GEOTECHNICAL INVESTIGATION REPORT

Proposed Escalante Drive Apartments
1270 Escalante Drive
Durango, Colorado

Yeh Project No.: 221-568

March 25, 2022

Prepared by:

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1.0 PURPOSE AND SCOPE OF STUDY

This report presents the results of our geotechnical investigation for the apartment complex that will be constructed in Durango, Colorado. This investigation was performed in general accordance with our Proposal No. 221-568 dated December 27, 2021. Our scope of services included a field exploration, laboratory testing, geotechnical engineering analyses, and preparation of this report.

The purposes of this investigation were to evaluate the subsurface conditions on the site and to develop geotechnical recommendations to guide design and construction of the proposed apartment complex. Our scope of services included the following:

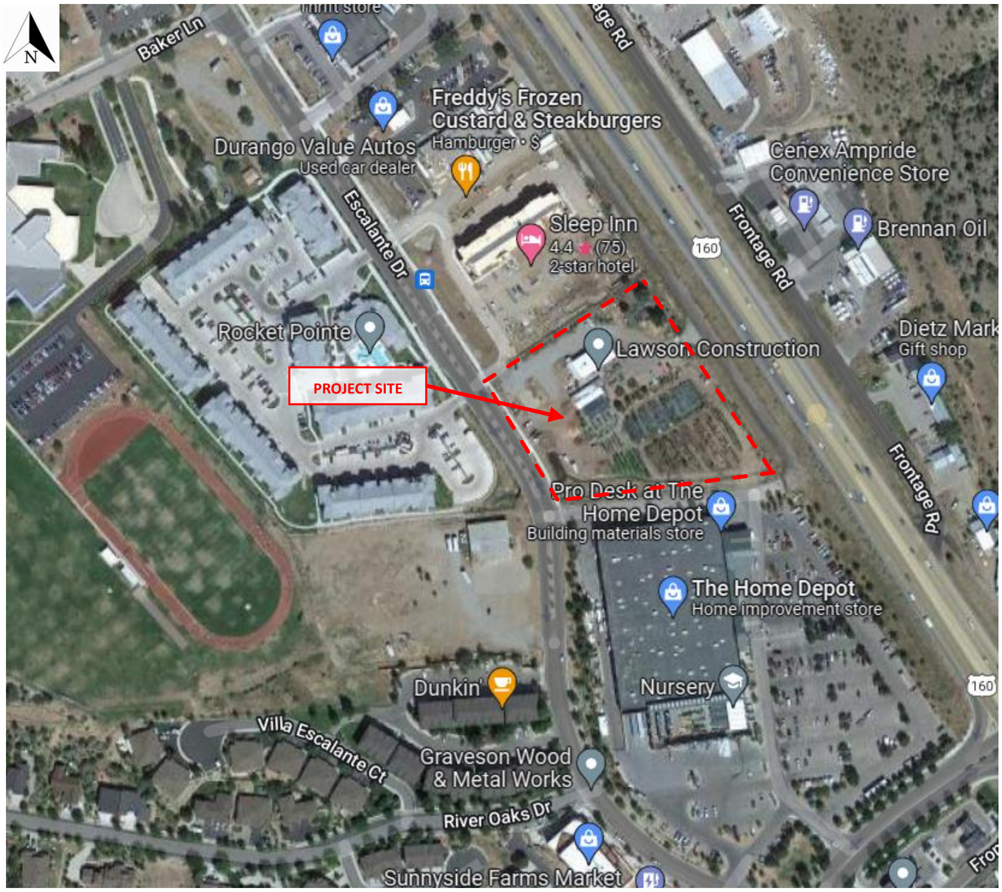
- Drilling soil borings to evaluate the subsurface conditions in the proposed building and parking areas.
- Laboratory testing of the soils encountered during the field exploration to evaluate pertinent engineering properties of the soil.
- Foundation design recommendations, including allowable bearing pressure, approximate depth to bearing stratum, and estimated movement.
- Floor slab design considerations and floor slab subgrade preparation recommendations.
- Pavement subgrade preparation and recommended pavement sections.
- Earthwork, including recommendations for fill placement and compaction, suitability of the site soil for reuse as engineered fill, and subgrade preparation
- Discussion of geotechnical conditions that could impact construction, such as hard rock excavation, dewatering, and drainage.

2.0 PROPOSED CONSTRUCTION

The project will consist of constructing an apartment complex in Durango, Colorado. The location of the project site is depicted on the following Figure 1, *Project Location Map*. The project will include four, wood-frame buildings; parking lots; access drives; and associated infrastructure. It was assumed that the buildings would have maximum column loads of less than 150 kips and maximum wall loads of less than 4 kips per linear foot.

A site grading plan was not available when this report was prepared. It was assumed that grade changes of less than 4 feet will be required to develop the final site grades. We should be contacted if this information is incorrect so that we can determine if a revision of the recommendations contained herein is necessary.

Figure 1 – Project Location Map



3.0 SITE CONDITIONS

The project site was formerly occupied by the Native Roots Garden Center. A two-story metal building with plan dimensions on the order of 40 by 93 feet is present in the northern portion of the site with an asphalt parking lot and/or drive aisles that generally surround the existing building. In addition, a loading dock is located south of the building and a detention pond is located near the southwest corner of the site. The remainder of the site is vacant. The northern portion of the site is on the order of 5 to 10 feet higher than the remainder of the site. The site is bounded on the north by a commercial development, on the south by a Home Depot store, on the east by the abandoned Highway 160 frontage road, and on the west by Escalante Drive.

Figure 2 –Site Photograph

Project site looking east from western property line.

Figure 3 –Site Photograph

Project site looking west from the eastern property line.

4.0 SUBSURFACE INVESTIGATION

4.1 Field Exploration

Ten borings were drilled for this project to depths ranging from approximately 9 to 21½ feet. Eight of the borings were terminated due to auger refusal in cobbles and boulders. The approximate boring locations are indicated on the *Boring Location Plan* attached in Appendix A.

Samples of the subsurface materials were obtained from the borings at select depths by driving either a split-spoon or modified California barrel sampler. Bulk samples of the soil were recovered from auger cuttings as the borings were advanced. The samples were transported to our laboratory where they were examined by the project geotechnical engineer and a program of laboratory testing was prepared.

Penetration resistance measurements were made by driving the samplers into the subsurface materials with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler 12 inches, after an initial penetration of 6 inches for the standard sampler, constitutes the N-value as shown on the boring logs. The N-values can be correlated to the relative density of granular soil and the consistency of cohesive soil.

Water levels were recorded in each boring at completion of the drilling operations. The borings were backfilled with the auger spoil after the water level readings were obtained. The water level readings are presented on the boring logs.

The drilling operations were monitored by a Yeh and Associates graduate engineer. The engineer prepared field logs documenting the soil conditions encountered, groundwater levels, standard penetration test blow counts (N-values), sampling intervals, and types of samples obtained. The field logs were used by the project geotechnical engineer as an aid in preparing the final boring logs. Copies of the boring logs are presented in Appendix B. Our scope of services did not include survey of the boring locations.

4.2 Laboratory Testing

The recovered soil samples were classified by the project geotechnical engineer in accordance with the Unified Soil Classification System (USCS). Laboratory tests were then performed on select samples to evaluate the pertinent engineering properties of the soil. The laboratory testing was conducted in general accordance with the American Society for Testing and Materials (ASTM) test procedures**.** The following laboratory tests were performed for this evaluation:

- Water Content
- Dry Unit Weight
- Liquid and Plastic Limits
- Swell Potential
- Percent Passing No. 200 Sieve

The laboratory test results are presented on the boring logs.

5.0 SUBSURFACE CONDITIONS

Lean clay fill with variable sand, gravel and cobble content was encountered in the borings to depths of approximately ½ to 2 feet. The fill was underlain by medium stiff to very stiff lean clay with variable sand content. The lean clay extended to depths of approximately 8 to 20 feet and was underlain by dense cobbles and boulders that extended to the boring termination depths. Stiff fat clay was encountered in borings B-6 and B-10. The depth to the cobble and boulder layer typically increased towards the northwest.

Groundwater was not encountered in the borings. Variations in the groundwater level may occur seasonally. The magnitude of the variation will be largely dependent upon the amount of spring snowmelt, duration and intensity of precipitation, irrigation practices, site grading changes, and the surface and subsurface drainage characteristics of the surrounding area. Perched water tables may be present but were not encountered in the borings.

6.0 DESIGN CONSIDERATIONS

The project site is underlain by expansive clays that are not considered to be suitable for direct foundation and floor slab support. Structures and related improvements situated within the clay will experience large movements with variations in the soil water content. However, the proposed structures can be supported by spread footings with slab-on-grade floors provided that a portion of the expansive clay is removed and replaced with non-expansive fill. Recommendations for treatment of the foundation/floor subgrade in order to reduce movement associated with volume changes in the expansive clay are presented herein.

The performance of a shallow foundation system will be highly dependent upon proper drainage during and following construction. Ponding water, waterline leaks, and other sources of water near the foundation can result in an increase in the predicted movements. Conversely, the water content in the foundation soil must be maintained during dry weather to prevent excessive drying, which can also result in a greater amount of movement than predicted. Even with a properly designed and constructed foundation system, foundation movements can cause distress to the structure, such as cracks in sheetrock, racking of doors and windows, and unlevel floors.

7.0 RECOMMENDATIONS

7.1 Foundations

The proposed apartment buildings can be supported by spread footings. However, the existing fill is not recommended for foundation support and should be removed from the proposed building areas. In addition, the native site soils are expansive and are not recommended for direct foundation support. The foundations should therefore be underlain by a minimum of 24 inches of imported non-expansive fill overlying 8 inches of scarified, moisture conditioned and recompacted native soil to reduce the amount of potential foundation movement. Foundation subgrade preparation is discussed in greater detail in the Earthwork section of this report.

Foundations bearing on the newly placed engineered fill can be designed for a maximum net allowable bearing pressure of 2,500 pounds per square foot (psf). The allowable bearing pressure applies to dead load plus design live load conditions. The design bearing pressure can be increased by one-third or as allowed by local code, when considering transient loads, such as wind or seismic.

Resistance to lateral loads will be provided by the passive earth pressure acting against the footings and the frictional resistance acting along the base of the footings. An ultimate passive earth pressure resistance of 300 pounds per square foot per foot (psf/ft) is recommended for design. A coefficient of sliding resistance of 0.35 is recommended for design. The lateral load resistance should incorporate a factor of safety of at least 1.5.

The foundations should be founded a minimum of 32 inches below the final site grade for frost considerations. Strip footings should have a minimum width of 16 inches and isolated column pad foundations should have a minimum dimension of 24 inches.

We estimate that the total post-construction movement of foundations supported as recommended herein will be on the order of 1 inch or less. We estimate that the differential movement between comparably sized and loaded foundations could equal the total foundation movement. It is recommended that the strip foundations be designed as rigid grade beams to reduce the potential for distress due to abrupt differential movement. Additional foundation movement can occur if water from any source infiltrates the foundation subgrade. Therefore, proper drainage should be provided in the final design and during construction.

Foundation excavations should be observed by the project geotechnical engineer, or a representative of the engineer, to document that the foundation bearing stratum is similar to the conditions encountered in the borings. If the subsurface conditions encountered differ from those presented herein, supplemental recommendations may be required.

7.2 Floor Slab

Slab-on-grade floors can be used for the proposed buildings. However, the existing fill is not recommended for floor slab support and should be removed from the proposed building areas. In addition, the floor slabs should be underlain by a minimum of 24 inches of non-expansive fill to reduce the potential for floor slab movement due to shrink/swell of the expansive clays. The floor slab subgrade should be prepared in accordance with the recommendations presented in the **Earthwork Recommendations** section of this report.

Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns, or utility lines to allow independent movement.
- Control joints should be provided in slabs to control the location and extent of cracking.
- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications outlined herein.
- If moisture-sensitive floor coverings are used on interior slabs, barriers to reduce the potential for vapor rise through the slab are recommended.
- Floor slabs should not be constructed on frozen subgrade.
- Other design and construction considerations, as outlined in Section 302.1 R of the "ACI Design Manual", are recommended.

7.3 Seismic Considerations

Seismic structural design criteria are provided below:

- Design Code Reference ASCE7-16
- Site Soil Classification: Site Class D*
- GPS Coordinates: 37.225609 -107.859785

$S_s = 0.21$ g $S_{MS} = 0.336$ g $S_{DS} = 0.224$ g
$S_1 = 0.065$ g $S_{M1} = 0.157$ g $S_{D1} = 0.104$ g

* The site class was based on the conditions encountered in our shallow exploratory soil borings and our knowledge of the soil conditions in the site vicinity. The soil characteristics extending beyond the depth of our borings were assumed for the purposes of providing this site classification.

7.4 Drainage Considerations

Properly functioning foundations and floor slabs require appropriately constructed and maintained site drainage conditions. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the structures. It is also important that proper planning and control of landscape and irrigation be performed.

The buildings should be provided with downspouts extensions to direct water away from the structures. The downspouts should discharge into drainage swales or into the storm sewer system.

Infiltration of water into utility or foundation excavations must be prevented during construction. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the potential for moisture infiltration. If utility line trenches are backfilled with the clay, care should be taken not to overcompact the backfill. However, if the trenches are backfilled with granular soil then a clay plug should be placed in the trench adjacent to the buildings to reduce the potential for water following the trench back under the structures.

In areas where sidewalks, patios, or driveways do not immediately adjoin the structures, the ground surface adjacent to the structures should slope down at a grade of about five percent for a distance of at least 10 feet from the perimeter walls. Planters or other surface features that could retain water adjacent to the structures should be avoided. If planters and/or landscaping are adjacent to or near the structures, we recommend the following:

- Grades should slope away from the structures.
- Planters should slope away from the structures and should not pond water. Drains should be installed in enclosed planters to facilitate flow out of the planters.
- Watering should be kept to a minimum. Irrigation systems should be situated on the far side of any planting and away from the buildings to reduce the potential for infiltration beneath the structure from possible leaks.
- A minimum horizontal distance of 36 inches should be maintained between the building foundations and shallow-rooted plants. In a like manner, for deeper-rooted plants a minimum of 72 inches should be maintained between the building foundations and the plants. These deeper-rooted plants should also have a low water requirement.
- Trees should be planted no closer than a distance equal to one-half their mature height or fifteen feet, whichever is greater, from the buildings.

These recommendations will help reduce the potential for soil movement and the resulting distress but will not eliminate this potential.

7.5 Pavement

The project will include the construction of parking lots and access drives. Design traffic volumes were not provided for our analysis. It was assumed that the parking lots would be subject to automobile and light truck traffic, with occasional moderately loaded delivery/moving vehicle traffic. A pavement design life of 20 years was assumed for the analysis.

A revision of the recommended pavement sections may be necessary if the design traffic loading conditions are different than assumed. An evaluation of the type and volume of traffic that each portion of the parking lot will experience should be conducted to determine if the pavement sections presented herein are appropriate.

Table 1: Recommended Pavement Sections

Traffic Area	Asphalt Pavement	Aggregate Base Couse
Parking Stalls	3 inches	6 inches
Access Drives	4 inches	8 inches

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

A rigid pavement section is recommended in loading and unloading areas and at dumpster locations due to the high static loads imposed by parking trucks in these areas. A minimum six-inch thick Portland cement concrete pavement bearing on compacted subgrade is recommended.

Bituminous pavement should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course, Portland cement, and asphalt concrete should conform to the City of Durango standard specifications. Material and compaction requirements should conform to recommendations presented in the **Earthwork Recommendations** section of this report.

The site soils are expansive and differential heave may occur. The pavement service life may be reduced due to water infiltration into the subgrade soils and heave induced cracks in the pavement. This will result in a softening and loss of strength of the subgrade soils. A regular maintenance program to seal pavement cracks will help prolong the life of the pavement.

Pavement design methods are intended to provide an adequate thickness of structural materials over a particular subgrade such that wheel loads are reduced to a level the subgrade can support. The support characteristics of the subgrade for pavement design do not account for shrink and swell movements of an expansive clay subgrade, such as the soils encountered on this project. Consequently, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swellmovement of the subgrade. It is therefore important to minimize moisture changes in the subgrade to reduce shrink/swell movements. The pavement surface, subbase surface, and adjacent areas should be well drained. Excessive watering of landscaped areas adjacent to pavements should be avoided. Proper maintenance should be performed on cracks in the pavement surface to prevent water from penetrating into the base, subbase, or subgrade material. Even with these precautions, some movement and related cracking may still occur, requiring periodic maintenance.

8.0 EARTHWORK RECOMMENDATIONS

Site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations, and other local, state, or federal guidelines. Earthwork on the project should be observed and evaluated by Yeh and Associates (Yeh). The evaluation of earthwork should include observation and testing of engineered fills, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

8.1 Site Grubbing and Stripping

The existing building should be demolished and any remnants of previous construction, topsoil, existing vegetation, tree root balls, and other deleterious materials should be removed from the proposed building and pavement areas. Existing fill should be removed from the proposed building areas. However, the existing fill can remain in the proposed pavement areas provided it does not contain any deleterious materials and the subgrade is prepared as discussed in Section 8.3. All exposed surfaces should be free of mounds and depressions, which could prevent uniform compaction.

8.2 Building Pad Preparation

Existing fill should be removed from the proposed building areas. The overexcavations should extend a lateral distance of at least five feet beyond the building footprint, or at least one foot beyond the building footprint for every foot of overexcavation depth, whichever is greater. The building areas should also be overexcavated, as required, to a minimum depth of 24 inches below the planned bottom of slab or to the top of the native cobble and boulder layer, whichever is shallower.

The foundation areas should be overexcavated to a minimum depth of 24 inches below the design foundation bearing grade or to the top of the cobble and boulder layer, whichever is shallower. The foundation overexcavations should extend a lateral distance of at least 1 foot beyond the outside edges of the foundations for every foot of fill that will be placed beneath the foundations.

The base of foundation/floor slab overexcavations should then be scarified to a minimum depth of 8 inches, moisture conditioned to a water content between 0 and 4 percentage points above the optimum water content, and recompacted to between 93 and 97 percent of the standard Proctor maximum dry density (ASTM D 698). The site can then be raised to the design finish grade with imported non-expansive fill that meets the requirements presented in Section 8.5.

The perimeter foundation excavations on the exterior side of the buildings should be backfilled with on-site clay to reduce the potential for surface water ponding in the non-expansive fill underlying the foundations. This clay backfill should extend from the base of the foundation to the planned finish grade. The ground surface should be sloped away from the building to promote drainage away from the structure.

8.3 Pavement Subgrade Preparation

The existing fill can remain in place beneath the pavement provided it is stable during proof rolling and does not contain any deleterious material. The pavement subgrade should be proof rolled under the observation of the project geotechnical engineer, or a representative of the engineer, to verify stability immediately prior to placing the aggregate base course. Proof rolling should be accomplished with a fully loaded water truck or similar heavy rubber-tired equipment weighing a minimum of 10 tons and should include multiple equipment passes in two directions. Any soft, loose, or otherwise unsuitable material detected during proof rolling operations should be removed and replaced with engineered fill or otherwise stabilized. The subgrade can then be raised to the design finish grade with engineered fill.

It should be noted that information regarding the properties of the existing fill and its placement and compaction were not available. Zones of unsuitable fill not encountered by the test borings may be encountered. Any unsuitable fill deposits that are encountered during site grading activities will require removal and replacement with engineered fill in order to develop a suitable subgrade for pavement support.

8.4 Fill Material

The site soil is expansive and not recommended for reuse as fill in the planned building area. However, the existing site soil can be used as fill in the proposed pavement areas provided it does not contain any deleterious material and provided any material greater than 6 inches in diameter is removed. Imported fill should meet the criteria of CDOT Class 1 Structure Backfill. Samples of any imported material proposed for use on the project should be submitted to our office for approval and testing at least three days prior to stockpiling at the site.

8.5 Compaction Requirements

Fill should be placed in horizontal lift thicknesses that are suitable for the compaction equipment being used but in no case should exceed 8 inches by loose measure. Scarified and recompacted subgrades in the building areas should be moisture conditioned to a water content between 0 and 4 percentage points above the optimum water content, and recompacted to between 93 and 97 percent of the standard Proctor maximum dry density. Imported non-expansive fill in the building areas and fill in the pavement areas should be compacted to at least 95 percent of the standard Proctor (ASTM D698) maximum dry density at a water content within 3 percentage points of the optimum water content.

We recommend that a qualified representative of Yeh and Associates visit the site during excavation and during placement of the structural fill to verify the soils exposed in the excavations are consistent with those encountered during our subsurface exploration and that proper foundation subgrade preparation and placement is performed.

9.0 LIMITATIONS

The recommendations in this report are based on our field observations, laboratory testing, and our present understanding of the proposed construction. It is possible that subsurface conditions can vary beyond the limits explored. If the conditions found during construction differ from those described in this report, please notify us immediately so that we can review our report considering those conditions and provide supplemental recommendations as necessary. We should also review this report if the scope of the proposed construction, including the proposed loads or structure locations, changes from that described in this report.

The scope of services for this project did not include, specifically or by implication, any environmental or biological (e.g. mold, fungi, and bacteria) assessment of the site or identification or prevention of pollutants, or conditions or biological conditions. If the owner is concerned about the potential for such contamination, conditions or pollution, other studies should be undertaken and a professional in that field should be consulted.

Yeh and Associates has prepared this report for the exclusive use of Four Points Funding, LLC. This report was prepared in substantial accordance with the generally accepted standards of practice for geotechnical engineering as they exist in the site area at the time of our investigation. No warranty is expressed or implied. The recommendations in this report are based on the assumption that Yeh and Associates will conduct an adequate program of construction testing and observation to evaluate compliance with our recommendations.

APPENDIX A

NOT TO SCALE

REFERENCE: ADAPTED FROM SITE PLAN PROVIDED BY CLIENT

BORING LOCATION DIAGRAM

PROPOSED ESCALANTE DRIVE APARTMENTS

Job No.: 221-568	Plate: A-1

APPENDIX B

Yeh and Associates, Inc.
Geotechnical • Geological • Construction Services

Project: Proposed Escalante Drive Apartments

Project Number: 221-568

Legend for Symbols Used on Borehole Logs

Sample Types

- Bulk Sample of auger/odex cuttings
- Modified California Sampler (2.5 inch OD, 2.0 inch ID)
- Standard Penetration Test (ASTM D1586)

Drilling Methods

- HOLLOW-STEM AUGER (8" OD)

Lithology Symbols

(see Boring Logs for complete descriptions)

- Boulders and cobbles
- Cobbles and gravel
- Fat Clay (CH)
- Fill
- Lean Clay (CL)
- Sandy Lean Clay (CL)

Lab Test Standards

Moisture Content	ASTM D2216
Dry Density	ASTM D7263
Sand/Fines Content	ASTM D421, ASTM C136, ASTM D1140
Atterberg Limits	ASTM D4318
AASHTO Class.	AASHTO M145, ASTM D3282
USCS Class.	ASTM D2487

(Fines = % Passing #200 Sieve
Sand = % Passing #4 Sieve, but not passing #200 Sieve)

Other Lab Test Abbreviations

pH	Soil pH (AASHTO T289-91)
S	Water-Soluble Sulfate Content (AASHTO T290-91, ASTM D4327)
Chl	Water-Soluble Chloride Content (AASHTO T291-91, ASTM D4327)
S/C	Swell/Collapse (ASTM D4546)
UCCS	Unconfined Compressive Strength (Soil - ASTM D2166, Rock - ASTM D7012)
R-Value	Resistance R-Value (ASTM D2844)
DS (C)	Direct Shear cohesion (ASTM D3080)
DS (phi)	Direct Shear friction angle (ASTM D3080)
Re	Electrical Resistivity (AASHTO T288-91)
PtL	Point Load Strength Index (ASTM D5731)

Notes

1. Visual classifications are in general accordance with ASTM D2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)".
2. "Penetration Resistance" on the Boring Logs refers to the uncorrected N value for SPT samples only, as per ASTM D1586. For samples obtained with a Modified California (MC) sampler, drive depth is 12 inches, and "Penetration Resistance" refers to the sum of all blows. Where blow counts were > 50 for the 3rd increment (SPT) or 2nd increment (MC), "Penetration Resistance" combines the last and 2nd-to-last blows and lengths; for other increments with > 50 blows, the blows for the last increment are reported.
3. The Modified California sampler used to obtain samples is a 2.5-inch OD, 2.0-inch ID (1.95-inch ID with liners), split-barrel sampler with internal liners, as per ASTM D3550. Sampler is driven with a 140-pound hammer, dropped 30 inches per blow.
4. "ER" for the hammer is the Reported Calibrated Energy Transfer Ratio for that specific hammer, as provided by the drilling company.

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-1**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 15.0 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical

Night Work: ☐

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifications	Field Notes and Other Lab Tests
							0.0 - 2.0 ft. (FILL) LEAN CLAY; with sand, gravel, cobbles, and woodchips, dark brown, moist.							
				3-5	8		**2.0 - 14.5 ft. LEAN CLAY; brown, medium stiff to stiff, moist**.	29.8	95.0	90.2	44	27		**2.5 ft** - 1.1% swell @ 100 psf
	5			6-10	16			27.4		88.8				
				4-6-8	14									
							changing to very stiff.							
	10			6-10-11	21									
	15						**14.5 - 15.0 ft. COBBLES AND BOULDERS; with clayey sand matrix, dense, moist**.							

Bottom of Hole at 15.0 ft.

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 Boring No.: **B-2**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 21.5 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical

Night Work: ☐

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifi-cations	Field Notes and Other Lab Tests
	0						**0.0 - 2.0 ft. (FILL) LEAN CLAY; with sand and gravel, brown, moist.**							
	2			4-7	11		**2.0 - 18.3 ft. LEAN CLAY; brown, stiff to very stiff, moist.**	26.6		87				
	5			6-6	12			20.4	106.0	71.8	41	25		**5.5 ft** - 0.6% swell @ 500 psf
	7.5			4-6-8	14			22.6		90.5				
	10			5-5-7	12									
	15			6-8-10	18									
	18.3						**18.3 - 21.5 ft. SANDY LEAN CLAY; with gravel, brown, very stiff, moist.**							
	20			9-12-10	22									

Bottom of Hole at 21.5 ft.

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Total Depth: 21.5 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Logged By: J. Carlson
Final By: R. Southworth

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifications	Field Notes and Other Lab Tests
	0.0			**0.0 - 0.5 ft. (FILL) LEAN CLAY; with sand, gravel, and cobbles, brown, moist.**							
	0.5			**0.5 - 4.0 ft. SANDY LEAN CLAY; brown, very stiff, moist.**							
		8-12	20		12.0		68.4				
	4.0			**4.0 - 20.0 ft. LEAN CLAY; with sand, brown, very stiff, moist.**							
	5	10-14	24		12.9		85.6				
		8-9-9	18		7.3		84.07				
	10	10-12-14	26		15.8		81.7				
	15	10-8-7	15		11.8		61.7				
	20			**20.0 - 21.5 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.**							
		8-17-13	30								

Bottom of Hole at 21.5 ft.

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-4**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Total Depth: 17.5 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Logged By: J. Carlson
Final By: R. Southworth

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifi-cations	Field Notes and Other Lab Tests
							0.0 - 2.0 ft. (FILL) CLAYEY SAND AND GRAVEL; with cobbles, brown, moist.							
				9-7	16		**2.0 - 6.5 ft. LEAN CLAY; with sand, brown, stiff, moist.**							
	5			4-5	9			17.5		78.4				
							6.5 - 15.5 ft. LEAN CLAY; with sand, brown, very stiff, moist.							
				5-7-11	18			16.1		88.6				
	10			6-9-12	21			19.6		79.1				
	15			6-11-14	25		**15.5 - 17.5 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.**							

Bottom of Hole at 17.5 ft.

02 BORING LOG 2021 - SPT NON-CDOT STYLE 221-568 ESCALANTE DRIVE APARTMENTS GINT.GPJ 2021 YEH COLORADO TEMPLATE.GDT 2021 YEH COLORADO LIBRARY.GLB 3/24/22

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-5**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 12.5 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifications	Field Notes and Other Lab Tests
							0.0 - 0.5 ft. (FILL) LEAN CLAY; with gravel, brown, moist.							
							0.5 - 11.5 ft. SANDY LEAN CLAY to LEAN CLAY with sand; brown, stiff, moist.	15.1		68.1	42	25		
				5-8	13									
	5			4-10	14			23.0		90.2				
				4-6-4	10			16.1		61.9				
	10			4-5-4	9									
							11.5 - 12.5 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.							

Bottom of Hole at 12.5 ft.

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-6**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)
Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 14.0 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram
Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Groundwater Levels: Not Observed			
Symbol / Depth / Date	Dry / -	- / -	- / -

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifications	Field Notes and Other Lab Tests
							0.0 - 2.0 ft. (FILL) LEAN CLAY; with sand, gravel, and cobbles, brown, moist.	15.2						
				4-7	11		**2.0 - 4.0 ft. FAT CLAY; brown, stiff, moist.**	17.5	106.0	92.4	59	41		**2.5 ft** - 1.6% swell @ 100 psf
	5			8-17	25		**4.0 - 6.5 ft. SANDY LEAN CLAY; brown, very stiff, moist.**	15.2		64.4				
				9-5-4	9		**6.5 - 9.3 ft. LEAN CLAY; with sand, brown, stiff, moist.**	20.3		80.5				
	10			5-5-5	10		**9.3 - 13.0 ft. SANDY LEAN CLAY to CLAYEY SAND; brown, stiff, moist.**	15.9		52				
							13.0 - 14.0 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.							

Bottom of Hole at 14.0 ft.

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-7**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)
Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 12.5 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram
Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifi-cations	Field Notes and Other Lab Tests
	0						**0.0 - 2.0 ft. (FILL) LEAN CLAY; with sand, gravel, and cobbles, brown, moist.**							
				4-8	12		**2.0 - 6.5 ft. LEAN CLAY; brown, stiff, moist.**	26.3		90.1				
	5			4-7	11			23.4						
							6.5 - 10.5 ft. SANDY LEAN CLAY; brown, very stiff, moist.							
				6-8-10	18			20.3		73.3				
	10							12.5						
				9-9-11	20		**10.5 - 12.5 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.**			31.8				

Bottom of Hole at 12.5 ft.

Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-8**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Total Depth: 12.0 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Logged By: J. Carlson
Final By: R. Southworth

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifi-cations	Field Notes and Other Lab Tests
							0.0 - 1.5 ft. (FILL) SANDY LEAN CLAY; with gravel and cobbles, brown, moist.							
							1.5 - 11.0 ft. LEAN CLAY; brown, medium stiff to stiff, moist.							
				3-5	8			25.0		94.1				
	5			5-6	11			24.9		93.8				
				4-6-8	14									
	10													
							11.0 - 12.0 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.	9.8		18.5				

Bottom of Hole at 12.0 ft.

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Project Name: Proposed Escalante Drive Apartments

Project Number: 221-568 *Boring No.:* **B-9**

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 14.0 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical
Night Work: ☐

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifi-cations	Field Notes and Other Lab Tests
							0.0 - 2.0 ft. (FILL) SANDY LEAN CLAY; with gravel and cobbles, brown, moist.							
				3-4	7		**2.0 - 13.5 ft. LEAN CLAY; with sand, medium stiff, moist**.	26.7		89				
							changing to stiff to very stiff.							
	5			5-7	12			22.4		89				
							decreased sand content.							
	10			5-7-10	17			18.4		97.3				
							13.5 - 14.0 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.							

Bottom of Hole at 14.0 ft.

Boring Began: 2/11/2022
Boring Completed: 2/11/2022
Drilling Method(s): Hollow-Stem Auger (8" OD)

Driller: Geomat
Drill Rig: CME 45
Hammer: Automatic (hydraulic), ER: %

Total Depth: 9.0 ft
Ground Elevation:
Coordinates:
Location: See Boring Location Diagram

Logged By: J. Carlson
Final By: R. Southworth

Weather Notes: Clear, 40s
Inclination from Horiz.: Vertical

Night Work: ☐

Groundwater Levels: Not Observed			
Symbol			
Depth	Dry	-	-
Date	-	-	-

Elevation (feet)	Depth (feet)	Sample Type/Depth	Drilling Method	Soil Samples: Blows per 6 in	Soil Samples: Penetration Resistance	Lithology	Material Description	Moisture Content (%)	Dry Density (pcf)	Fines Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	AASHTO & USCS Classifications	Field Notes and Other Lab Tests
							0.0 - 1.0 ft. (FILL) SANDY LEAN CLAY; with gravel and cobbles, brown, moist.							
							1.0 - 8.0 ft. FAT CLAY; with sand, brown, stiff, moist.							
				5-7	12			22.7	102.0	89	50	34		**2.5 ft** - 1.8% swell @ 100 psf
	5			5-8	13			21.9		89.7				
				6-10-18	28									
							8.0 - 9.0 ft. COBBLES AND BOULDERS; with clayey sand and gravel matrix, brown, dense, moist.							

Bottom of Hole at 9.0 ft.