ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
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February 15, 2022

Scott McDermott
12930 Herring Road
Colorado Springs, CO 80908

Re: Soil, Geology, and Geologic Hazard Study
McDermott Subdivision, Filing 1
12930 Herring Road
Parcel No. 52080-00-030
El Paso County, Colorado

Dear Mr. McDermott:

GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in a portion of the NE¼ of the SE ¼ of Section 8, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 2.5 miles northeast of Colorado Springs city limits, northwest of Shoup Road and Herring Road in El Paso County, Colorado. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gradually-moderately sloping to the south-southwest and northwest with moderate slopes trending away from the crest of the ridge that bisects the central site. Two minor drainage swales are located in the south-central portion of the property and southeast portion. Water was not observed in the drainages at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included undeveloped and a rural residential development. The site is located within the Black Forest burn scar. The site contains primarily field grasses and weeds with areas of burned ponderosa pines in the western portion of the site. Site photographs, taken December 23, 2021, are included in Appendix A.

Total acreage involved in the proposed subdivision is 29.32-acres. Three rural residential lots are proposed as part of the replat. The proposed lot sizes range from approximately 5-acres to 20-acres. The existing house located on Lot 1 will remain. The new lots will be serviced by individual wells and on-site wastewater treatment systems. The Site Plan with the proposed replat is presented in Figure 3.

LAND USE AND ENGINEERING GEOLOGY

This site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose some minor constraints on development and land use. These include areas of potentially expansive soils, potentially seasonal shallow groundwater. Based on the proposed development plan, it appears that these areas will have minimal impacts on the development. These conditions will be discussed in greater detail in the report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site are either avoided or properly mitigated. All recommendations are subject to the limitations discussed in the report.

SCOPE OF THE REPORT

The scope of the report will include the following:

- A general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property.

FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements, and aerial photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Geology/Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on December 23, 2021.

Two test borings were drilled by Entech on the site to determine general suitability for the use of on-site wastewater treatment systems and general soil characteristics. The location of the test pits and drill borings is indicated on the Site Plan/Testing Location Map, Figure 3. The Test Boring Log is presented in Appendix B and the Profile Pit Report by Geoquest, LLC is presented in (Appendix C, Reference 1). Results of this testing will be discussed later in this report.

Laboratory testing was also performed on some of the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis, ASTM D-422, and Atterberg Limits, ASTM D-4318. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

SOIL AND GEOLOGIC CONDITIONS

Soil Survey

The Natural Resource Conservation Service (NRCS) (Reference 1, Figure 4), previously the Soil Conservation Service (Reference 2) has mapped three soil types on the site. Complete descriptions of the soil types are presented in Appendix D. In general, the soils consist of sandy loam and sandy clay loam to sandy clay bedrock. The soils are described as follows:

Type	Description
26	Elbeth Sandy Loam, 8 – 15% Slopes
40	Kettle Gravelly Loamy Sand, 3 – 8% Slopes
41	Kettle Gravelly Loamy Sand, 8-40% Slopes

The soils have been described to have moderate to rapid to moderate permeabilities. The soils are described as well suited for use as homesites. Possible hazards with soils erosion are present on the site. The erosion potential can be controlled with vegetation. The soils have been described to have moderate erosion hazards (Reference 2).

Soils

The soils encountered in the test borings and test pits consisted of silty sand to sandy clay overlying clayey sandstone to sandy claystone. Bedrock was encountered at depths ranging from 2 to 4 feet. The upper sands were encountered at dense and firm states and moderate moisture conditions, and the sandstone was encountered at very dense states and moderate moisture conditions. The claystone was encountered at hard consistencies and moderate moisture conditions. The samples of sand tested had approximately 13 to 37 percent of the soil size particles passing the No. 200 sieve. FHA Swell Testing on a sample of the clayey sand resulted in an expansion pressure of 480 psf, which indicates a low expansion potential. The samples of sandstone tested had 17 percent of the soil size particles passing the No. 200 sieve. The samples of claystone tested had 73 percent of the soil size particles passing the No. 200 sieve. A Swell/Consolidation Test indicated a volume change of 0.1% which is in the low consolidation range for a sample of sandy clay from Test Boring No. 2 at a depth of 2 to 3 feet. Highly expansive claystone lenses are commonly interbedded in the Dawson Formation.

Groundwater

Groundwater or signs of seasonally occurring water were encountered in Profile Pit No. 1 at 24 inches below grade, which was excavated to 8 feet. It is anticipated groundwater will not affect shallow foundations on the majority of the site. Areas of potentially seasonal shallow and seasonal shallow groundwater have been mapped in drainages on the site that are discussed in the following sections. Fluctuations in groundwater conditions may occur due to variations in rainfall or other factors not readily apparent at this time. Isolated sand layers within the soil profile can carry water in the subsurface. Contractors should be cognizant of the potential for the occurrence of subsurface water features during construction.

Geology

Approximately 12 miles west of the site is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within a large structural feature known as the Denver Basin. Bedrock in the area is typically gently dipping in a northerly direction (Reference 3). The bedrock underlying the site consists of the Dawson Formation of Cretaceous Age. The Dawson Formation typically consists of coarse-grained arkosic sandstone with interbedded layers claystone or siltstone.

The geology of the site was evaluated using the *Geologic Map of the Black Forest,* by Thorson in 2003, (Reference 4, Figure 5). The Geology Map for the site is presented in Figure 6. One mappable unit was identified on this site which is described as follows:

Qc/Tkd **Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age:** The materials consist of colluvial or residual soils overlying the bedrock materials on-site. The colluvial soils were deposited by the action of sheetwash and gravity. The residual soils were derived from the in-situ weathering of the bedrock on site. These materials typically consist of silty to clayey sand with potential areas of sandy clays. The bedrock consists of the Dawson Formation. The Dawson Formation typically consists of coarse-grained, arkosic sandstone with interbedded lenses of fine-grained sandstone, siltstone and claystone.

Some fill deposits may be encountered around the existing residence on Lot No. 1. Ash burned logs were encountered throughout the site overlying the above-mentioned colluvium soils.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Black Forest Quadrangle* distributed by the Colorado Geologic Survey in 2003 (Reference 4, Figure 5), The *Geologic Map of the Colorado Springs-Castle Rock Area,* distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Pueblo 1° x 2° Quadrangle,* distributed by the US Geological Survey in 1978 (Reference 6). The test borings and test pits were used in evaluating the site and is included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

ENGINEERING GEOLOGIC HAZARDS

Mapping has been performed on this site to identify areas where various geologic conditions exist of which developers should be cognizant during the planning, design and construction stages where new construction is proposed. The engineering geologic hazards identified on this site include potentially expansive soils and potentially seasonal shallow groundwater areas. These hazards and recommended mitigation techniques are discussed as follows:

Expansive Soils - Constraint

Expansive soils were encountered in Test Boring No. 2 located on the north west lot. These occurrences are typically sporadic; therefore, none have been indicated on the maps. Highly expansive claystone and siltstone are commonly interbedded in the sandstone of the Dawson Formation. These clays, if encountered beneath foundations, can cause differential movement in the structure foundation.

Mitigation: Should expansive soils be encountered beneath the foundation; mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements.

Potentially Seasonal Shallow Groundwater Areas - Constraint

The site is not mapped within any floodplains according to the FEMA Map No. 08041CO320G, dated December 7, 2018 (Figure 7, Reference 7). Areas of potentially seasonal shallow groundwater were observed on the site (Figure 6). In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. These areas lie within low-lying areas and along the drainages in the south-central and south east portions of the site. The potentially seasonal shallow groundwater areas are located in the south-central portion and southeast corner of the site. Water was not observed in any of the drainages at the time of our site investigation. These areas can likely be avoided or properly mitigated by development. The potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas the following precautions should be followed.

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains are recommended to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 8. Any grading in these areas should be done to direct surface flow around construction to avoid areas of ponded water. All organic material would be completely removed prior to any fill placement. **Specific drainage studies are beyond the scope of this report.**

RELEVANCE OF GEOLOGIC CONDITIONS TO LAND USE PLANNING

The proposed development will be rural-residential utilizing individual on-site wastewater treatment systems and water wells. Total acreage involved in the proposed subdivision is 29.32-acres. Three rural residential lots are proposed. The proposed lot sizes range from approximately 5-acres to 20-acres. The existing house located on Lot 1 will remain. The house on Lot 1 has an existing water well and on-site wastewater treatment system. The new lots will be serviced by an individual wells and on-site wastewater treatment systems. The existing geologic and engineering geologic conditions will impose minimal constraints on development and construction. The geologic conditions on the site include potentially seasonal shallow and shallow groundwater areas, which can be satisfactorily mitigated through avoidance or proper engineering design and construction practices.

The upper granular soils encountered in the test borings and test pits on the site were encountered at dense states, the sandstone was encountered at very dense states, and the claystone at hard consistencies. Highly expansive claystone and siltstone are commonly interbedded in the sandstone of the Dawson Formation. Mitigation of expansive soils if encountered will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. These soils will not prohibit development.

Areas of potentially seasonal shallow groundwater were observed on the site (Figure 6). In these areas, we would anticipate the potential for periodically high subsurface moisture

conditions and frost heave potential. These areas lie within low-lying areas and along the minor drainages in the southeastern and southern portions of the site. These areas can likely be avoided or properly mitigated by development. The potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas. Subsurface perimeter drains are recommended should structures encroach on this area. Typical drain details are presented in Figure 8. Septic systems are not recommended in in these areas due to the potential for shallow groundwater. Any grading in theses areas should be done to direct surface flow around construction to avoid areas of ponded water. All organic material should be completely removed prior to any fill placement. Specific drainage studies are beyond the scope of this report. The site is not mapped within any floodplains according to the FEMA Map No. 80841C0320G (Figure 7, Reference 7).

In summary, the granular soils will likely provide suitable support for shallow foundations. The geologic conditions encountered on site can be mitigated with avoidance or proper engineering and construction practices.

ROADWAY AND EMBANKMENT CONSTRUCTION RECOMENDATIONS

In general, the site soils are suitable for the proposed roadways and embankments. Groundwater maybe encountered in deeper cuts and along drainage areas. If excavations encroach on the groundwater level unstable soil conditions may be encountered. Excavation of saturated soils will be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary.

Any areas to receive fill should have all topsoil, organic material or debris removed. Prior to fill placement Entech should observe the subgrade. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557, prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if shallow groundwater conditions are encountered.

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. These materials should be placed at a moisture content conducive to compaction, usually 0 to ±2% of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction. Entech should approve any import materials prior to placing or hauling them to the site. Additional investigation will be required for pavement designs once roadway grading is completed and utilities are installed.

ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low-grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 8), of the area of the site is not mapped with any potential aggregate resources. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 9), the site is not mapped with any resources.

According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 10), the area of the site has been mapped as "little or no potential" for industrial minerals.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 10), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as "Poor" for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on the site (Reference 10).

The site has been mapped as "Fair" for oil and gas resources (Reference 10). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

EROSION CONTROL

The soil types observed on the site are mildly to highly susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed and vegetation re-established, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap. In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill

slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to revegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose minimal constraints on development and construction of the site. The majority of these conditions can be avoided by construction. Others can be mitigated through proper engineering design and construction practices. The proposed development and use are consistent with anticipated geologic and engineering geologic conditions.

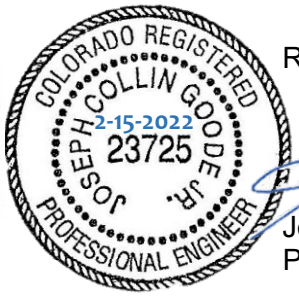
It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Individual investigations for new building sites and septic systems will be required prior to construction. Construction and design personnel should be made familiar with the contents of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems.

This report has been prepared for Scott McDermott, for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust that this report has provided you with all the information that you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

Respectfully Submitted,

ENTECH ENGINEERING, INC.



Reviewed by:

Logan L. Langford, P.G.
Geologist

Joseph C. Goode, Jr., P.E.
President

LLL/jhr

Encl.

Entech Job No. 213346
AAprojects/2021/213346 sg&ghs

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3. United States Department of Agriculture Soil Conservation Service. June 1981. *Soil Survey of El Paso County Area, Colorado.*

4. Scott, Glen R.; Taylor Richard B.; Epis, Rudy C; and Wobus, Reinhard A. 1978. *Geologic Structure Map of the Pueblo 1° x 2° Quadrangle, South-Central Colorado*. Sheet 2. U.S. Geologic Survey. Map I-1022, Sheet 2.

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9. El Paso County Planning Development. December 1995. *El Paso County Aggregate Resource Evaluation Maps.*

10. Schwochow, S.D.; Shroba, R.R. and Wicklein, P.C. 1974. *Atlas of Sand, Gravel, and Quarry Aggregate Resources, Colorado Front Range Counties*. Colorado Geological Survey. Special Publication 5-B.

11. Keller, John W.; TerBest, Harry and Garrison, Rachel E. 2003. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands Administered by the Colorado State Land Board*. Colorado Geological Survey. Open-File Report 03-07.

TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

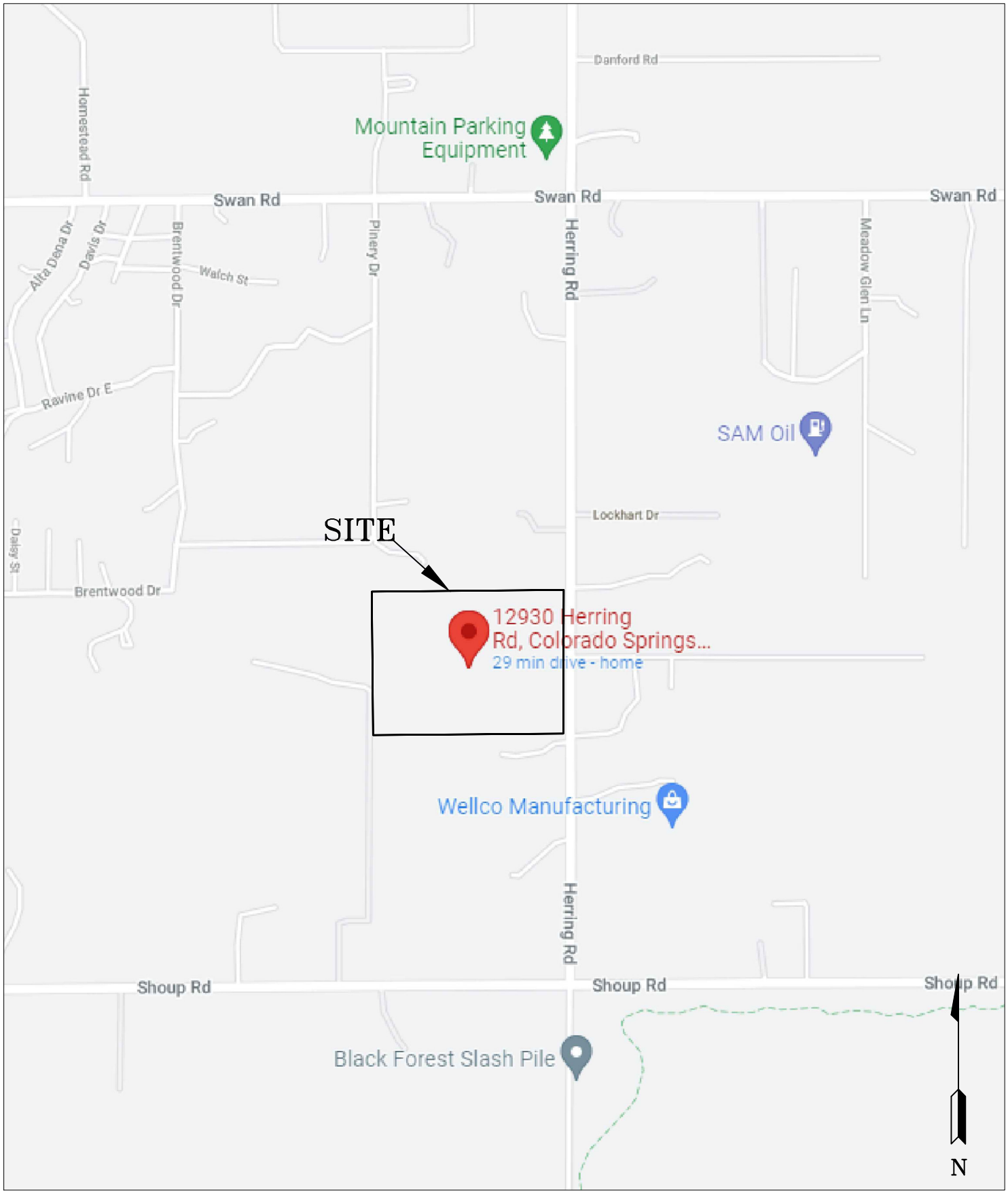
CLIENT SCOTT MCDERMOTT
PROJECT 12930 HERRING ROAD
JOB NO. 213346

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			13.4						SM	SAND, SILTY
2	2	2-3	15.9	114.8	73.0					0.1	CL	CLAY, SANDY
3	1	5			36.6				480		SC	SANDSTONE, CLAYEY
3	2	15			17.3						SM	SANDSTONE, SILTY
4	2	5	14.7	117.9						-0.1	CL	CLAYSTONE, SANDY

Table 2: Summary Test Boring Results

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	4	N/A
2	4	N/A

FIGURES



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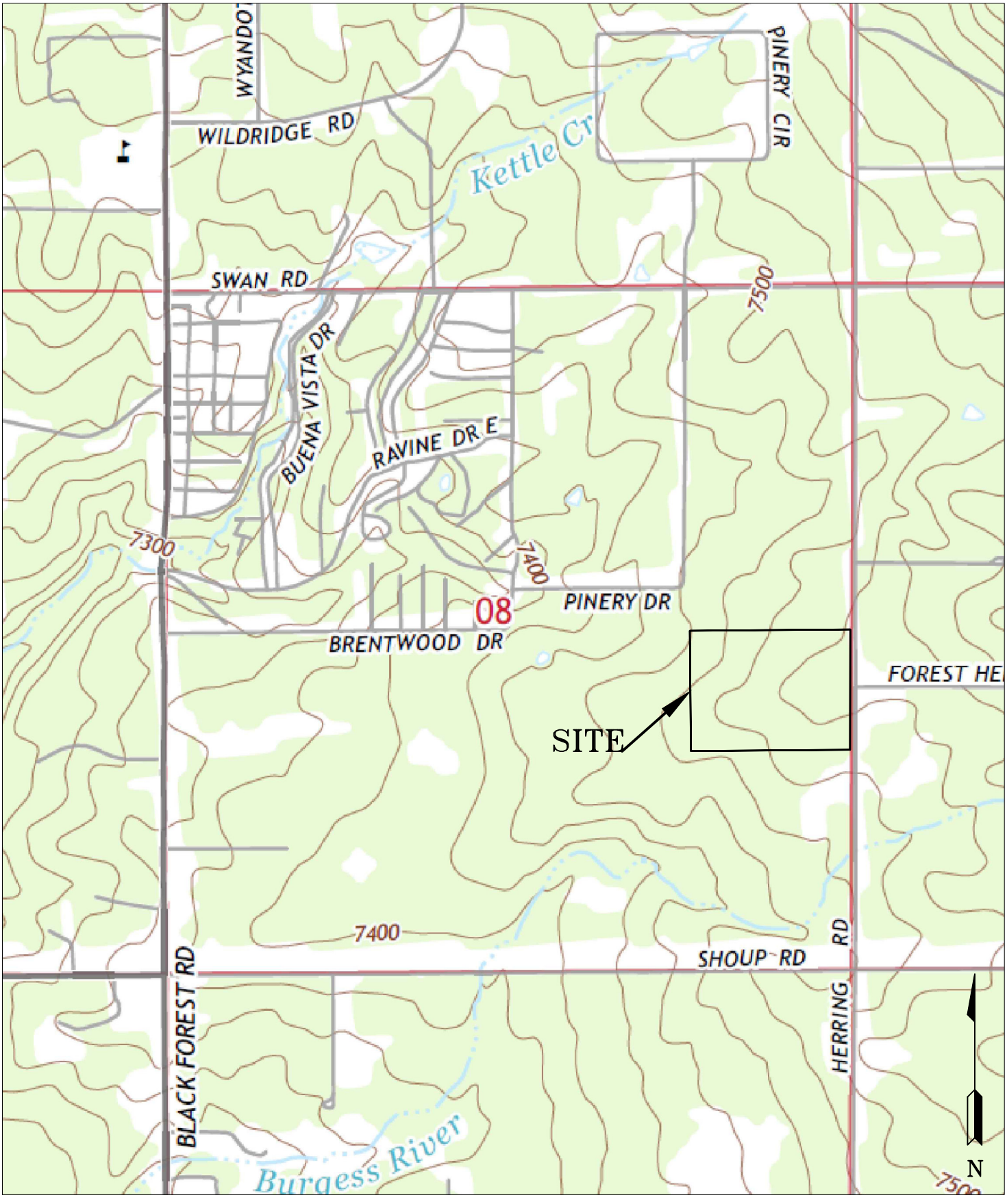
COLORADO SPRINGS, CO. 80907 (719) 531-5599

VICINITY MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

DRAWN:	DATE:	CHECKED:	DATE:
JHR	1/10/22	LLL	

JOB NO.: 213346

FIG NO.: 1



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USGS MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

DRAWN:	DATE:	CHECKED:	DATE:
JHR	1/10/22	LLL	

JOB NO.: 213346

FIG NO.: 2

P1 - approximate photograph location and number

- approximate test boring location and number

- approximate test pit location and number (Geoquest, LLC)

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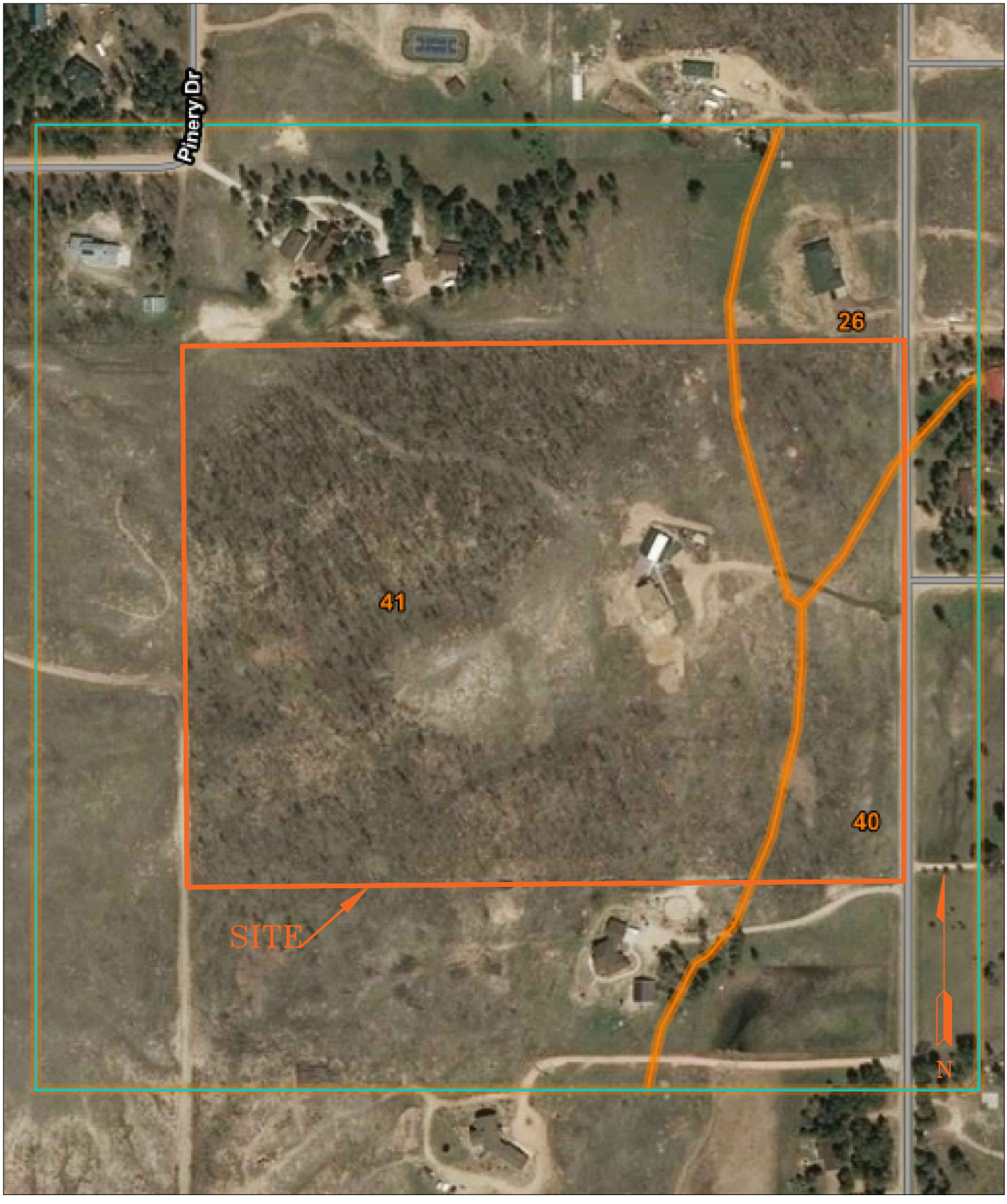
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907
(719) 531-5599

SITE PLAN/TESTING LOCATION MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

DRAWN	JHR
CHECKED	LLL
DATE	1/10/22
SCALE	AS SHOWN
JOB NO.	213346
FIGURE No.	3



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SOIL SURVEY MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

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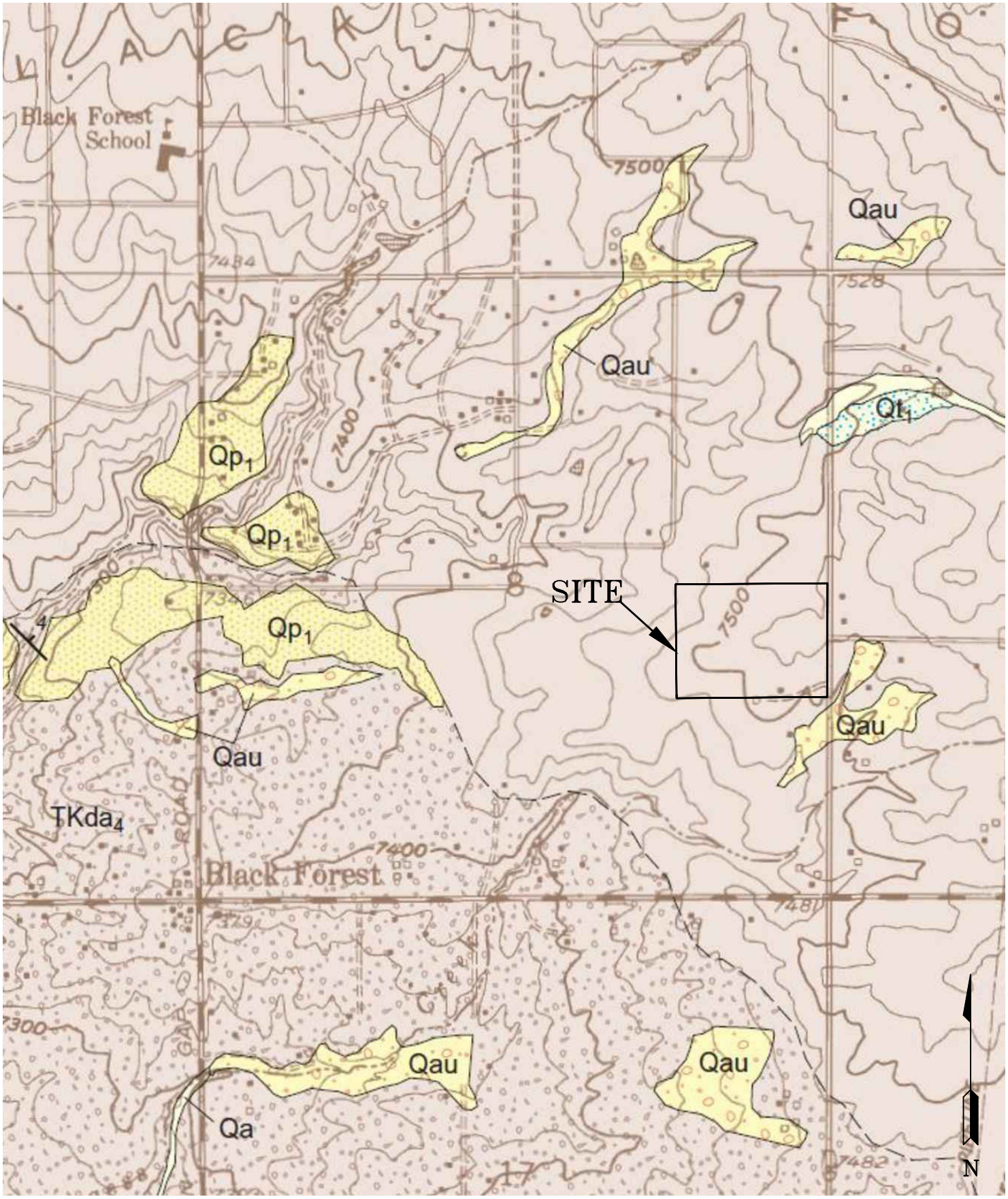
JHR	1/10/22	LLL	

JOB NO.: 213346

FIG NO.: 4



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BLACK FOREST QUADRANGLE GEOLOGIC MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

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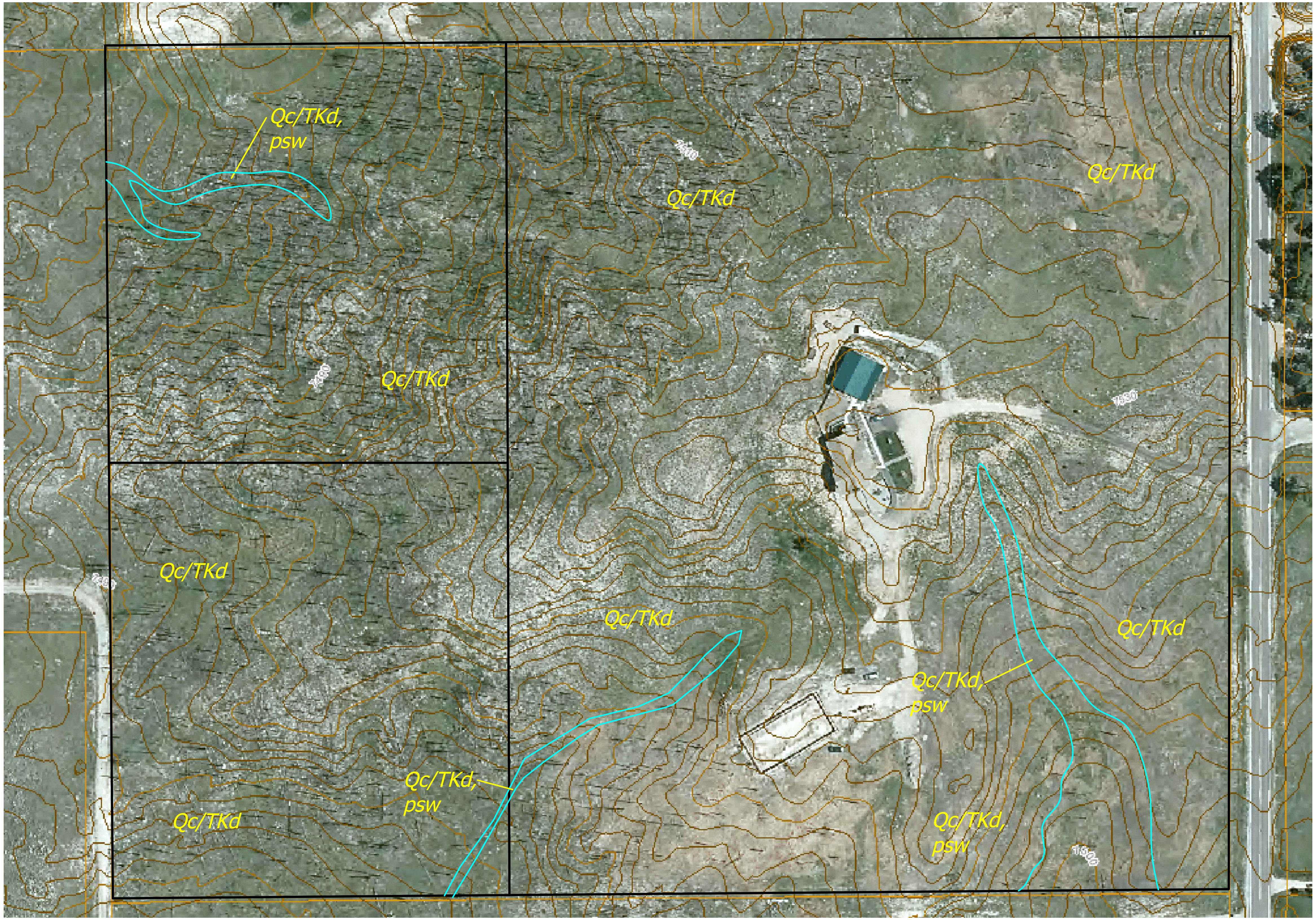
JOB NO.: 213346

FIG NO.: 5



Legend:

QcTKd - Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age: colluvial and residual soils overlying arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone

psw - potentially shallow groundwater area

N

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505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907
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GEOLOGY/ENGINEERING GEOLOGY MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

DRAWN	JHR
CHECKED	LLL
DATE	1/10/22
SCALE	AS SHOWN
JOB NO.	213346
FIGURE No.	6

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FEMA FLOODPLAIN MAP
MCDERMOTT SUBDIVISION, FILING 1
12930 HERRING ROAD
EL PASO COUNTY, CO.
FOR: SCOTT MCDERMOTT

DRAWN:	DATE:	CHECKED:	DATE:
JHR	1/10/22	LLL	

JOB NO.: 213346

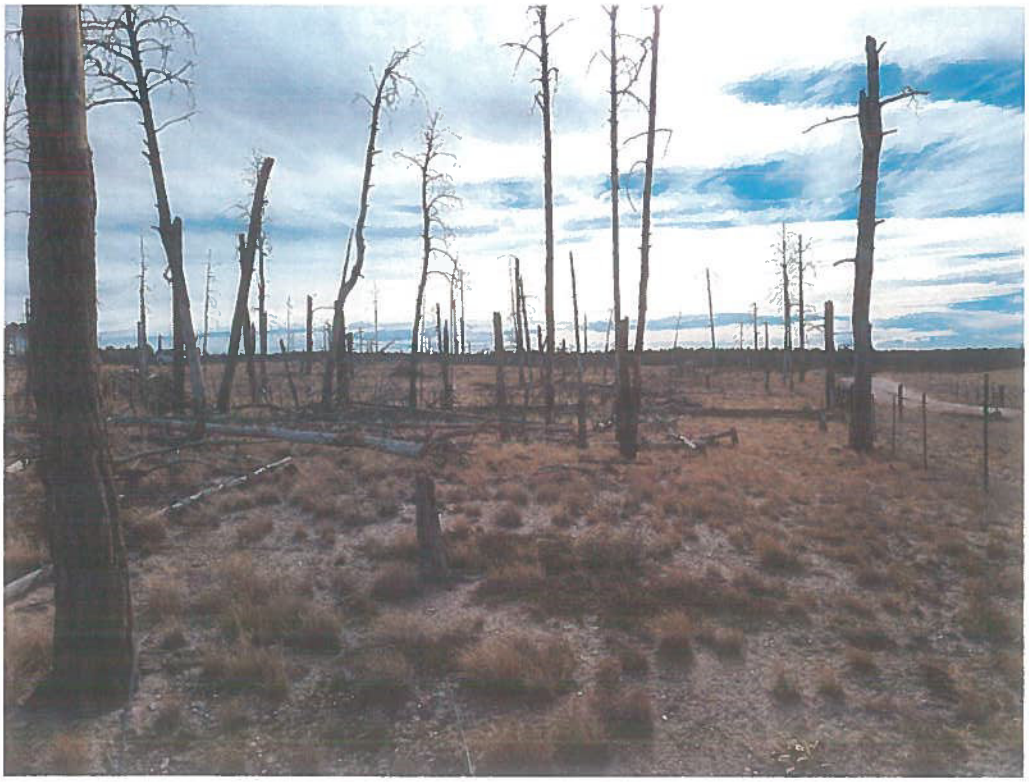
FIG NO.: 7

APPENDIX A: Photographs

1

Looking East from West-Central portion of the site.

December 23, 2021

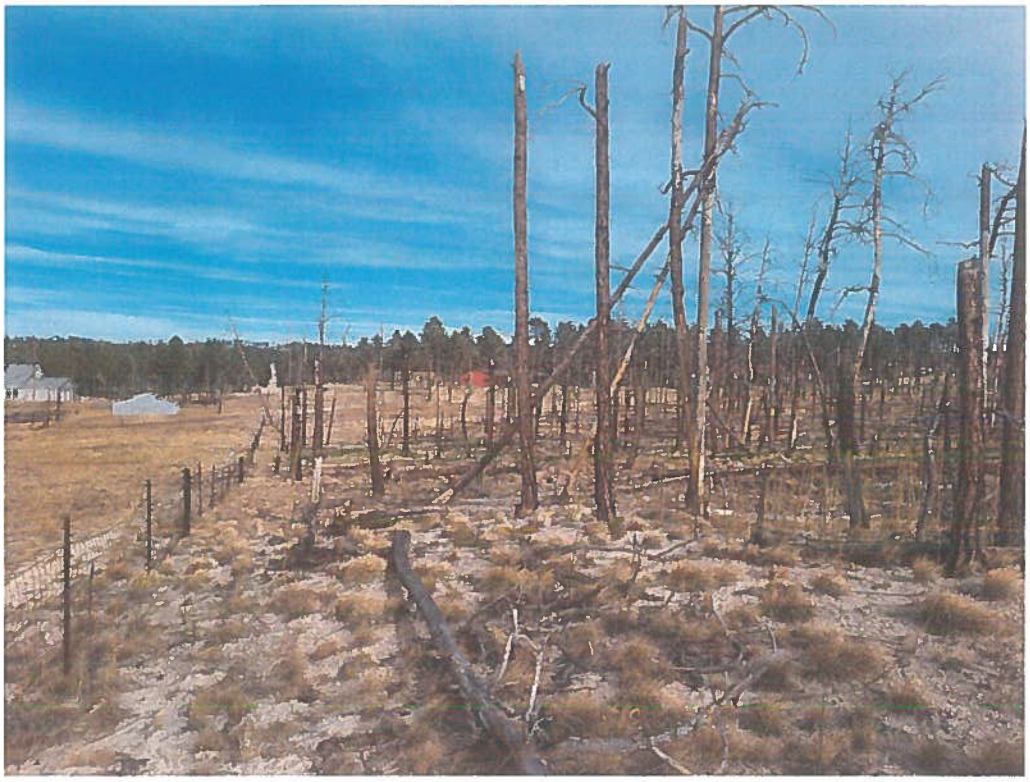


2

Looking South from the Western Side of the site.

December 23, 2021

Job No. 213346



3

Looking north from western side of the site.

December 23, 2021

4

Looking West from the Central portion of the site.

December 23, 2021

Job No. 213346

APPENDIX B: Test Borings

TEST BORING NO. 1
DATE DRILLED 1/5/2022
Job # 213346

REMARKS

DRY TO 20', 1/5/22

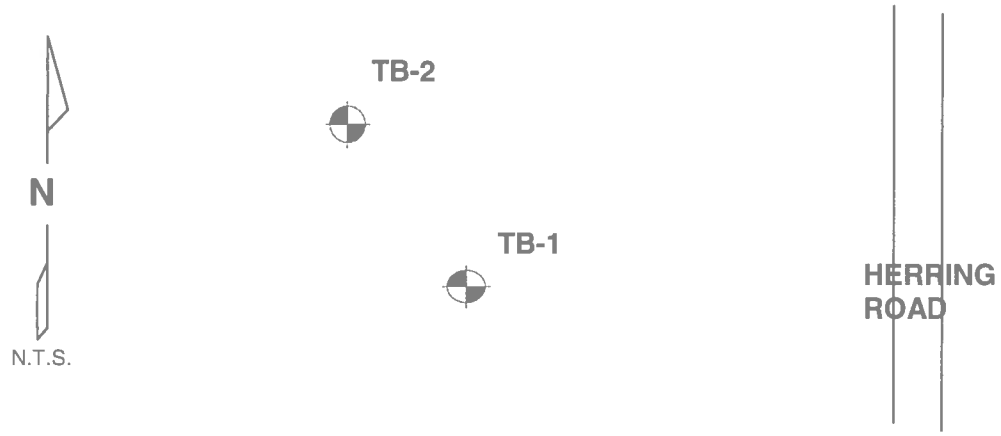
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST		43	6.6	1
5	SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, LIGHT BROWN, VERY DENSE, MOIST		50	12.4	3
10			50	9.8	3
15			50/5"	8.7	3
20			50/4"	9.0	3

TEST BORING NO. 2
DATE DRILLED 1/5/2022
CLIENT SCOTT MCDERMOTT
LOCATION 12930 HERRING ROAD

REMARKS

DRY TO 20', 1/5/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, SANDY, DARK BROWN, FIRM, MOIST		12	14.9	2
5	CLAYSTONE, SANDY, BROWN, HARD, MOIST		50	11.7	4
10	SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, LIGHT BROWN, VERY DENSE, MOIST		50/5"	9.8	3
15			50/4"	6.8	3
20			50/4"	8.9	3



LOCATIONS OF TEST BORINGS ARE APPROXIMATE

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TEST BORING LOG

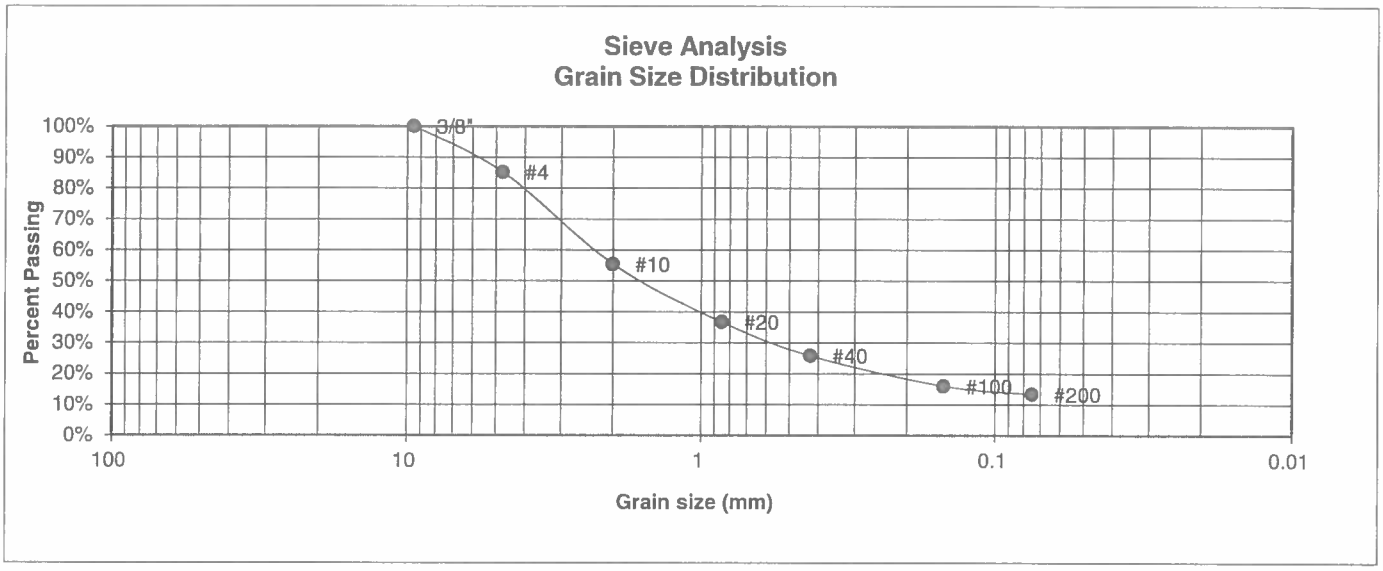
DRAWN:	DATE:	CHECKED:	DATE:
		LLL	2/15/22

JOB NO. 213346

FIG NO. B-1

APPENDIX C: Laboratory Test Results

BORING NO.	1	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	213346
CLIENT	SCOTT MCDERMOTT				
PROJECT	12930 HERRING ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	85.2%
10	55.4%
20	36.7%
40	25.8%
100	16.0%
200	13.4%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

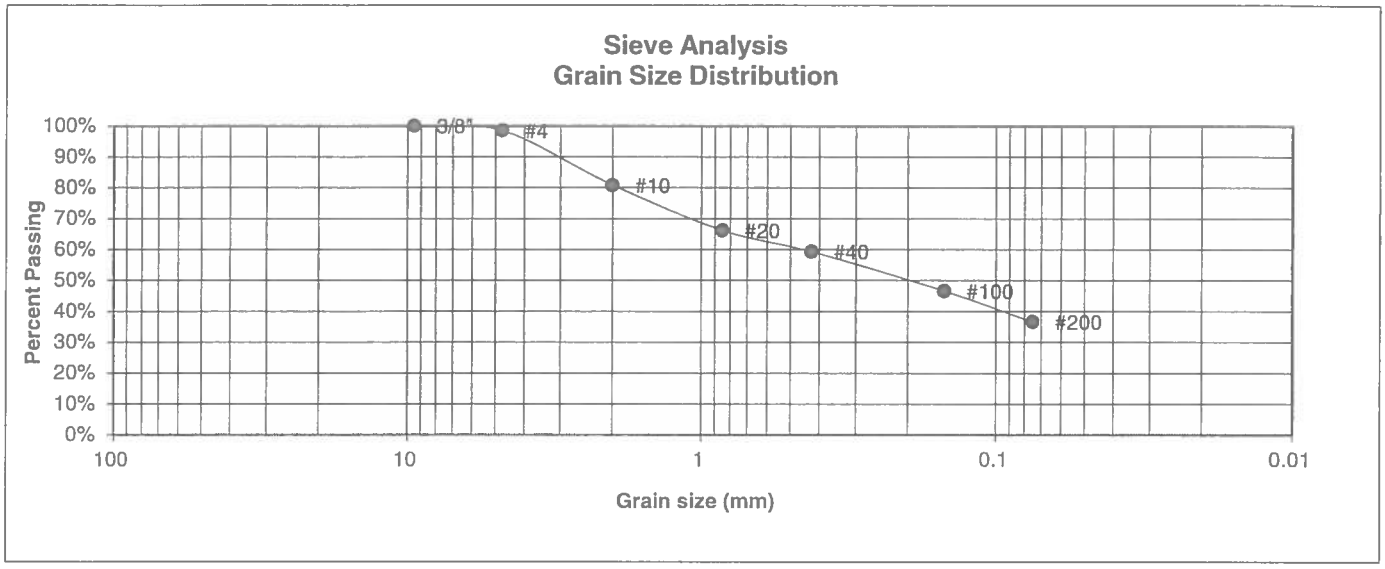
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	1/12/22

JOB NO.: 213346

FIG NO.: C-1

BORING NO.	1	UNIFIED CLASSIFICATION	SC	TEST BY	BL
DEPTH(ft)	5	AASHTO CLASSIFICATION		JOB NO.	213346
CLIENT	SCOTT MCDERMOTT				
PROJECT	12930 HERRING ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	80.8%
20	66.2%
40	59.4%
100	46.6%
200	36.6%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start	12.4%
Moisture at finish	22.1%
Moisture increase	9.7%
Initial dry density (pcf)	101
Swell (psf)	480

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ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

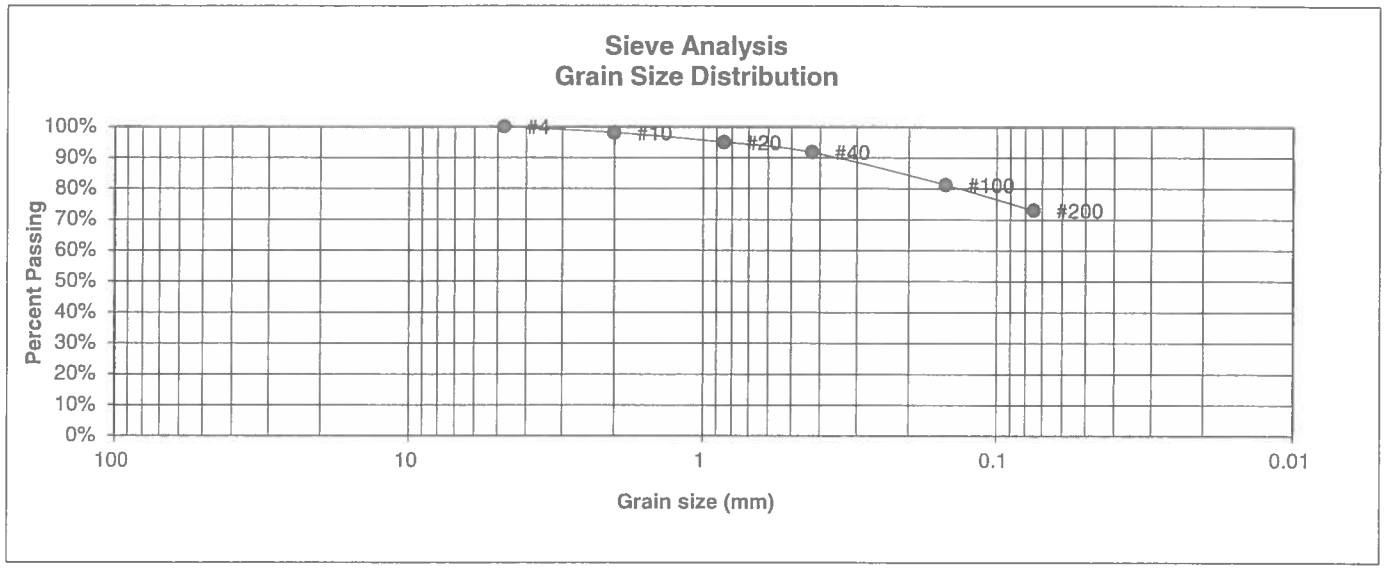
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	1/12/22

JOB NO.: 213346

FIG NO.: C-2

BORING NO.	2	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	213346
CLIENT	SCOTT MCDERMOTT				
PROJECT	12930 HERRING ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.1%
20	94.9%
40	91.8%
100	81.2%
200	73.0%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

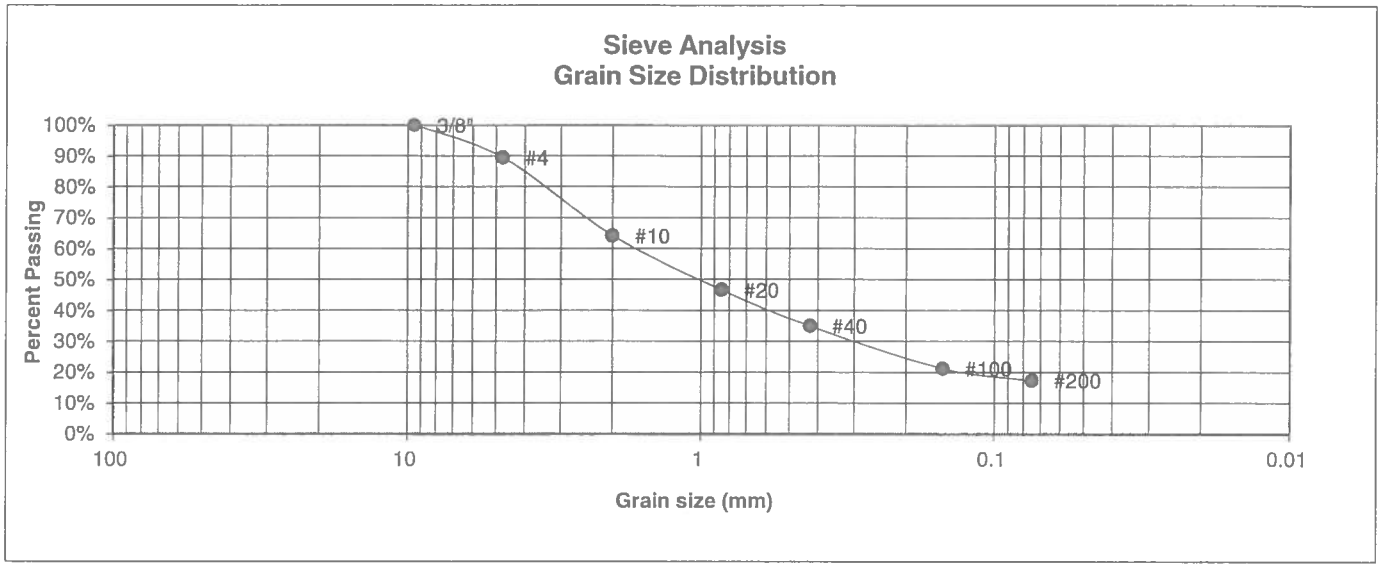
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	1/12/22

JOB NO.: 213346

FIG NO.: C-3

BORING NO.	2	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	15	AASHTO CLASSIFICATION		JOB NO.	213346
CLIENT	SCOTT MCDERMOTT				
PROJECT	12930 HERRING ROAD				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.4%
10	64.1%
20	46.6%
40	34.9%
100	21.2%
200	17.3%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	1/12/22

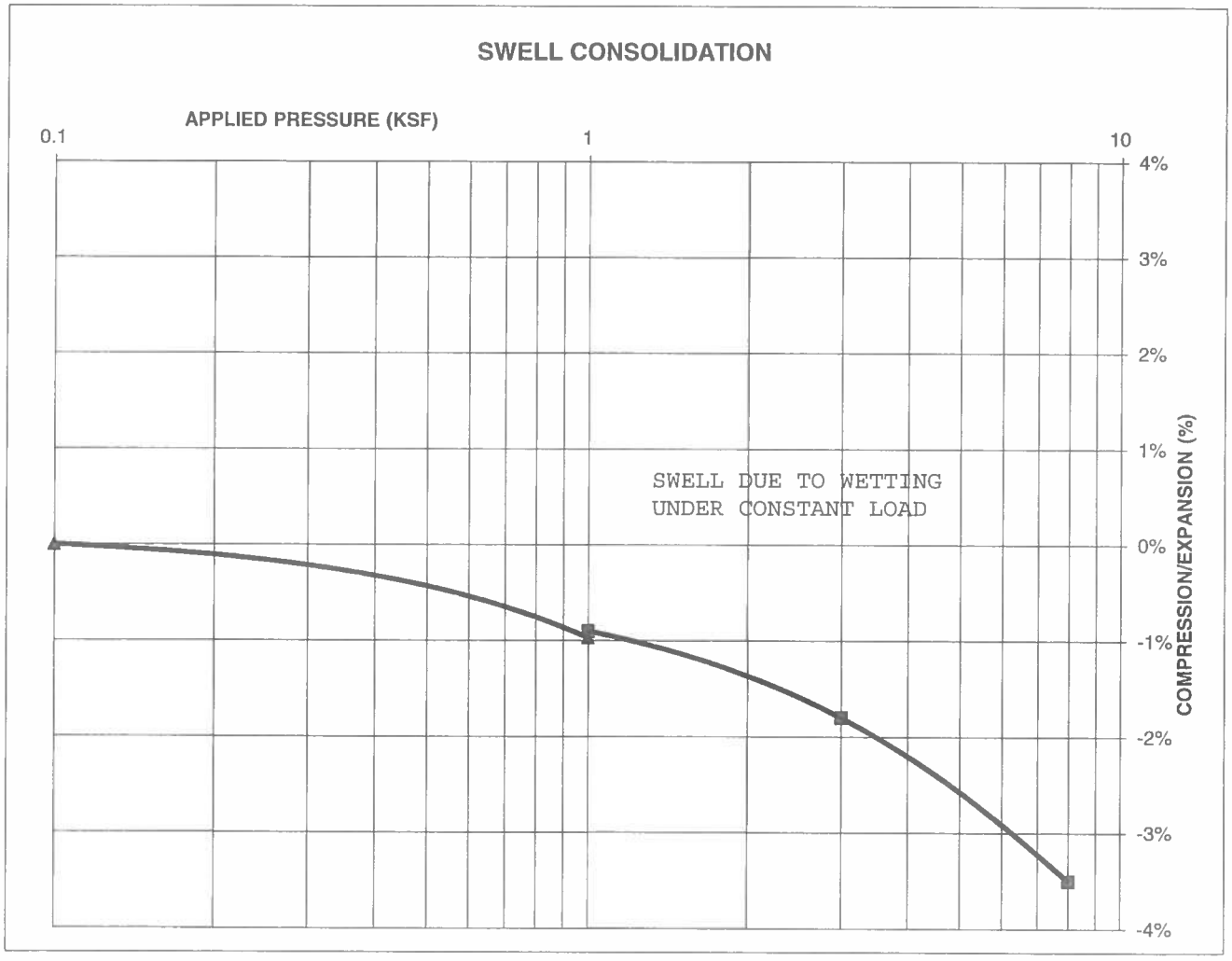
JOB NO.: 213346

FIG NO.: C-4

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	2	DEPTH(ft)	2-3
DESCRIPTION	CLAY, SANDY		
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			15.9%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 213346
CLIENT SCOTT MCDERMOTT
PROJECT 12930 HERRING ROAD



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COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

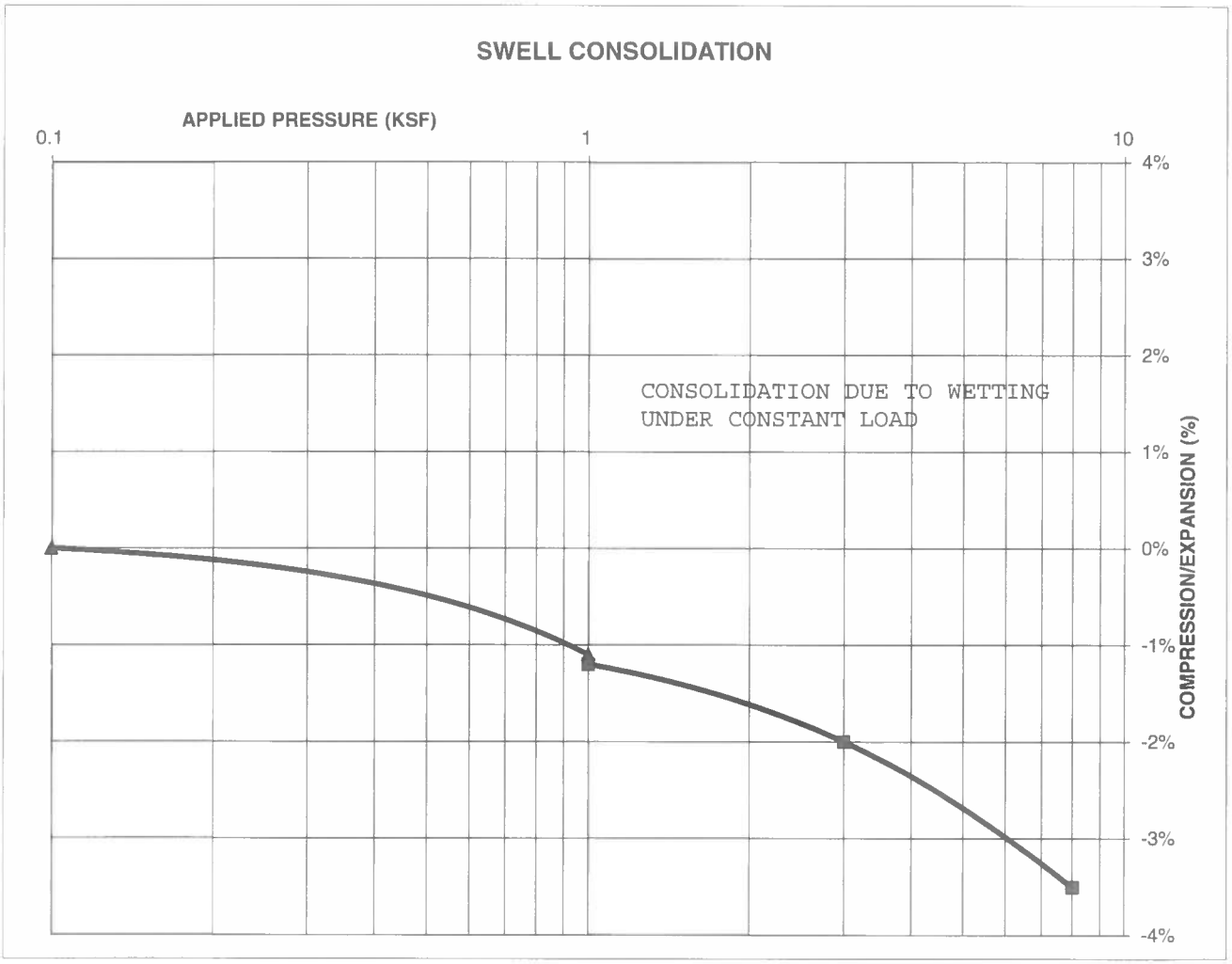
DRAWN:	DATE:	CHECKED:	DATE:
		LL	1/12/22

JOB NO.: 213346
FIG NO.: C-5

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	2	DEPTH(ft)	5
DESCRIPTION	CLAYSTONE, SANDY		
NATURAL UNIT DRY WEIGHT (PCF)			118
NATURAL MOISTURE CONTENT			14.7%
SWELL/CONSOLIDATION (%)			-0.1%

JOB NO. 213346
CLIENT SCOTT MCDERMOTT
PROJECT 12930 HERRING ROAD



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ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	2/15/22

JOB NO. 213346
FIG NO. C-6

APPENDIX D: **Profile Pit Evaluation by Geoqust, LLC., dated November 10, 2021, Geoquest Job No. 21-1209**

GEOQUEST, LLC
6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

PROFILE PIT EVALUATION

FOR

SCOTT MCDERMOTT

JOB #21-1209

12930 Herring Road,
El Paso County,
Colorado

Sincerely,

Douglas J Pretzer

Douglas J. Pretzer, P.E.
Civil Engineer

PROFILE PIT FINDINGS

Enclosed are the results of the profile pit for the septic system to be installed at **12930 Herring Road, El Paso County, Colorado.** The location of the test pits was determined by Scott McDermott. The residence will not be on a public water system. The number of bedrooms in the design for the residence is unknown. Due to the natural slope of the property, the entire system will feed to the southwest at approximately 7% at least 20 feet. All applicable portions of the El Paso County Public Health Department Onsite Wastewater Treatment System Regulations (OWTS) must be complied with for the installation of the treatment system.

The inspection was performed on November 2, 2021, in accordance with Table 10-1 of the **E.P.C.P.H. OWTS Regulations.**

Soil Profile #1:

0 to 4" - Topsoil - loam, organic composition.

4" to 24" - USDA soil texture sandy loam, soil type 2A, structure shape granular, structure grade 1, non-cemented, LTAR 0.50, light brownish grey in color, 10 YR 6/2, 17% rock.

24" to 8' - USDA soil texture sandy clay, soil type R-1, structure shape massive, structure grade 0, moderately cemented, LTAR 0.15, light yellowish brown in color, 10 YR 6/4, redoximorphic features at interface, soil type 4A with 47% rock, sandstone.

Soil Profile #2:

0 to 6" - Topsoil - loam, organic composition.

6" to 30" - USDA soil texture sandy loam, soil type 2A, structure shape granular, structure grade 1, non-cemented, LTAR 0.50, light brownish grey in color, 10 YR 6/2, 21% rock.

30" to 8' - USDA soil texture sandy clay loam, soil type R-1, structure shape massive, structure grade 0, moderately cemented, LTAR 0.30, pale brown in color, 10 YR 6/3, soil type 3A with 39% rock, sandstone.

Groundwater evidence was encountered at the depth of 24 inches in Profile Pit #1 during the inspection. Bedrock was encountered at the depth of 24 inches in Profile Pit #1 and 30 inches in Profile Pit #2 during the inspection. No known wells were observed within 100 feet of the proposed system. **All setbacks shall conform to county regulations.**

Due to encountering bedrock and groundwater evidence, the septic system to be installed on this site shall be designed by a Colorado Licensed Engineer. Based on the observed conditions, we feel a design based on an LTAR of 0.50 GPD/SF (USDA soil type 2A, treatment soil, treatment level 1) is reasonable. An above grade uniformly pressure dosed soil treatment area is required.

If during construction of the field itself, subsurface conditions change considerably or if the location of the proposed field changes, this office shall be notified to determine whether the conditions are adequate for the system as designed or whether a new system needs to be designed.

Weather conditions at the time of the test consisted of overcast skies with cold temperatures.

PROFILE PIT LOG - Profile Pit #1

JOB#: 21-1209
DATE EVALUATED: 02 November 2021
EQUIPMENT USED: MINI-EX

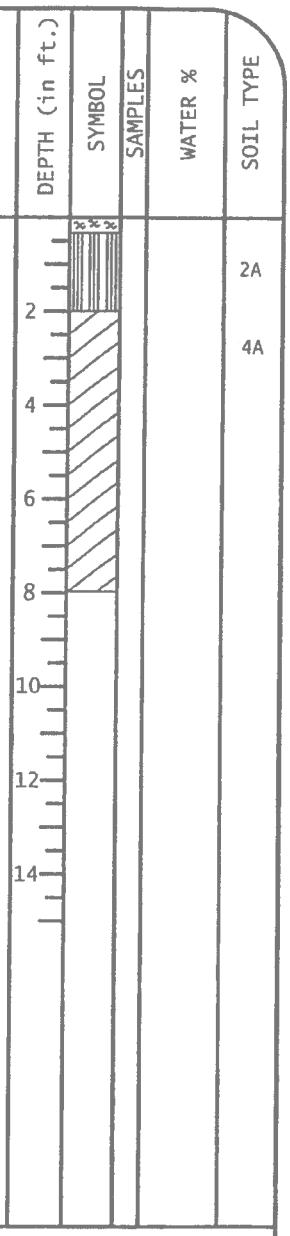
0"-4" **TOPSOIL**
Loam
Organic Composition

4"- 24" **Sand**

Fine-coarse Grained	USDA Soil Texture: Sandy Loam
Moderate Density	USDA Soil Type: 2A
Low Moisture Content	USDA Structure Shape: Granular
Low-moderate Clay Content	USDA Structure Grade: 1
Low-moderate Cohesion	Cementation Class: Non-cemented
Low-moderate Plasticity	Long Term Acceptance Rate (LTAR, Treatment Level 1):0.50
Light Brownish Grey Color	17% Rock
10YR 6/2	

24"- 8' **Sandstone**

Fine-coarse Grained	USDA Soil Texture: Sandy Clay
High Density	USDA Soil Type: R-1
Low-moderate Moisture Content	USDA Structure Shape: Massive
Moderate-high Clay Content	USDA Structure Grade: 0
Moderate-high Cohesion	Cementation Class: Moderately
Moderate-high Plasticity	Long Term Acceptance Rate (LTAR, Treatment Level 1):0.15
Light Yellowish Brown Color	Redox @ Interface
10YR 6/4	Soil Type 4A w/ 47% Rock



LTAR to be Used for OWTS Sizing: **0.50GPD/SF (USDA Type 2A, Treatment soil, Treatment Level 1)**
Depth to Groundwater (Permanent or Seasonal): Seasonal at 24"
Depth to Bedrock and Type: Sandstone @ 24"
Depth to Proposed Infiltrative Surface from Ground Surface: Above Grade (Uniformly Pressure Dosed)
Soil Treatment Area Slope and Direction: Southwest @ 7%

Note: See El Paso County Board of Health Regulation Chapter 8: On-Site Wastewater Treatments Systems (OWTS) Regulations for Additional Information. Refer to Table 10-1 for Corresponding LTAR if Treatment Level 2, 2N, 3, or 3N will be Implemented in the Design of the OWTS. System Sizing Depends on a Number of Factors (i.e. LTAR, # of Bedrooms, Type of Soil Treatment Area (STA), Method of Transfer to the STA (Gravity, Dosed, or Pressure Dosed), and Type of Storage / Distribution Media Used in the STA)

Project: 21-12098
Sheet: 1 of 2
Date: 05 Nov 2021
Scale: 1/4" = 1'
Drawn by: rah
Checked by: djp

Project Name and Address

Scott Mcdermott

12930 Herring Rd
Sch. No. 5208000030
El Paso County, Colorado

GEOQUEST, LLC.
6825 SILVER PONDS HEIGHTS
SUITE 101
COLORADO SPRINGS, CO
80908

OFFICE: (719) 481-4560
FAX: (719) 481-9204

PROFILE PIT LOG - Profile Pit #2

JOB#: 21-1209
DATE EVALUATED: 02 November 2021
EQUIPMENT USED: MINI-EX

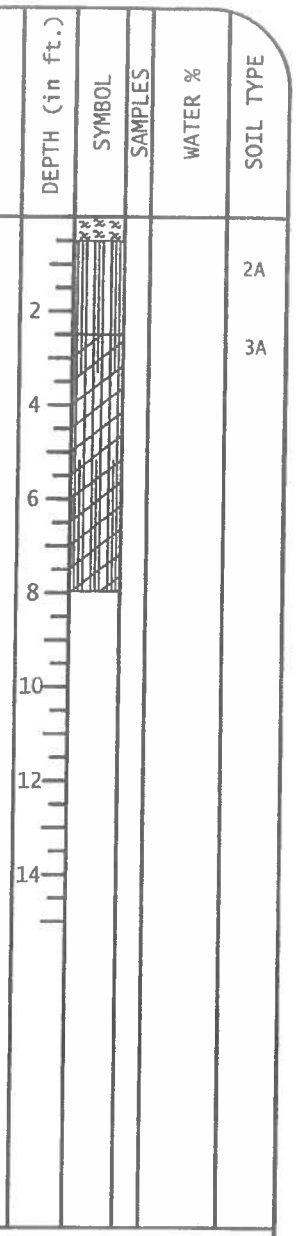
0"-6" **TOPSOIL**
Loam
Organic Composition

6"- 30" **Sand**

Fine-coarse Grained	USDA Soil Texture: Sandy Loam
Moderate Density	USDA Soil Type: 2A
Low Moisture Content	USDA Structure Shape: Granular
Low-moderate Clay Content	USDA Structure Grade: 1
Low-moderate Cohesion	Cementation Class: Non-cemented
Low-moderate Plasticity	Long Term Acceptance Rate (LTAR, Treatment Level 1):0.50
Light Brownish Grey Color 10YR 6/2	21% Rock

30"- 8' **Sandstone**

Fine-coarse Grained	USDA Soil Texture: Sandy Clay Loam
High Density	USDA Soil Type: R-1
Low Moisture Content	USDA Structure Shape: Massive
Moderate Clay Content	USDA Structure Grade: 0
Moderate Cohesion	Cementation Class: Moderately
Moderate Plasticity	Long Term Acceptance Rate (LTAR, Treatment Level 1):0.30
Pale Brown Color 10YR 6/3	Soil Type 3A w/ 39% Rock



LTAR to be Used for OWTS Sizing: **0.50GPD/SF (USDA Type 2A, Treatment soil, Treatment Level 1)**
Depth to Groundwater (Permanent or Seasonal): Not Encountered
Depth to Bedrock and Type: Sandstone @ 30"
Depth to Proposed Infiltrative Surface from Ground Surface: Above Grade (Uniformly Pressure Dosed)
Soil Treatment Area Slope and Direction: Southwest @ 7%

Note: See El Paso County Board of Health Regulation Chapter 8: On-Site Wastewater Treatments Systems (OWTS) Regulations for Additional Information. Refer to Table 10-1 for Corresponding LTAR if Treatment Level 2, 2N, 3, or 3N will be Implemented in the Design of the OWTS. System Sizing Depends on a Number of Factors (i.e. LTAR, # of Bedrooms, Type of Soil Treatment Area (STA), Method of Transfer to the STA (Gravity, Dosed, or Pressure Dosed), and Type of Storage / Distribution Media Used in the STA)

Project: 21-12098	Project Name and Address
Sheet: 2 of 2	Scott Mcdermott
Date: 05 Nov 2021	12930 Herring Rd
	Sch. No. 5208000030
	El Paso County, Colorado
Scale: 1/4" = 1'	
Drawn by: rah	
Checked by: djp	

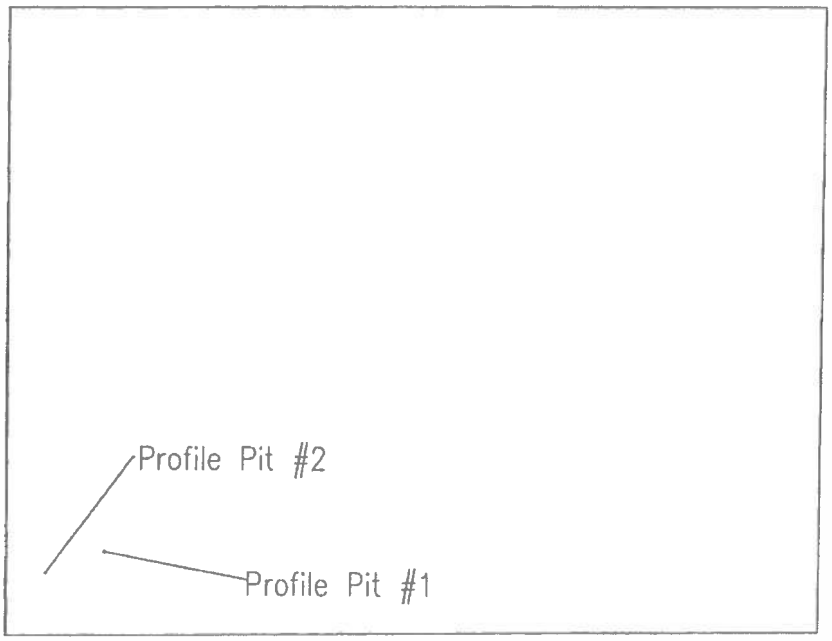
GEOQUEST, LLC.
6825 SILVER PONDS HEIGHTS
SUITE 101
COLORADO SPRINGS, CO
80908

OFFICE: (719) 481-4560
FAX: (719) 481-9204

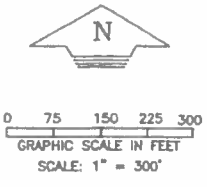
GEOQUEST LLC

SITE MAP

12930 Herring Road
El Paso County
Colorado
Job #21-1209



Location from Southwest Lot Corner to Profile Pit #1:
N. 50° E. – 210'
Location from Profile Pit #1 to Profile Pit #2:
S. 20° W. – 100'
GPS Coordinates:
Pit 1; N. 39° 01' 4.1" W. 104° 41' 9.2"
Pit 2; N. 39° 01' 3.8" W. 104° 41' 10.4"



APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

26—Elbeth sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 367y
Elevation: 7,300 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Elbeth and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elbeth

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from arkose

Typical profile

A - 0 to 3 inches: sandy loam
E - 3 to 23 inches: loamy sand
Bt - 23 to 68 inches: sandy clay loam
C - 68 to 74 inches: sandy clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:

Hydric soil rating: No

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No