter, for a total of five cross sections. The cross-section locations are shown in the plan view on Figure 1 and the cross sections are presented in Figures 3 and 4.

A review of the cross sections indicates that the proposed 3H:1V slope for a maximum depth of 15 ft will be identical in each location, and the upper silt and clayey silt layers are relatively consistent in thickness. Therefore, because the same slope, depth and material type thickness were assumed for the cross sections, the features beyond the slope crest and the recommended setbacks do not come into play for the analysis. Therefore, a single section was used in the offset analysis, assuming the thickest silt layer encountered during the prior geotechnical exploration of 7.5 ft, and the shallowest groundwater depth of 2.5 ft bgs.

As noted in Section 3.3, a bedrock layer was noted at approximately 15 to 18 ft bgs in the ELI (1980) investigation. The SLR stability model did not include the bedrock layer, and SLR assumed that the sand and gravel layer extended beyond the depth of the critical slip surface. Because the bedrock layer is anticipated to have greater strength parameters than the overlying sand and gravel layer, this assumption is considered conservative.

The typical slope stability section analyzed is presented on Figure 5.

4.6 Minimum FOS Criteria

The minimum stability FOS values for operations and reclamation required by DRMS is presented in Table 3 from DRMS (2023).

Table 3: Mine Land Reclamation Bureau (MLRB) Minimum Factors of Safety for Slope Stability Analysis for Operations and Reclamation

Type of Structure/Consequence of Failure	Generalized, Assumed, or Single Test Strength Measurements	Strength Measurements Resulting from Multiple Tests(1)
Non-Critical Structures (e.g., fences) No imminent danger to human life, minor repair costs, and minor environmental impact if slope fails	1.3 (1.15)(2)	1.25 (1.1) (2)
Critical Structures (e.g., residences, utilities, dams, pipelines, irrigation canals, public roads, etc.) Potential human safety risk, major environmental impact, and major repair costs if slope fails (includes Environmental Protection Facilities/EPFs, such as tailings facilities, heap leach pads, process effluent ponds, milling facilities, overburden/waste rock storage facilities, and hazardous/toxic material storage facilities, etc.)	1.5 (1.3) (2)	1.3 (1.15) (2)

1) The number of tests required to provide a high degree of confidence in the strength parameters used depends on the variability of the material being tested and the extent of disturbance.

2) Numbers without parentheses apply for analyses using static conditions. Those within parentheses apply to analyses using seismic parameters. Based on site specific conditions, seismic analyses may be required and parameters selected shall be consistent with the risk and duration of the condition being considered.

SLR considered the type of structures/consequence of failure to be critical, with generalized or assumed test strength measurements; therefore, SLR applied a static FOS of 1.5 and a pseudo-static FOS of 1.3 as the minimum FOS to be met as part of this analysis.

4.7 Results of Stability Analysis

4.7.1 Static Analysis

SLR performed a slope stability analysis using the parameters and geometry noted above, with the toe and crest of the slope constrained. SLR calculated a minimum FOS of 1.7, which is greater than the minimum stability FOS of 1.5 required by DRMS. The analysis output is shown on Figure 6.

4.7.2 Pseudo-Static Analysis

To evaluate the potential for slope deformations resulting from the MCE_R, SLR performed a pseudo-static analysis to determine the yield acceleration (i.e., the seismic acceleration required that results in a FOS of 1.0) for comparison of the design PGA_M. Based on this evaluation, the yield acceleration of the modeled stability section was calculated to be 0.17g. Because this is greater than the PGA_M of 0.148g, permanent deformations of the slope are not likely to occur under the design seismic loading. Output for this analysis is presented on Figure 7.

Full PGA values are not typically used in pseudo-static stability analysis, and a seismic coefficient (k_H) is typically applied to the PGA to account for typical response spectra, relatively short duration of the actual seismic event, and the deformation capabilities of the soils.

Based on the recommendations made by Marcuson and Franklin (1983), a k_H of 0.5 was used, resulting in a design acceleration of 0.074g.

Using the material parameters and geometry noted above, with the toe and crest of the slope constrained and a k_H of 0.5, SLR calculated a minimum pseudo-static FOS of 1.3, which meets the minimum pseudo-static stability FOS of 1.3 required by DRMS. The output plot is provided in **Figure 8**.

4.7.3 Liquefaction

Liquefaction is a phenomenon that generally occurs as a result of strong ground shaking in saturated, loose to medium dense, granular soil and in saturated, soft to moderately, firm silt.

While not specifically requested as part of the permitting requirements, SLR performed a liquefaction analysis in accordance with Youd, et al (2001) to assess the liquefaction potential of the materials. SLR used the full PGA of 0.15g, and an earthquake magnitude obtained from the USGS disaggregation web tool of 5.79. The upper silt material was assigned a conservative blow count value of three blows per foot, a unit weight of 115 pounds per cubic foot (pcf), fines content of 50 percent, and extended from the ground surface to 7.5 ft bgs. The sand/gravel layer was assigned a conservative blow count of eleven blows per foot (the lowest measured by ELI), a unit weight of 120 pcf, fines content of 0 percent, and extended from 7.5 ft to 15 ft bgs. The underlying bedrock material was not considered to be susceptible to liquefaction.

Based on the results of the analysis, the PGA at the site is not of sufficient magnitude to trigger a liquefaction event. Therefore, SLR consider the potential for liquefaction-induced deformations and strength reduction to be very low.

5.0 Conclusions and Recommendations

5.1 Conclusions

Based on the stability analyses using relatively conservative parameters, the stability FOS of the proposed 3H:1V slopes calculated for static and pseudo-statice conditions meet the minimum DRMS requirements for slope stability.

The results of the stability analysis suggest that a nominal offset from the crest is not required in theory; however, the lack of site-specific strength testing warrants a more conservative offset from the slope crest to provide additional safety for the adjacent infrastructure.

Therefore, SLR recommends a minimum Pit offset of 20 ft from a geotechnical slope stability perspective, to account for uncertainties and assumptions made in this stability analysis. The final Timnath Pit setback limits should be confirmed by McAtee and be surveyed, and should consider the minimum offset from structures noted by SLR, in addition to actual ROWs, buffers, property/land ownership, and easements.

5.2 Recommendations

SLR has the following recommendations for the Timnath Pit:

1. The final Timnath Pit setback limits should be confirmed by McAtee and be surveyed, and should consider the minimum offset from structures noted by SLR, in addition to actual ROWs, buffers, property/land ownership, and easements.
2. The maximum slope shall be 3H:1V and maximum excavation depth shall be 15 ft bgs. Note that the excavation layout provided here is a schematic for concept demonstration purposes only and not intended as a grading plan for construction. The Owner shall develop plans and phasing, as needed, as long as the minimum offset and buffer conditions are satisfied.
3. The minimum horizontal setback shall be 20 ft between the top of slope and the closest edge of any element to be protected (i.e., roadway, gas line, etc.).
4. The phreatic surface is a key component in the overall slope stability. A dewatering system shall be used to always maintain slopes free of any seepage onto the slope face. The groundwater level shall be kept a minimum of 2 ft below the toe of slope or the excavation bottom.
5. The dewatering system shall be designed by the Owner to include temporary drainage ditches, grading, collection points, sump pumping, or other suitable methods (e.g. wells). The dewatering system is to be designed and implemented by others.
6. As excavation descends, the dewatering system shall be adjusted to maintain the requirement set forth in Item 4.
7. No surcharge loads or stockpiling shall be permitted within the offset zone.
8. Should the excavation depth exceed 15 ft, additional geotechnical investigations, laboratory testing, and slope stability analyses will be performed prior to any excavation. SLR shall be consulted when that is needed.
9. Slope conditions should be inspected at minimum monthly intervals by the Owner. If any slope deformations, slumping, seepage, scour channels, or other anomalies are observed, they should be documented, photographed, reported to SLR, and repaired promptly.
10. After any major hazard events (storms, floods, seismic activities, etc.), a post-event inspection should be conducted within 48 hours after the event and the same procedures followed as in Item 9.

6.0 Closure

We are pleased to be of service to you on this project. If you have any questions regarding this report, please contact the undersigned at your convenience.

Regards,

SLR International Corporation

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cc Jamie Christopher, SLR

Figures:

Figure 1. Site Plan

Figure 2. Geologic Map

Figure 3. Cross-Sections – Sheet 1 of 2

Figure 4. Cross-Sections – Sheet 2 of 2

Figure 5. Slope Stability Typical Section

Figure 6. Static Slope Stability and Offset Analysis

Figure 7. Pseudo Static Yield Analysis

Figure 8. Pseudo Static Slope Stability and Offset Analysis

Attachments:

Attachment 1. Colorado Division of Reclamation, Mining and Safety Incompleteness Notice

Attachment 2. ELI Boring Logs

Attachment 3. Maximum Considered Earthquake and Peak Ground Acceleration Output from ASCE 7 Hazard Tool Web Application

References

Colorado Division of Reclamation, Mining and Safety (DRMS). 2023. Incompleteness Notice No. 2. June 30.

Colton. 1976. Geologic Map of the Boulder – Fort Collins – Greely Area, Colorado.

Electric Power Research Institute (EPRI). 1990. Manual on Estimating Soil Properties for Foundation Design. Prepared by Cornell University, Ithaca, New York. EL-6800, Research Project 1493-6. Final Report. August.

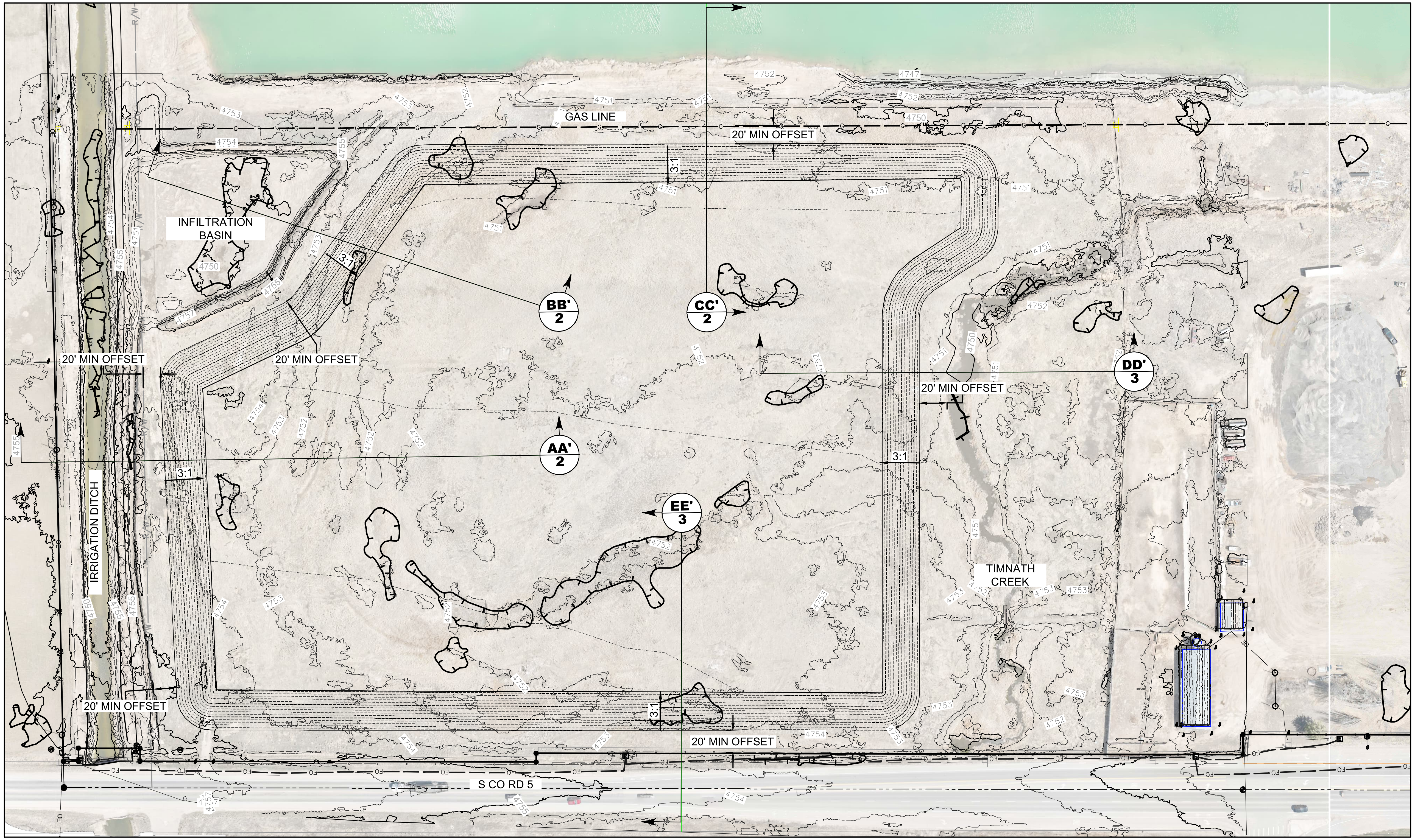
Empire Laboratories, Inc. (ELI). 1980. Report of a Geotechnical Investigation for Garth W. Rogers, Ft. Collins, Colorado, Project No. 4149-80, RE: Proposed Gravel and Mineral Evaluation West of Windsor, Colorado.

Marcuson and Franklin. 1983. Seismic Design, Analysis, and Remedial Measures to Improve Stability of Existing Earth Dams

Tuttle Applegate, Inc. 1992. Amendment to a Regular Operation (112) Mined Land Reclamation Permit (Permit Document). July.

Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J.T., Dobry, R., Liam Finn, W.D., Harder Jr., L.F., Hynes, M.E., Ishihara, K., Koester, J.P., Liao, S.C., Marcuson III, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R.B., Stokoe II, J.H. (2001). Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils., Journal of Geotechnical and Geoenvironmental Engineering, October.

Figures



LEGEND:

- EXISTING CONTOURS
- CONCEPTUAL PIT LIMITS AND CONTOURS
- BURIED FIBER OPTIC LINE
- BURIED GAS LINE
- FENCE LINE
- OVERHEAD ELECTRIC LINE
- RIGHT OF WAY
- PROPERTY BOUNDARY

SOURCE:

1. AERIAL PHOTOGRAMMETRY, AERIAL IMAGE, BOUNDARIES AND UTILITY LOCATIONS DEVELOPED BY OTHERS AND PROVIDED BY MCATEE CONSTRUCTION COMPANY. SLR ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY AND COMPLETENESS OF THE DATA PROVIDED BY OTHERS AND PRESENTED IN THIS FIGURE.
2. THE PIT LIMITS SHOWN ARE BASED ON THE STABILITY ANALYSIS. THE FINAL TIMANTH PIT SETBACK LIMITS SHOULD BE CONFIRMED BY MCATEE AND SURVEYED IN, AND SHOULD CONSIDER THE MINIMUM OFFSET FROM STRUCTURES NOTED BY SLR, IN ADDITIONAL TO ACTUAL ROWS, BUFFERS, PROPERTY / LAND OWNERSHIP AND EASEMENTS.

60 0 60 120 FT

SCALE 1" = 120' (PLOT SIZE 11"X17")

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	DATE	NAME
DRAWN:	07/23	TN
CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: MCATEE CONSTRUCTION COMPANY

PROJECT: TIMNATH SLOPE STABILITY EVALUATION

TITLE: SITE PLAN

PLOT DATE: 8/3/2023

FIGURE: 1

SLR PROJECT NUMBER: 123.01536.00013

REV: 0

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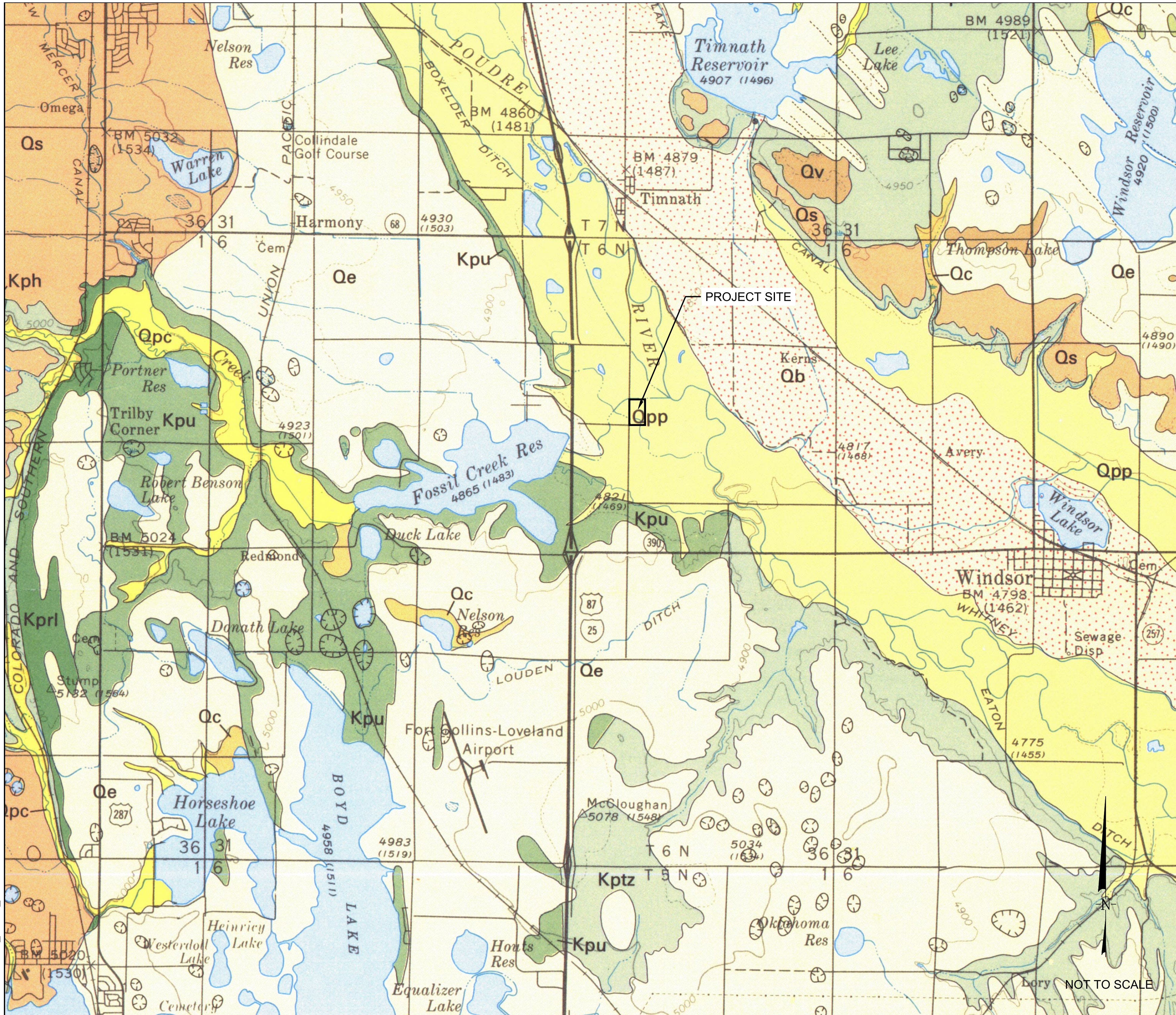
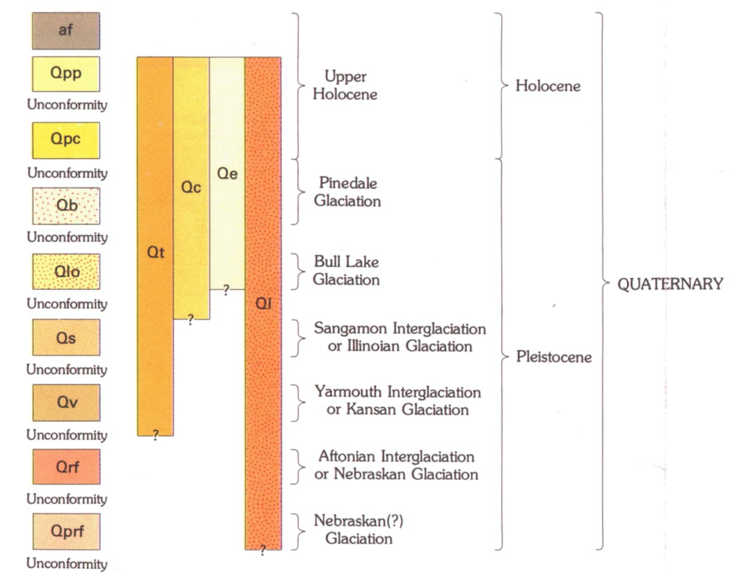


CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

af ARTIFICIAL FILL—Only large rock and earth fills shown

Qpp POST-PINEY CREEK ALLUVIUM (UPPER HOLOCENE)—Dark-gray humic, sandy to gravelly alluvium containing scattered plant remains. Underlies flood plains of major streams and terraces less than 10 feet (3 m) above stream level. Underlain by older alluvial gravel in large valleys. Thickness is from 5 to 15 feet (2 to 5 m). Occasional floods may cover this

Qb BROADWAY ALLUVIUM (PINEDALE GLACIATION, PLEISTOCENE)—Sand and gravel deposited by the South Platte River and its tributaries. Well-sorted and well-stratified; size analyses indicate that the average size distribution is 50% sand, 25% granules and 25% pebbles. Poorly developed Brown soil profile of early Holocene age underlies surface of deposit. Terrace surfaces are about 40 feet (13 m) above major streams near the Front Range but are only 20 ft (6 m) above near Greeley. Locally, map unit includes some gravel of Louviers age. Along tributaries the Broadway Alluvium is 10 to 15 ft (3 to 5 m) thick. Thickness of Broadway and Louviers Alluviums along South Platte River is as much as 125 ft (38 m), but averages only 35 ft (11 m)

Qlo LOUVIERS ALLUVIUM (BULL LAKE GLACIATION, PLEISTOCENE)—Reddish-brown pebbly to bouldery well stratified alluvium along perennial streams and sandy to clayey alluvium along intermittent streams. Well developed Brown soil profile underlies surface of deposit. Terrace surface is 70 feet (21.5 m) above major streams near mountains but deposit is buried under Broadway Alluvium along South Platte River

SOURCE:

1. GEOLOGIC MAP IS OBTAINED FROM GEOLOGIC MAP OF THE BOULDER-FORT COLLINS-GREELEY AREA, COLORADO, U.S., GEOLOGICAL SURVEY GEOLOGIC INVESTIGATIONS SERIES I-855-G, GEOLOGY COMPILED IN 1976.

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CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: MCATEE CONSTRUCTION COMPANY

PROJECT: TIMNATH SLOPE STABILITY EVALUATION

TITLE: GEOLOGIC MAP

PLOT DATE: 8/2/2023

FIGURE: 2

SLR PROJECT NUMBER: 123.01536.00013

REV: 0

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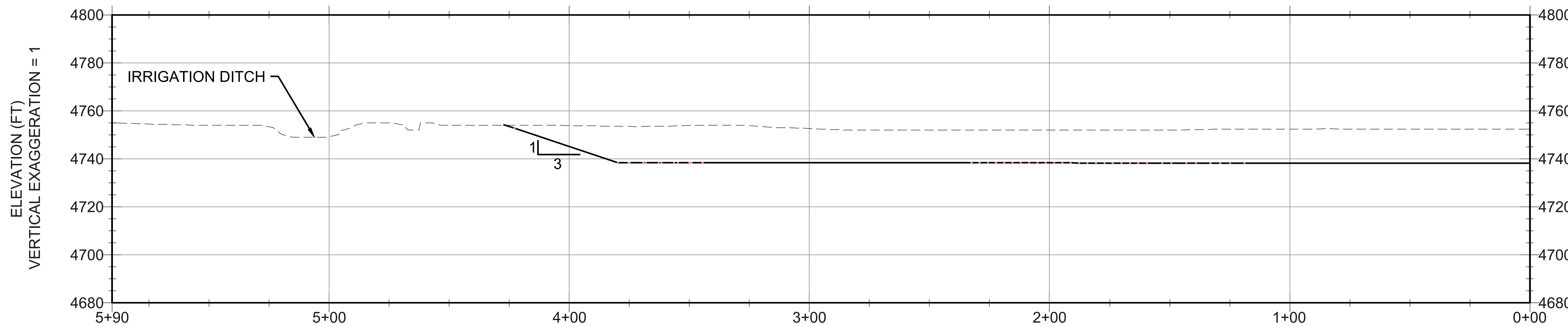
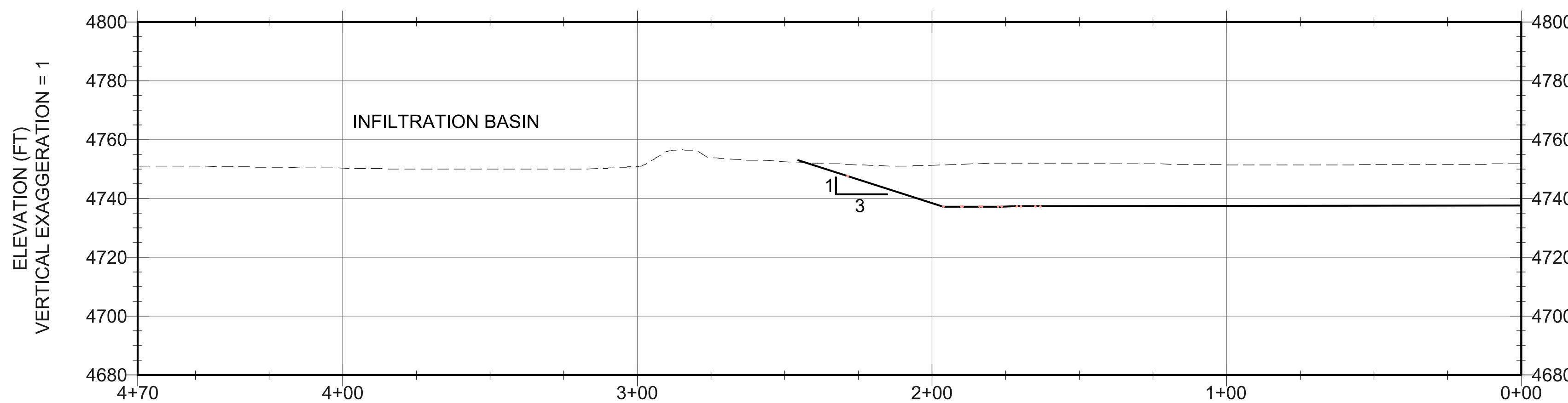


AA' / 1 **CROSS SECTION AA'**
SCALE 1"=60' (PLOT SIZE 11" X 17")



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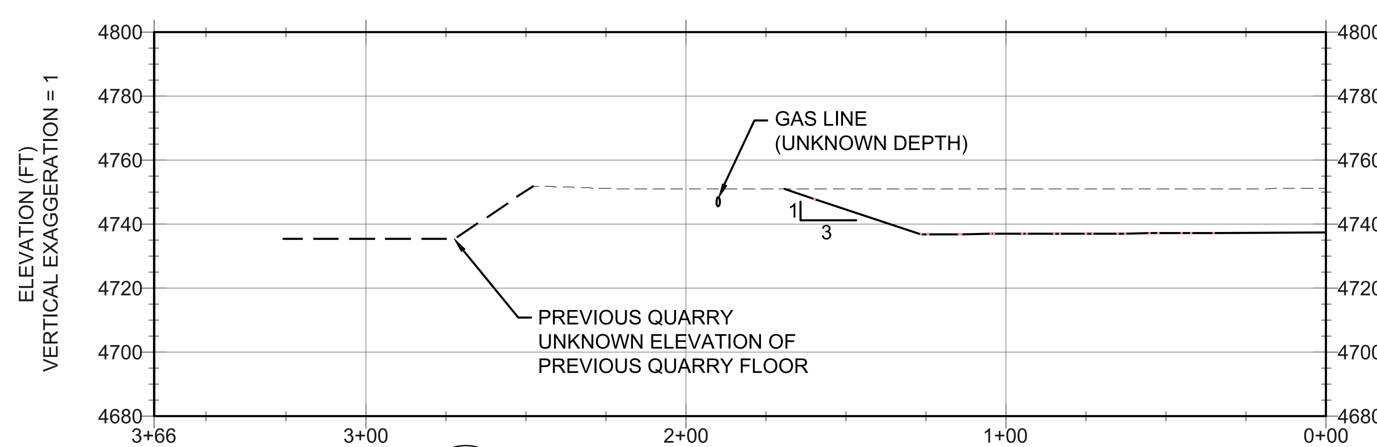

CC' / 1 **CROSS SECTION CC'**
SCALE 1"=60' (PLOT SIZE 11" X 17")

SOURCE:

1. EXISTING GROUND SURFACE, BOUNDARIES AND UTILITY LOCATIONS DEVELOPED BY OTHERS AND PROVIDED BY MCATEE CONSTRUCTION COMPANY. SLR ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY AND COMPLETENESS OF THE DATA PROVIDED BY OTHERS AND PRESENTED IN THIS FIGURE.

N:\IRVINE\CAD\123.01536.00013 TIMNATH PIT\01_CADIA_MODELS\FIGURE-FORT COLLINS PIT.DWG

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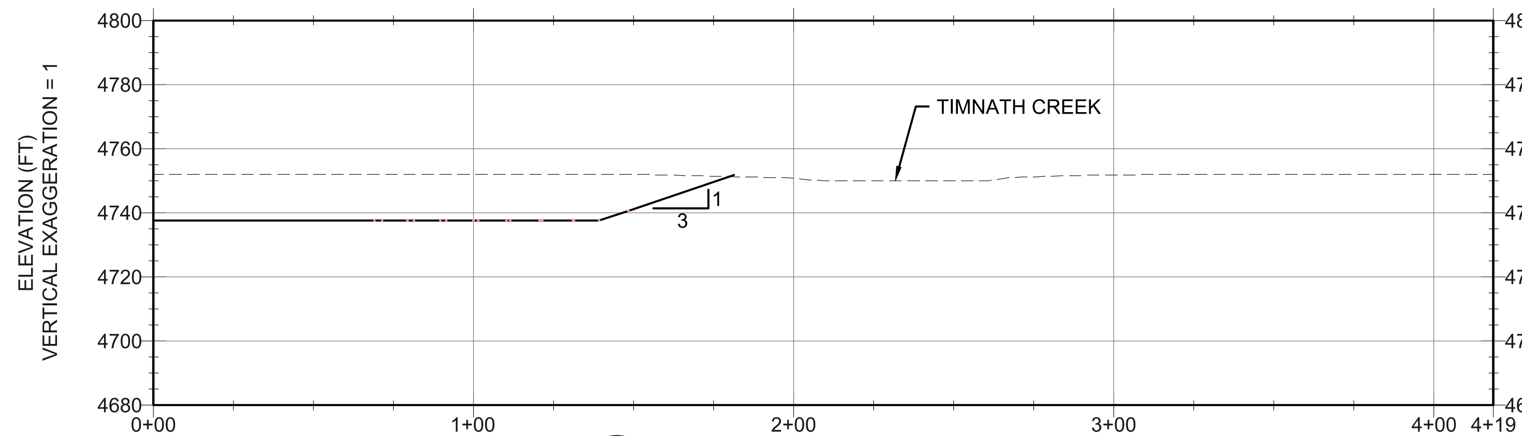
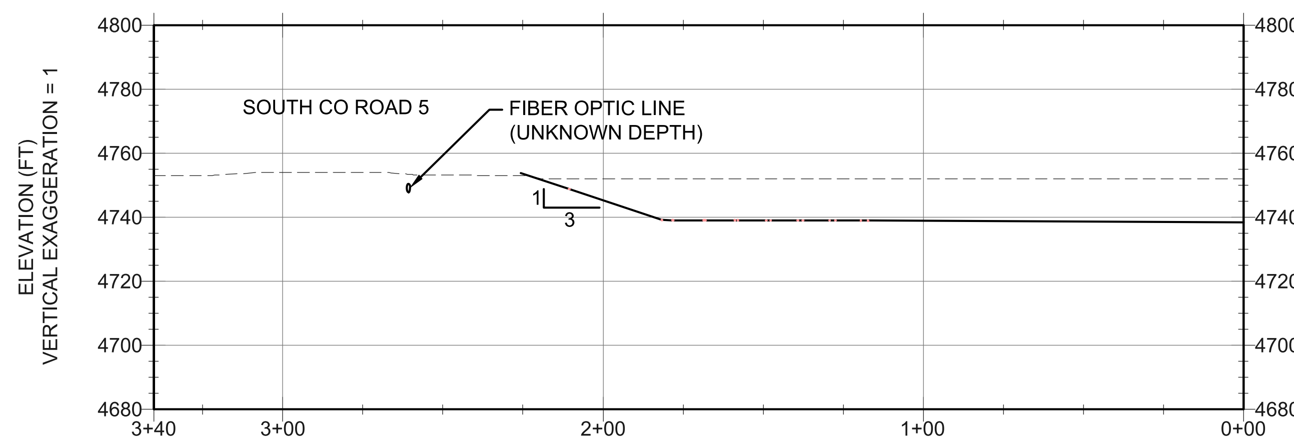
APPROVED:	07/23	TM

CLIENT:	MCATEE CONSTRUCTION COMPANY	PLOT DATE: 8/3/2023
PROJECT:	TIMNATH SLOPE STABILITY EVALUATION	FIGURE: 3
TITLE:	CROSS SECTIONS SHEET 1 OF 2	
SLR PROJECT NUMBER: 123.01536.00013		REV: 0



DD' / 1 **CROSS SECTION DD'**
SCALE 1"=60' (PLOT SIZE 11" X 17")



EE' / 1 **CROSS SECTION EE'**
SCALE 1"=60' (PLOT SIZE 11" X 17")

SOURCE:

1. EXISTING GROUND SURFACE, BOUNDARIES AND UTILITY LOCATIONS DEVELOPED BY OTHERS AND PROVIDED BY MCATEE CONSTRUCTION COMPANY. SLR ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY AND COMPLETENESS OF THE DATA PROVIDED BY OTHERS AND PRESENTED IN THIS FIGURE.

N:\IRVINE\CAD\123.01536.00013 TIMNATH PIT\01_CADIA_MODELS\FIGURE-FORT COLLINS PIT.DWG

SLR
SLR INTERNATIONAL CORPORATION
Consulting Engineers & Scientists
20 Corporate Park, Suite 200
Irvine, CA. 92606
Tel: (949) 553-8417

	DATE	NAME
DRAWN:	07/23	TN
CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: **MCATEE CONSTRUCTION COMPANY**

PROJECT: **TIMNATH SLOPE STABILITY EVALUATION**

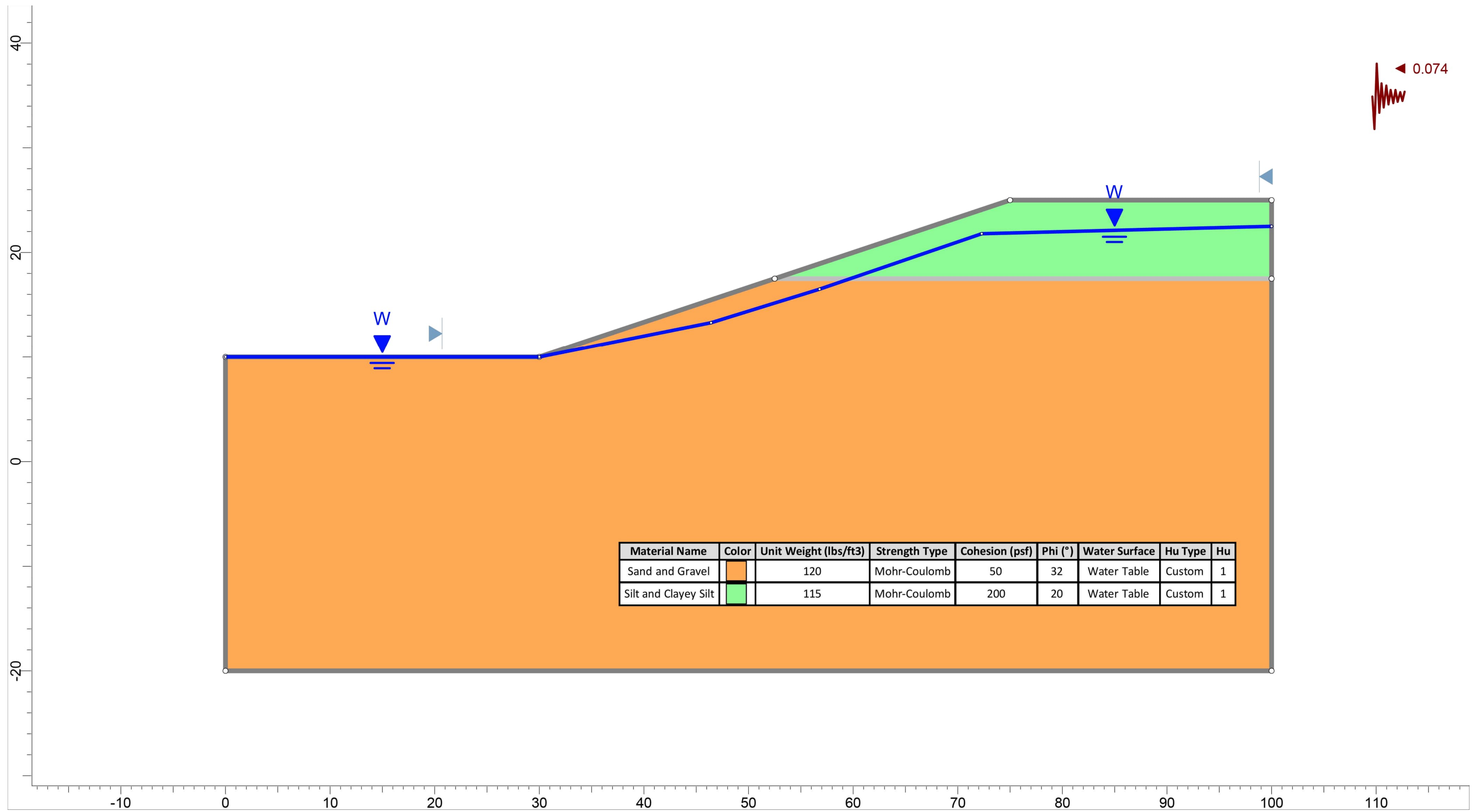
TITLE: **CROSS SECTIONS SHEET 2 OF 2**

SLR PROJECT NUMBER: 123.01536.00013

PLOT DATE: 8/3/2023

FIGURE: 4

REV: 0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu
Sand and Gravel		120	Mohr-Coulomb	50	32	Water Table	Custom	1
Silt and Clayey Silt		115	Mohr-Coulomb	200	20	Water Table	Custom	1

N:\IRVINE\CAD\123.01536.00013 TIMNATH PIT01_CAD\A_MODELS\SLOPE STABILITY ANALYSIS.DWG

SLR INTERNATIONAL CORPORATION
Consulting Engineers & Scientists
20 Corporate Park, Suite 200
Irvine, CA. 92606
Tel: (949) 553-8417

	DATE	NAME
DRAWN:	07/23	TN
CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: **MCATEE CONSTRUCTION COMPANY**

PROJECT: **TIMNATH SLOPE STABILITY EVALUATION**

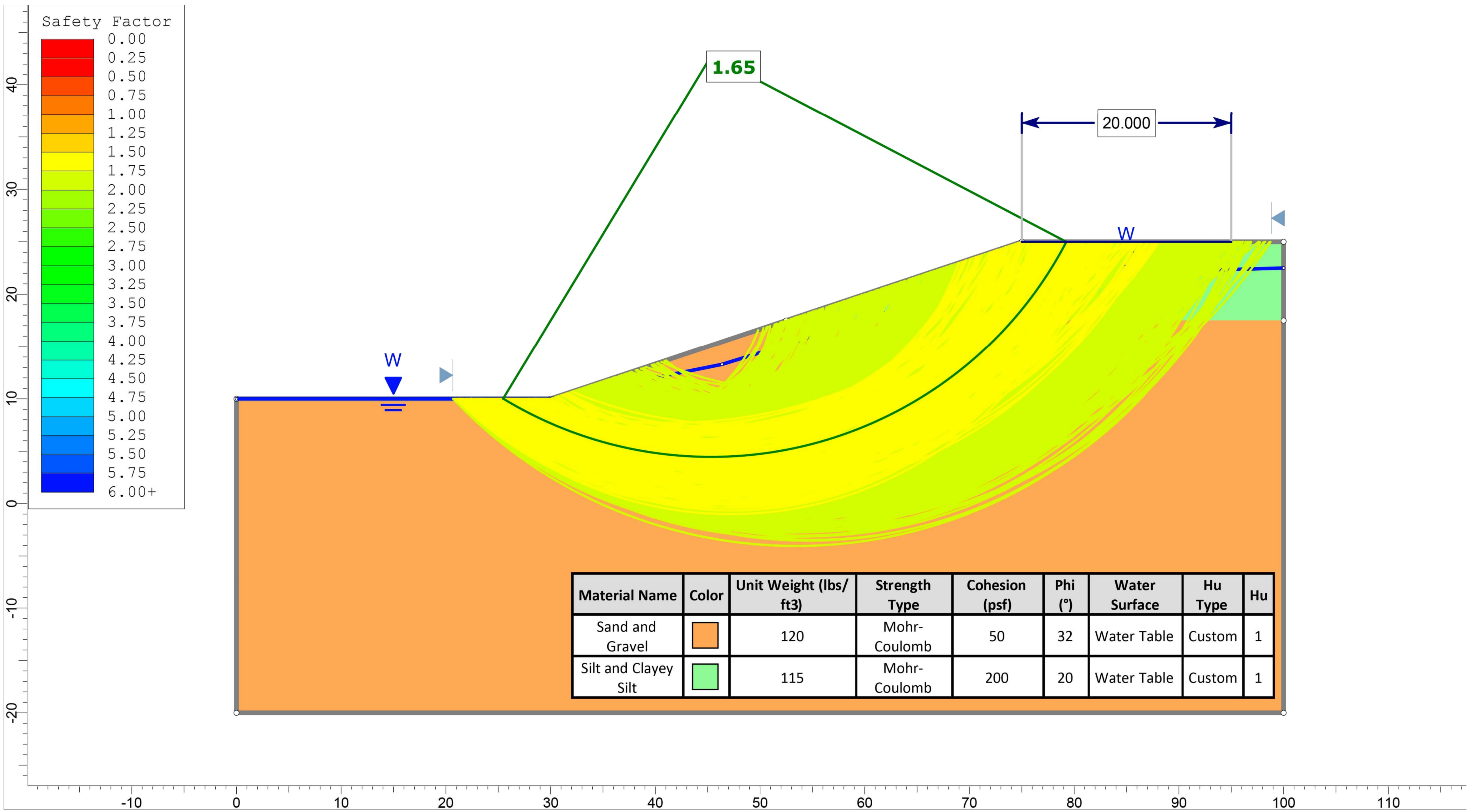
TITLE: **SLOPE STABILITY TYPICAL SECTION**

SLR PROJECT NUMBER: 123.01536.00013

PLOT DATE: 8/3/2023

FIGURE: 5

REV: 0



Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu
Sand and Gravel		120	Mohr-Coulomb	50	32	Water Table	Custom	1
Silt and Clayey Silt		115	Mohr-Coulomb	200	20	Water Table	Custom	1

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20 Corporate Park, Suite 200
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Tel: (949) 553-8417

	DATE	NAME
DRAWN:	07/23	TN
CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: **MCATEE CONSTRUCTION COMPANY**

PROJECT: **TIMNATH SLOPE STABILITY EVALUATION**

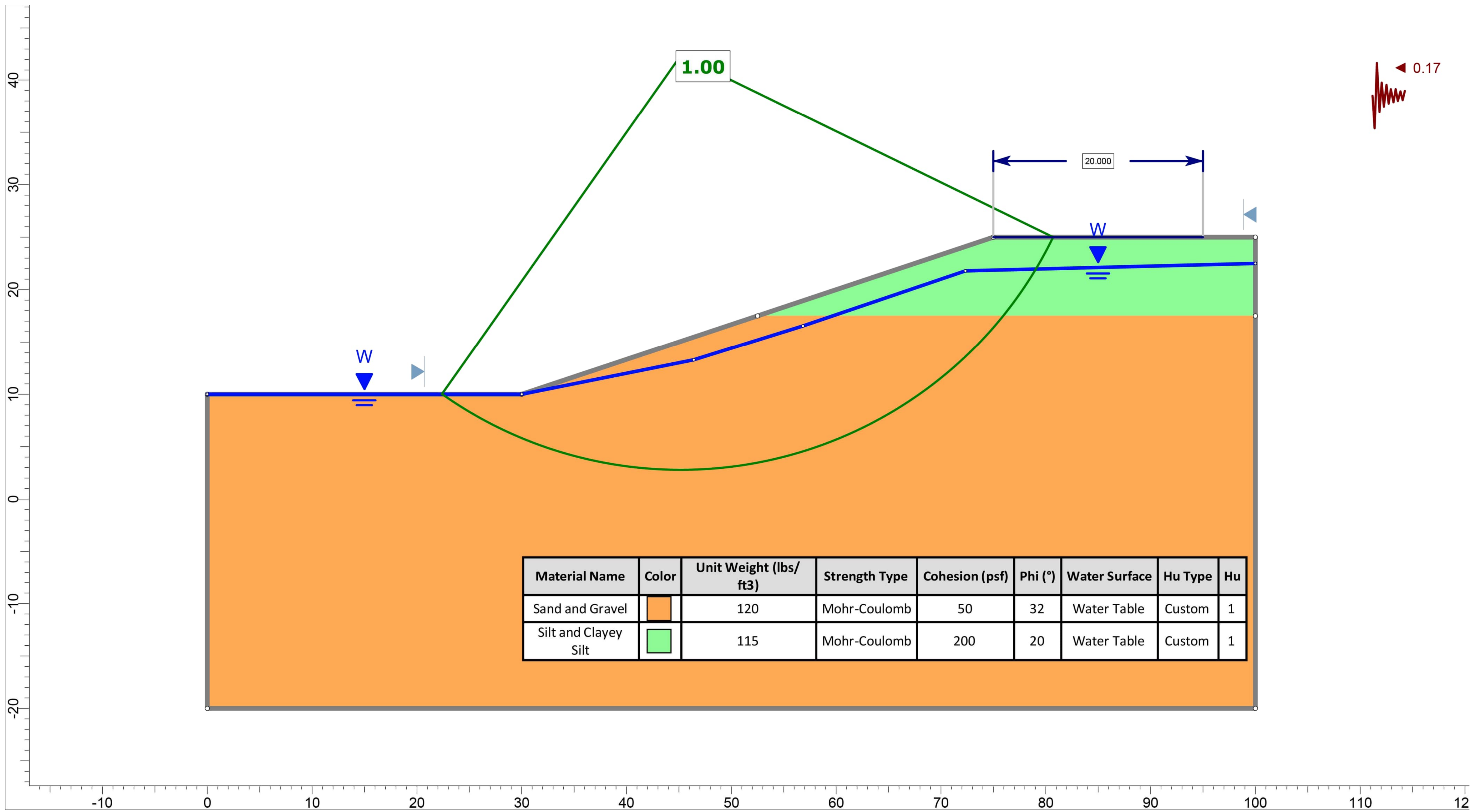
TITLE: **STATIC SLOPE STABILITY AND OFFSET ANALYSIS**

SLR PROJECT NUMBER: 123.01536.00013

PLOT DATE: 8/3/2023

FIGURE: 6

REV: 0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu
Sand and Gravel		120	Mohr-Coulomb	50	32	Water Table	Custom	1
Silt and Clayey Silt		115	Mohr-Coulomb	200	20	Water Table	Custom	1

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SLR INTERNATIONAL CORPORATION
Consulting Engineers & Scientists
20 Corporate Park, Suite 200
Irvine, CA. 92606
Tel: (949) 553-8417

	DATE	NAME
DRAWN:	07/23	TN
CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: MCATEE CONSTRUCTION COMPANY

PROJECT: TIMNATH SLOPE STABILITY EVALUATION

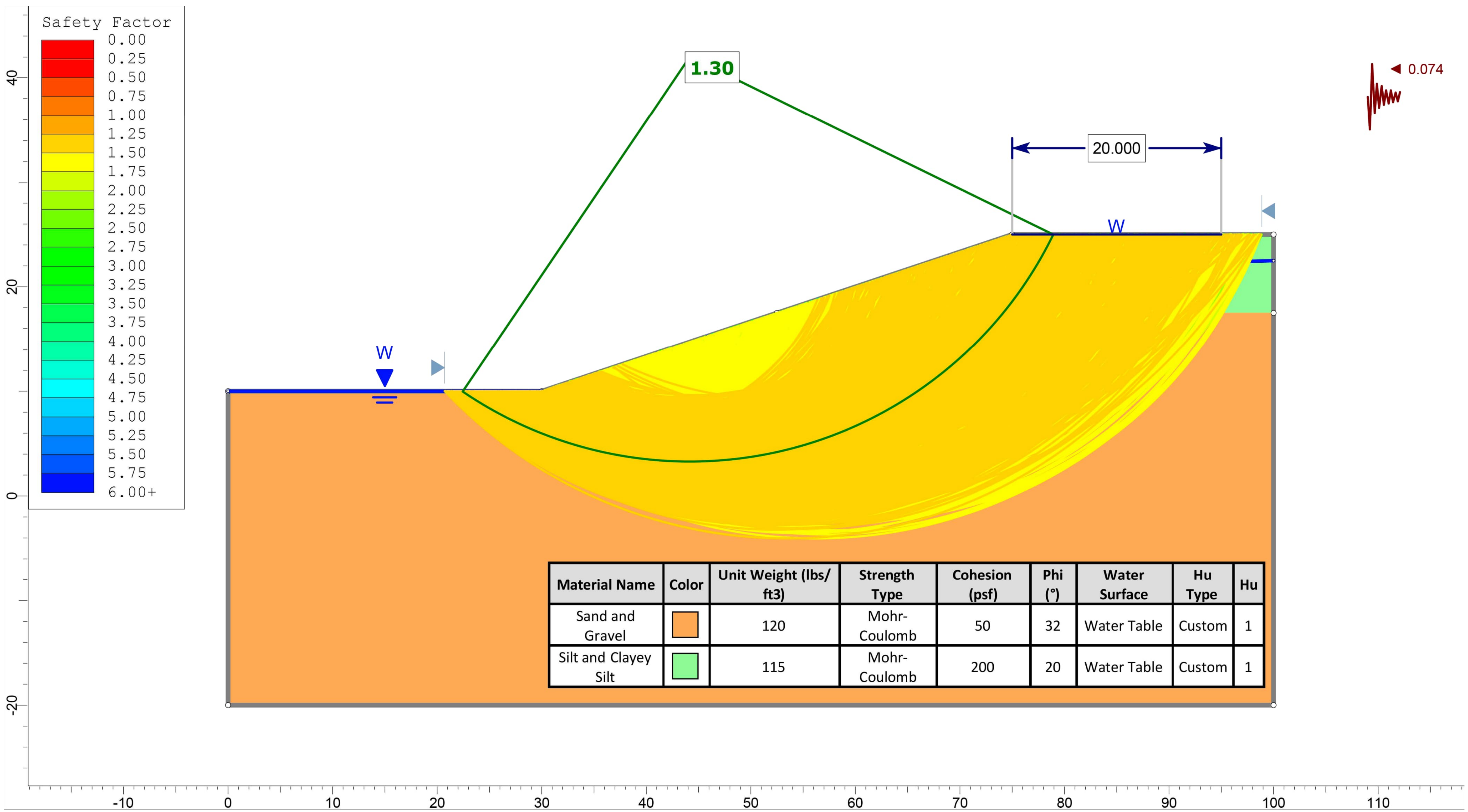
TITLE: PSEUDO STATIC YIELD ANALYSIS

PLOT DATE: 8/3/2023

FIGURE: 7

SLR PROJECT NUMBER: 123.01536.00013

REV: 0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu
Sand and Gravel		120	Mohr-Coulomb	50	32	Water Table	Custom	1
Silt and Clayey Silt		115	Mohr-Coulomb	200	20	Water Table	Custom	1

N:\IRVINE\CAD\123.01536.00013 TIMNATH PIT\01_CAD\A_MODELS\SLOPE STABILITY ANALYSIS.DWG

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	DATE	NAME
DRAWN:	07/23	TN
CHECKED:	07/23	JH
APPROVED:	07/23	TM

CLIENT: MCATEE CONSTRUCTION COMPANY

PROJECT: TIMNATH SLOPE STABILITY EVALUATION

TITLE: PSEUDO STATIC SLOPE STABILITY AND OFFSET ANALYSIS

SLR PROJECT NUMBER: 123.01536.00013

PLOT DATE: 8/3/2023

FIGURE: 8

REV: 0

Attachment 1 Colorado Division of Reclamation, Mining and Safety Incompleteness Notice

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

June 30, 2023

Rod Havens
McAtee Construction Company
6215 Clear Creek Parkway
Cheyenne, WY 82007

RE: Incompleteness Notice No. 2, Succession of Operators–SO-1, Timnath Pit, Permit No. M-1989-056

Dear Mr. Havens:

On June 29, 2023, the Division of Reclamation, Mining and Safety (DRMS/Division) received your responses to the Division's Incompleteness Notice dated February 1, 2023 for Transfer of Mineral Permit and Succession of Operators from Don Kehn Construction Inc. to McAtee Construction Company for the Timnath Pit, Permit M-1989-056. Review of the submitted responses determined the following items must be received before the Division can consider the application as being submitted/file.

1. The submitted engineering evaluation is not sufficient. At a minimum the prospective Operator needs to propose offsets, in feet, from the edge of the right-of-way (ROW) or any structure to the top of the mined and reclaimed 3:1 slope, i.e. the Operator needs a buffer from any ROW or structure not owned by them to the beginning of the mined slope.

   Please prepare a slope stability analysis, including 2-D models, indicating the cross-sections from each structure without an agreement including a calculated factor of safety for each scenario. Table 1 below lists the Mined Land Reclamation Board (MLRB) factors of safety for slope stability/geotechnical analyses it has adopted for permits.

Table 1. MLRB Minimum Factors of Safety for Slope Stability Analyses for Operations and Reclamation

Type of Structure/Consequence of Failure	Generalized, Assumed, or Single Test Strength Measurements	Strength Measurements Resulting from Multiple Tests[1]
<u>Non-Critical Structures</u> (e.g., fences) No imminent danger to human life, minor repair costs, and minor environmental impact if slope fails	1.3 (1.15)[2]	1.25 (1.1)[2]
<u>Critical Structures</u> (e.g., residences, utilities, dams, pipelines, irrigation canals, public roads, etc.) Potential human safety risk, major environmental impact, and major repair costs if slope fails (includes Environmental Protection Facilities/EPFs, such as tailings facilities, heap leach pads, process effluent ponds, milling facilities, overburden/waste rock storage facilities, and hazardous/toxic material storage facilities, etc.)	1.5 (1.3)[2]	1.3 (1.15)[2]

1) The number of tests required to provide a high degree of confidence in the strength parameters used depends on the variability of the material being tested and the extent of disturbance.
2) Numbers without parentheses apply for analyses using static conditions. Those within parentheses apply to analyses using seismic parameters. Based on site specific conditions, seismic analyses may be required and parameters selected shall be consistent with the risk and duration of the condition being considered.

<u>Please respond to the items above by the decision date July 1, 2023</u>. All completed permit documents are required to be submitted for consideration of your Request for Transfer of Mineral Permit and Succession of Operators Application. If additional time is needed to respond, an extension request must be received by our Office by the decision date. If on the decision date, outstanding items remain, and no extension request has been received, your application will be denied and the file terminated. The Division reserves the right to further supplement this document with additional items and details as necessary.

Please contact Patrick Lennberg (303) 866-3567 ext. 8114 or by email at patrick.lennberg@state.co.us if you have any questions.

Sincerely,

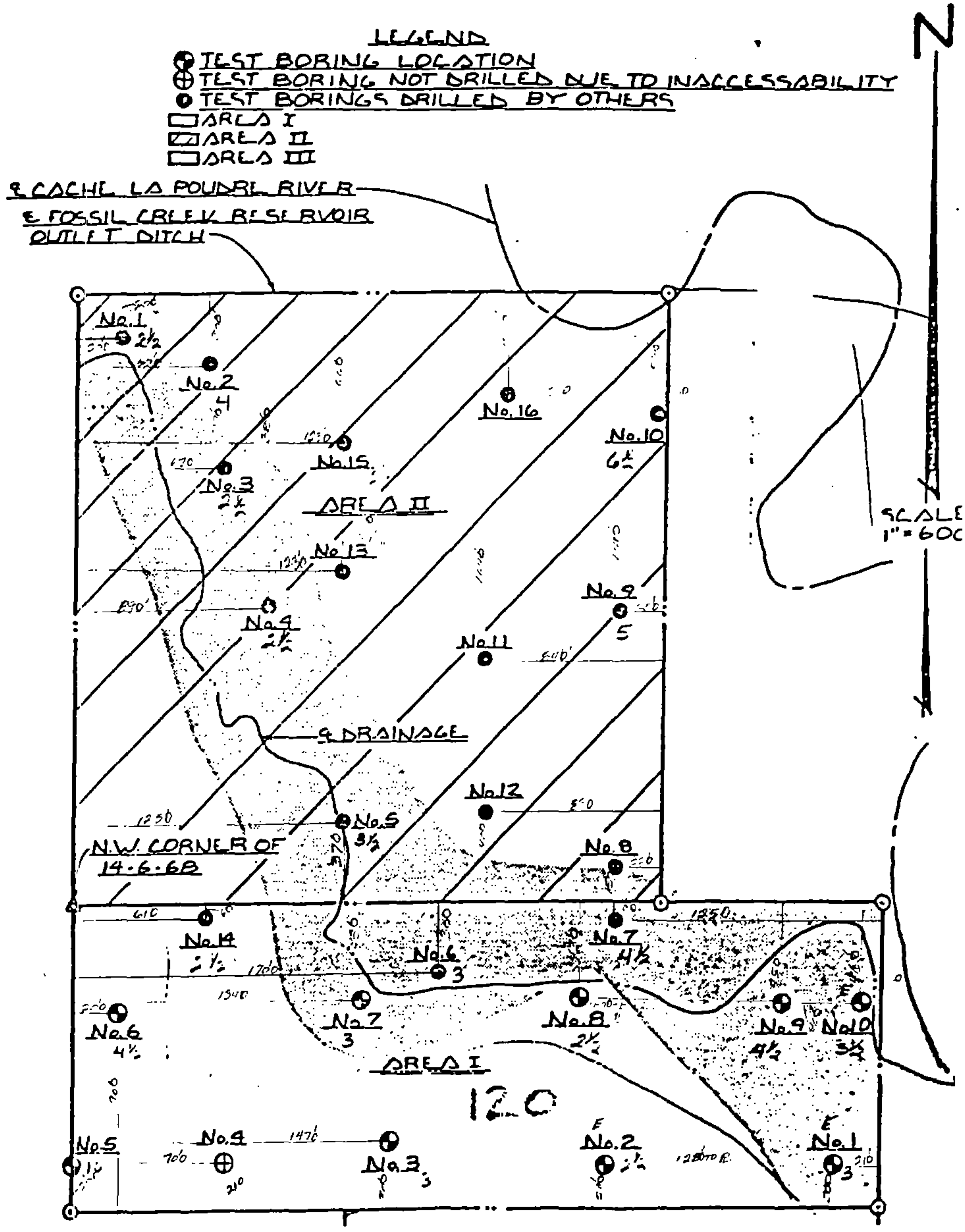
Patrick Lennberg
Environmental Protection Specialist

cc: Jared Ebert, DRMS

ec: Ron Havens, McAtee Construction Company, rhavens@simonteam.com
Josh Kruchten, McAtee Construction Company, jkruchten@simonteam.com
Tim Bennett, McAtee Construction Company, tim.bennett@simonteam.com

Attachment 2 ELI Boring Logs

TEST BORING LOCATION PLAN



KEY TO BORING LOGS

TOPSOIL	GRAVEL
FILL	SAND & GRAVEL
SILT	SILTY SAND & GRAVEL
CLAYEY SILT	COBBLES
SANDY SILT	SAND, GRAVEL & COBBLES
CLAY	WEATHERED BEDROCK
SILTY CLAY	SILTSTONE BEDROCK
SANDY CLAY	CLAYSTONE BEDROCK
SAND	SANDSTONE BEDROCK
SILTY SAND	LIMESTONE
CLAYEY SAND	GRANITE
SANDY SILTY CLAY	

SHELBY TUBE SAMPLE

STANDARD PENETRATION DRIVE SAMPLER

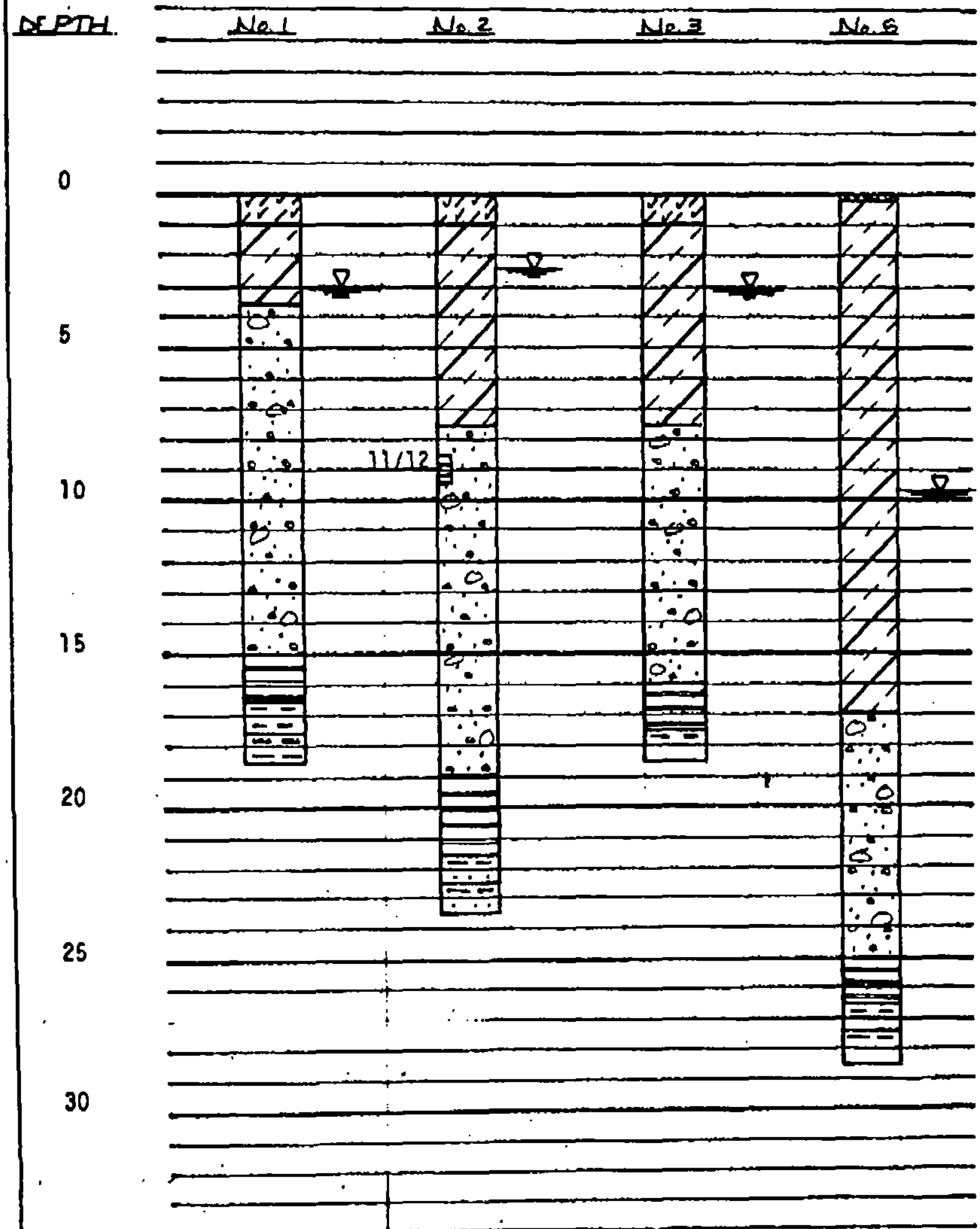
WATER TABLE 0 HOURS AFTER DRILLING

HOLE CAVED

5/12 Indicates that 5 blows of a 140 pound hammer [illegible] 30 inches was required to penetrate 12 inches.

LOG OF BORINGS

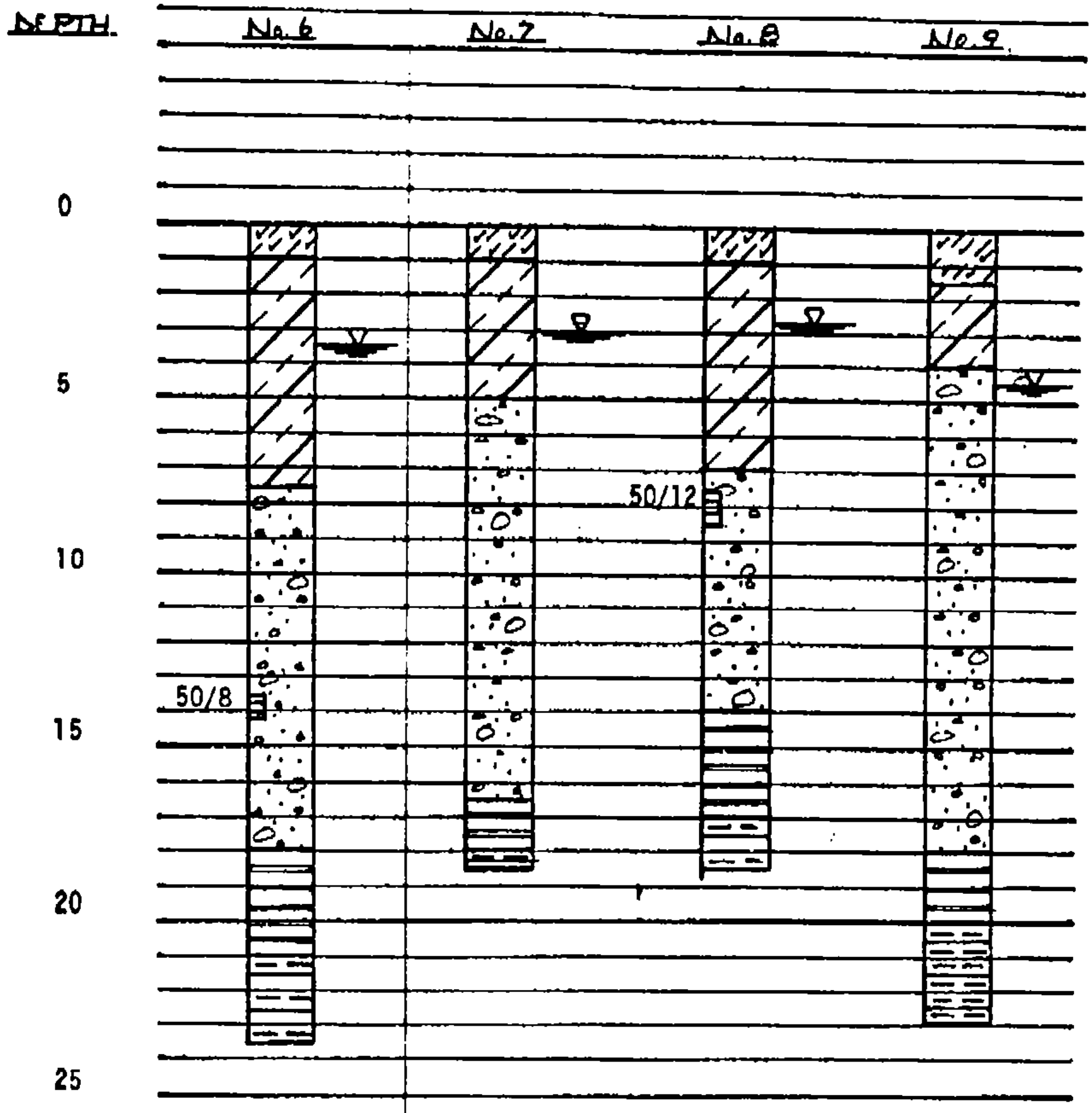
AREA I



EMPIRE LABORATORIES, INC

LOG OF BORINGS

AREA I



LOG OF BORINGS

AREA II

DEPTH — No. 1 — No. 2 — No. 3 — No. 4

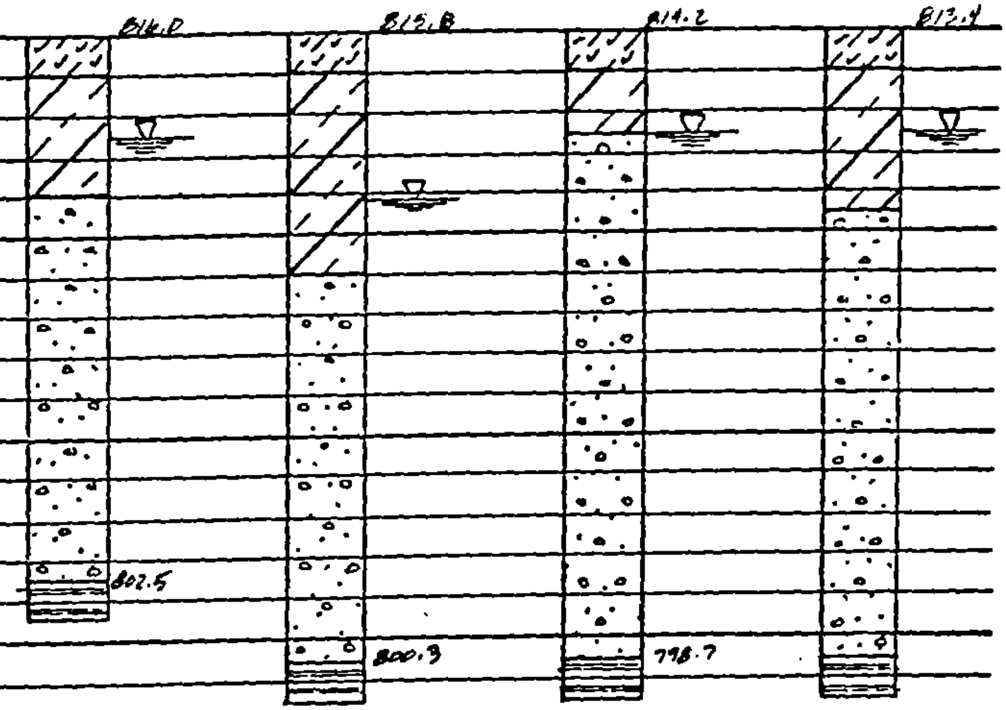
0

5

10

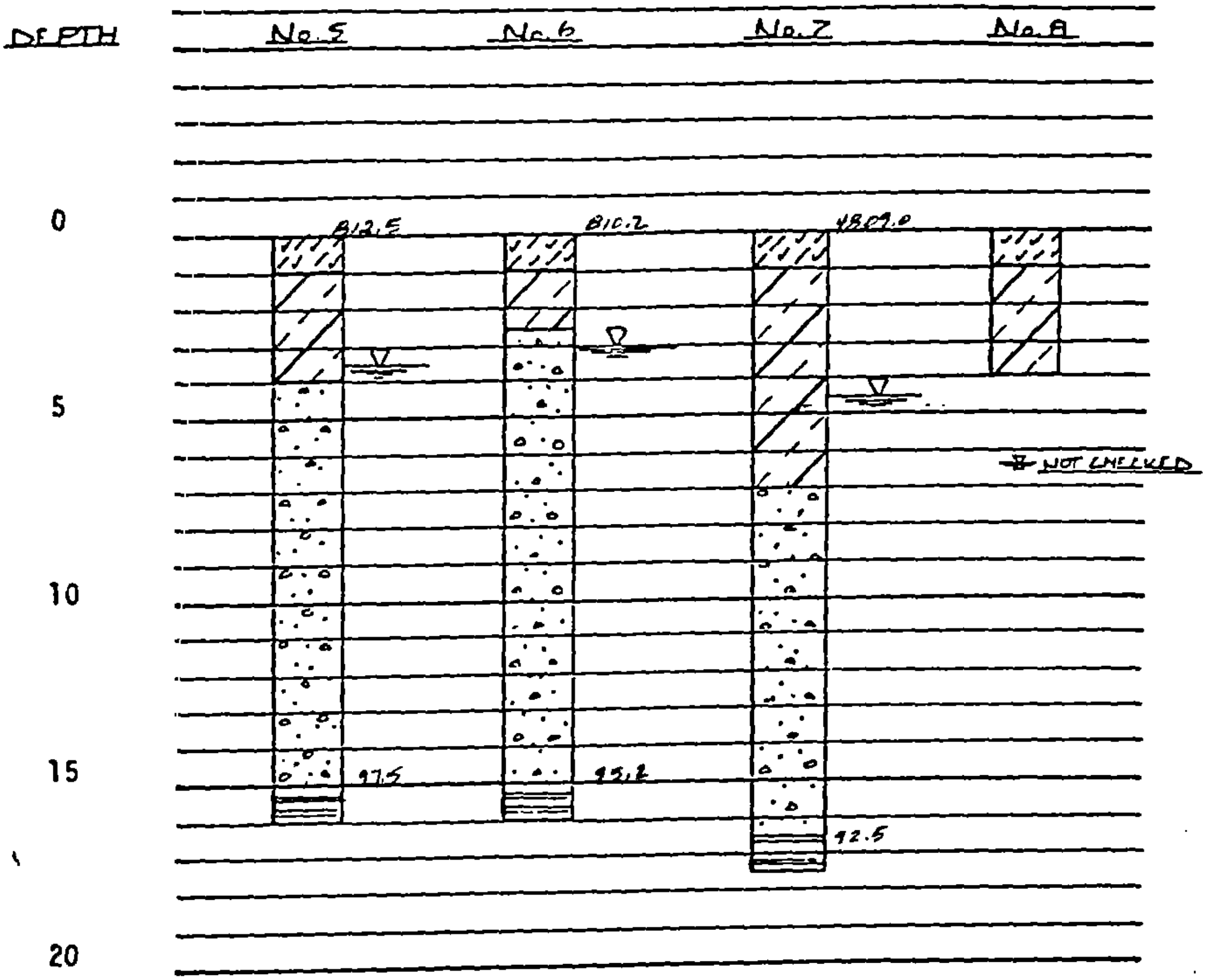
15

20



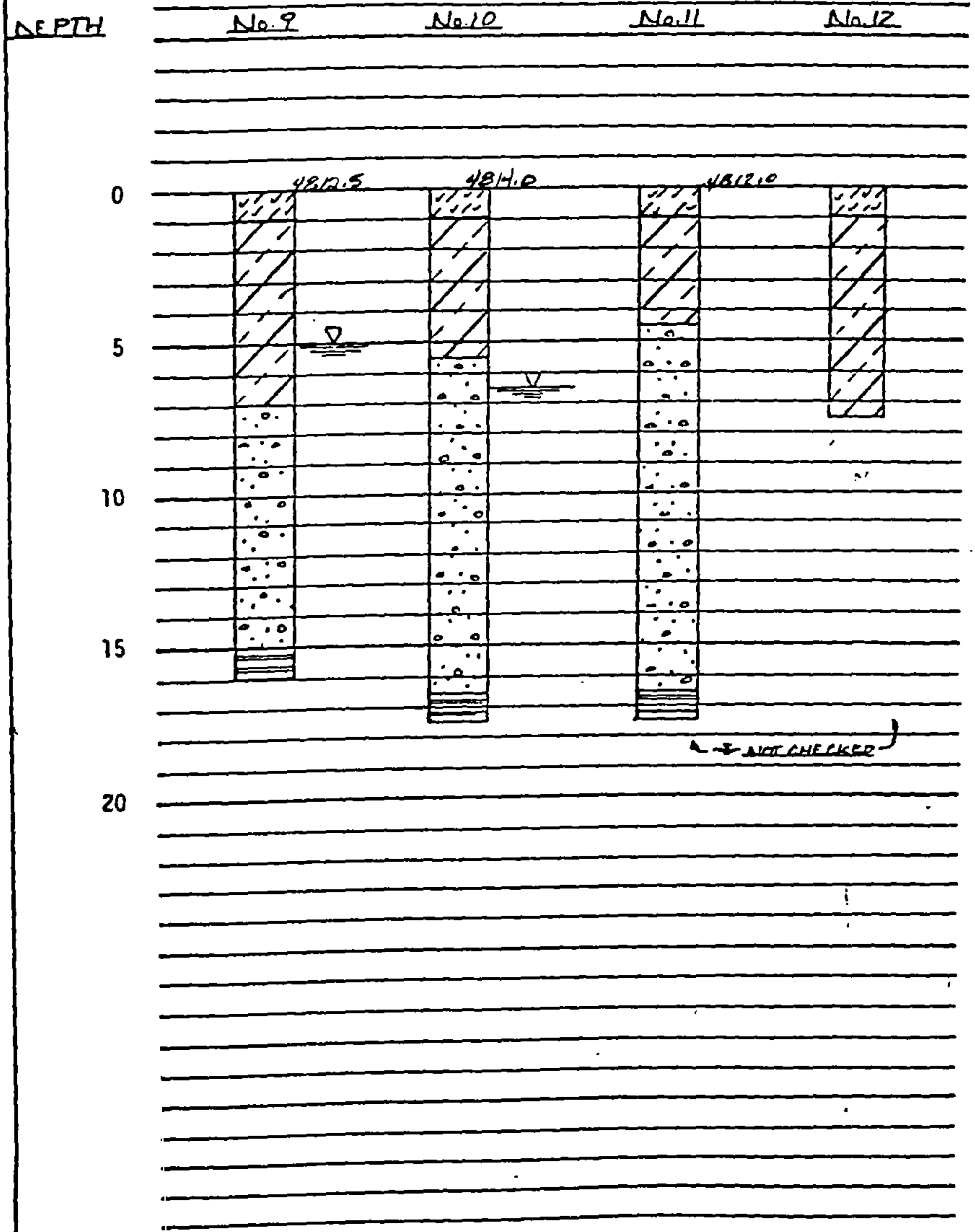
LOG OF BORINGS

AREA II



LOG OF BORINGS

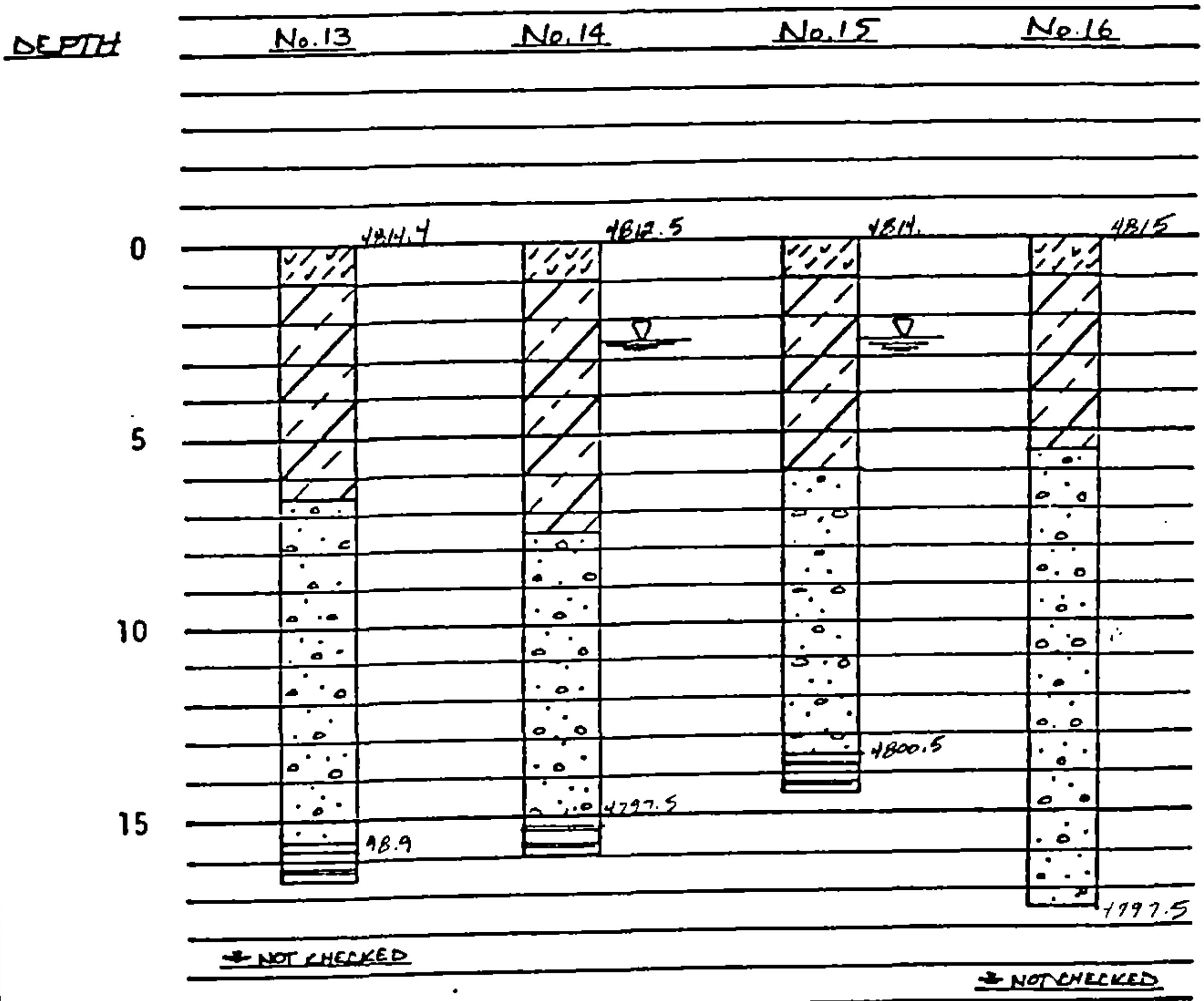
AREA II



Note; APPROX. GROUND SURFACE ELEV. ADDED BY PLH 7/11/92

LOG OF BORINGS

AREA II



EMPIRE LABORATORIES, INC.

APPENDIX B.

SUMMARY OF TEST RESULTS

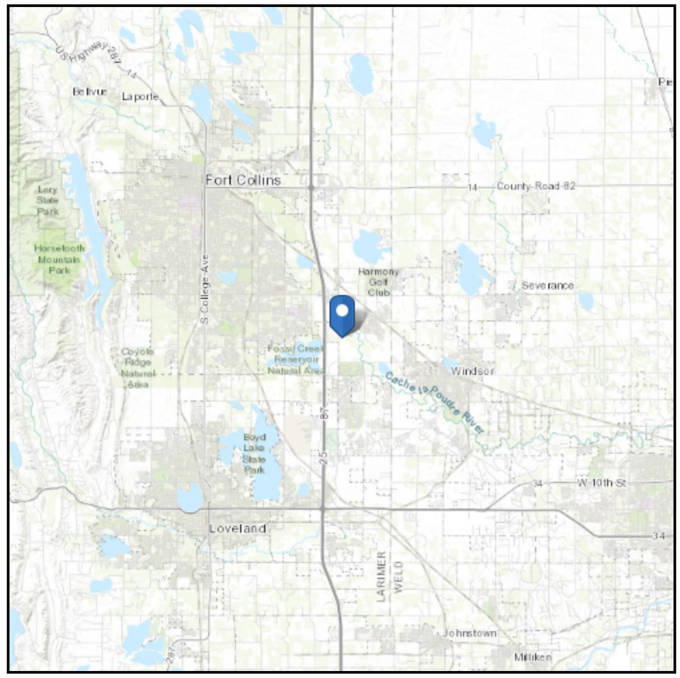
BORING NO.	DEPTH FT.	% MOISTURE	DRY DENSITY P.C.F.	UNCONFINED COMPRESSIVE STRENGTH—P.S.F.	WATER SOLUBLE SULFATES—%	PENETRATION BLOWS/INCHES
2	8.5-9.5					11/12
6	13.5-14.2					50/8
8	7.5-8.5					50/12

Attachment 3 Maximum Considered Earthquake and Peak Ground Acceleration Output from ASCE 7 Hazard Tool Web Application

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Latitude:**	40.4994
Risk Category:	III	**Longitude:**	-104.9797
Soil Class:	D - Stiff Soil	**Elevation:**	4817.309596309415 ft (NAVD 88)



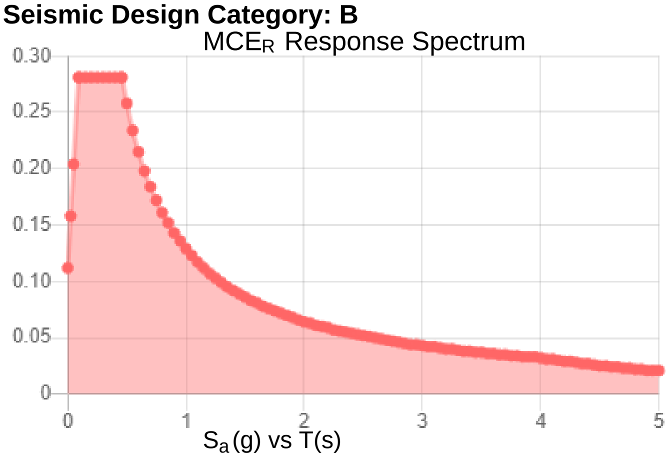
Seismic D - Stiff Soil

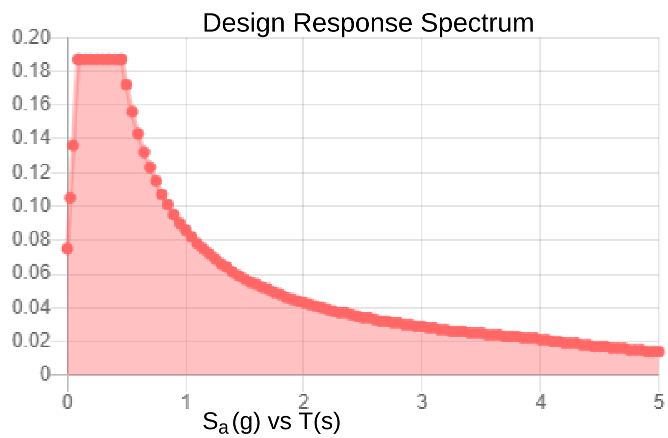
Site Soil Class:

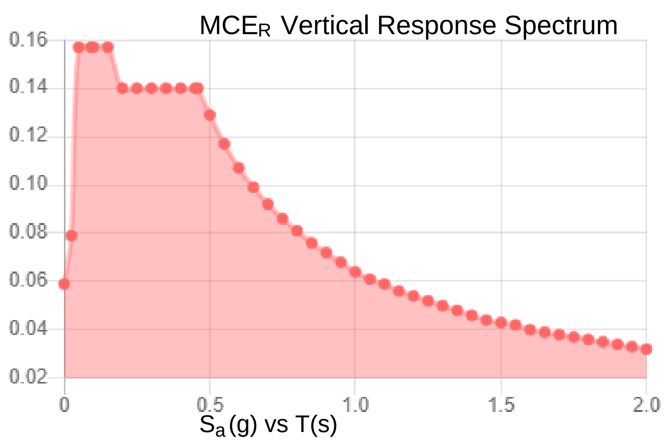
Results:

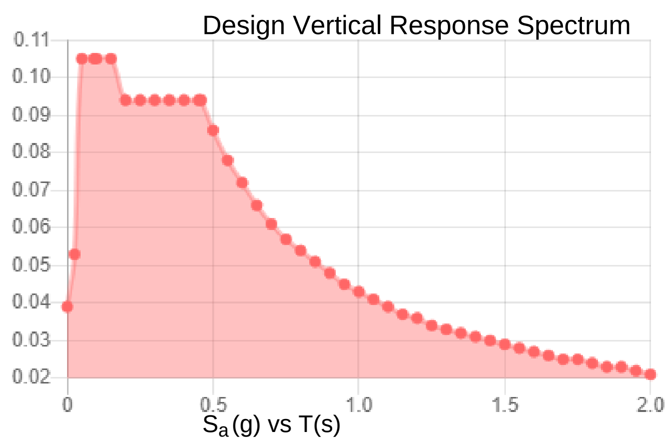
S_S :	0.175	S_{D1} :	0.086
S_1 :	0.054	T_L :	4
F_a :	1.6	PGA :	0.092
F_v :	2.4	PGA_M :	0.148
S_{MS} :	0.281	F_{PGA} :	1.6
S_{M1} :	0.129	I_e :	1.25
S_{DS} :	0.187	C_v :	0.7

Seismic Design Category: B









Data Accessed: **Thu Jul 27 2023**

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.