

Ocotber 28, 2022



**ENTECH**  
ENGINEERING, INC.

505 ELKTON DRIVE  
COLORADO SPRINGS, CO 80907  
PHONE (719) 531-5599  
FAX (719) 531-5238

Doug Hill  
13985 Silverton Road  
Colorado Springs, CO 80921

Re: OWTS – Wastewater Study  
Hill Subdivision  
Parcel Nos. 51290-04-018 and 51290-09-002  
Alpaca Heights and Black Forest Road  
El Paso County, Colorado

Dear Mr. Hill:

The project consists of subdividing 16.49-acres; four rural residential lots are proposed as part of the subdivision. An existing home on Lot 1 will remain, and three new lots are proposed. The site is located southeast of the intersection of Hodgen Road and Black Forest Road, in El Paso County. The Black Forest Road right-of-way the for future road realignment is located in the western portion of the site between Lots 1 and 4.

#### **GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION**

The site is located in a portion of the NW¼ of Section 29 Township 11 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in El Paso County, Colorado. The site is located approximately 7 miles east of the town of Monument, southeast of the intersection of Hodgen Road and Black Forest 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 gradually sloping to the northeast for Lots 1 through 3 and gradually sloping to the west on Lot 4. A minor drainage swale is located in the northeastern portion of the property on Lot 2. Water was not observed in the drainage at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included undeveloped agricultural and rural residential. The site contains field grasses, weeds, and ponderosa pines. The existing house with a water well and septic system located on Lot 1, will remain. Site photographs were taken and site mapping was completed on was September 21 and 28, 2022. Site photographs are included in appendix A. Test Borings and Test Pits were performed on September 28 and 29, 2022.

Total acreage involved in the proposed subdivision is 16.49-acres. Four rural residential lots are proposed as part of the subdivision. The proposed lot sizes range from 1.78-acres to 5.0-acres. The existing house and barns located on Lot 1 will remain. The new lots will be serviced by individual wells and on-site wastewater treatment systems. The Site Plan 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 constraints on development and land use. These include areas of artificial fill, potentially expansive soils, potentially seasonal shallow groundwater. Based on the proposed development plan, it appears that these areas will have minor impacts on the development. These conditions will be discussed in greater detail in the report.

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Entech Job No. 221947

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**

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 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 April 22, 2021.

Two test borings were drilled, and two test pits were excavated on the site to determine general suitability of the soil characteristics for residential construction. The locations of the test borings/pits are indicated on the Site Plan/Test Boring Location Map, Figure 3. The Test Boring and Test Pit Logs are presented in Appendix B. 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. Results of the laboratory testing are included in Appendix C.

## **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 one soil type on the site. Complete descriptions of the soil type are presented in Appendix D. In general, the soils consist of sandy loam to loam. The soils are described as follows:

<u>Type</u>	<u>Description</u>
15	Brussett Loam, 3 – 5% Slopes
68	Peyton-Pring Complex, 3 – 8% Slopes

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The soils have been described to have rapid permeabilities. The soils are described as well suited for use as home sites. 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 can be grouped into three general soil and rock types. The soils were classified using the Unified Soil Classification System (USCS). The test pit soils were also classified using the USDA Textural Soil Classification.

Soil Type 1 is a slightly silty to silty sand (SM-SW, SM). The sand soils were encountered in all of the test borings at depths ranging from the existing surface grade to 3 feet, and extending to a depth of 12 feet in Test Boring No. 1 or to the termination of Test Boring Nos. 2 and 3 (20 feet). These soils were encountered at medium dense to dense states and at dry to moist conditions. Samples tested had approximately 8 percent of the soil size particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in a liquid limit of 19 and a plastic index of 2.

Soil Type 2 is a sandy clay to very sandy clay (CL). The clay soils were encountered in Test Boring No. 3, and in Test Pit Nos. 1 and 2. The clays were encountered at the existing ground surface and extended to depths of 3 feet bgs in Test Boring No. 3, and to the termination of the test pits (6 to 8 feet). The clay was encountered at firm to stiff consistencies and dry to moist conditions. The samples tested had 57 to 77 percent of the soil size particles passing the No. 200 sieve. Expansion pressure of 580 psf was determined by laboratory tests on samples of the clay soils. This magnitude of expansion is in the low expansion range.

Soil Type 3 is a silty sandstone (SM). The sandstone was encountered in Test Boring No. 1 at an approximate depth of 12 feet bgs and extended to the termination of the boring (20 feet). The sandstone was encountered at dense states and moist conditions. The sandstone had approximately 60 percent of the soil sized particles passing the No. 200 sieve. Atterberg Limits Testing resulted in liquid limit of no value and plastic indexes of non-plastic. Expansive claystone and siltstone is commonly interbedded in the Dawson Formation in the area.

#### Groundwater

Groundwater was not encountered in the test borings which were drilled to depths of 20 feet, or in the test pits which were excavated to depths of 6 to 8 feet. Groundwater is not anticipated to affect shallow foundations on the majority of the site. An area in the northern portion of Lot 2 has been identified as a potentially seasonal shallow groundwater area, and is discussed further later in this report. 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.

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### 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 Tertiary to Cretaceous Age. The Dawson Formation typically consists of coarse-grained arkosic sandstone with interbedded layers of claystone or siltstone.

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

**Qaf Artificial Fill of Holocene Age:** These are man-made fill deposits associated with a small embankment in the western portion of Lot 1.

**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.

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 logs used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

### Drainage Areas

A minor drainage areas exist in the northeastern portion of the site on proposed Lot 2. No water was observed flowing in the drainage, however, this area has the potential for seasonal shallow groundwater. This area is indicated in the Geology/Engineering Geology Map (Figure 6) and are discussed below. Due to the size of the proposed lot this area can be avoided or redirected around proposed structures or proposed soil treatment areas. The site does not lie within any floodplain zones according to the FEMA Map No. 08041CO305G dated December 7, 2018 (Figure 7, Reference 7). Exact locations of floodplain and specific drainage studies are beyond the scope of this report.

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## **ON-SITE WASTEWATER TREATMENT**

The Natural Resource Conservation Service (Reference 1), previously the Soil Conservation Service (Reference 2) has been mapped with three soil descriptions. The Soil Survey Map (Reference 1) is presented in Figure 4, and the Soil Survey Descriptions are presented in Appendix D. The soils are described as having moderate to rapid percolation rates. The existing septic system is located on Lot 1 will remain. Observations of the leach field area indicated that the system is operating properly. Records for the existing septic system located on Lot 1 are included in Appendix E. The system for the existing home is a conventional infiltration trench system in series.

Soils encountered in the tactile test pits consisted of sandy clay. The limiting layers encountered in the test pits are the sandy clay, which corresponds with USDA Soil Type 4, with a LTAR value of 0.20 gallons per day per square foot. Bedrock or signs of groundwater were not encountered in the test pits. Absorption fields must be installed a minimum of 4 feet above groundwater, bedrock, or confining layers. Should groundwater or bedrock be encountered within 6 feet of the surface, designed systems will be required. Designed systems are anticipated on the lots due to the restrictive clay soils. Areas where conventional systems can be utilized may be determined with additional testing. Testing will be required on each lot to determine the site characteristics prior to construction.

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems (OWTS) and that contamination of surface and subsurface water resources should not occur provided the OWTS sites are evaluated and installed according to El Paso County and State Guidelines and properly maintained. Based on the testing performed designed systems are anticipated for the majority of the lots, depending on soils encountered. The Septic Suitability Map is presented in Figure 8. Potential house locations, water wells, and two septic sites for the new lots are indicated on Figure 8. Absorption fields must be located a minimum of 100 feet from any well, including those on adjacent properties. Absorption fields must also be located a minimum of 50 feet from any drainages, floodplains or ponded areas and 25 feet from dry gulches.

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## CLOSURE

This report has been prepared for Ramses II Properties, LLC, 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.



Logan L. Langford, P.G.  
Geologist

LLL

Encl.

Entech Job No. 221947  
AAprojects/2022/221947 wws

Reviewed by:



Joseph C. Good  
President



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El Paso County, Colorado  
Entech Job No. 221947

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#### BIBLIOGRAPHY

1. Natural Resource Conservation Service, September 2, 2022. *Web Soil Survey*. United States Department Agriculture, <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>.
2. United States Department of Agriculture Soil Conservation Service. June 1981. *Soil Survey of El Paso County Area, Colorado*.
3. 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.
4. Thorson, Jon P., 2003. *Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado*. Colorado Geological Survey. Open-File Report 03-6.
5. Trimble, Donald E. and Machette, Michael N. 1979. *Geologic Map of the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado*. USGS, Map I-857-F.
6. Scott, Glen R.; Taylor Richard B.; Epis, Rudy C; and Wobus, Reinhard A. 1978. *Geologic Map of the Pueblo 1° x 2° Quadrangle, South-Central Colorado*. Sheet 2. U.S. Geologic Survey. Map I-1022.
7. Federal Emergency Management Agency. December 7, 2018. *Flood Insurance Rate Maps for the City of Colorado Springs, Colorado*. Map Number 08041CO305G.

## TABLES

**TABLE 1**  
**SUMMARY OF LABORATORY TEST RESULTS**

CLIENT DOUG HILL  
PROJECT ALPACA HTS. & BLACK FOREST  
JOB NO. 221947

SOIL TYPE	TEST BORING/ TEST PIT 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	TB-2	5			7.8	NV	NP				SM-SW	SAND, SLIGHTLY SILTY
2	TB-3	2-3			57.2				580		CL	CLAY, VERY SANDY
2	TP-1	2			77.4						CL	CLAY, SANDY
2	TP2	4			67.6						CL	CLAY, SANDY
3	TB-1	15			29.8	NV	NP				SM	SANDSTONE, SILTY

**Table 2: Summary Test Boring Results**

<b>Test Boring No.</b>	<b>Depth to Bedrock (ft.)</b>	<b>Depth to Groundwater (ft.)</b>
1	12	>20
2	>20	>20
3	>20	>20

**Table 3: Summary Test Pit Results**

<b>Test Pit No.</b>	<b>Depth to Bedrock (ft.)</b>	<b>Depth to Groundwater (ft.)</b>	<b>USDA Soil Type</b>	<b>LTAR Value</b>
1	>8	>8	4*	0.20*
2	>6	>6	4*	0.20*

\*- Conditions that will require an engineered OWTS

## FIGURES



**ENTECH**  
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VICINITY MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

DRAWN:  
LLL

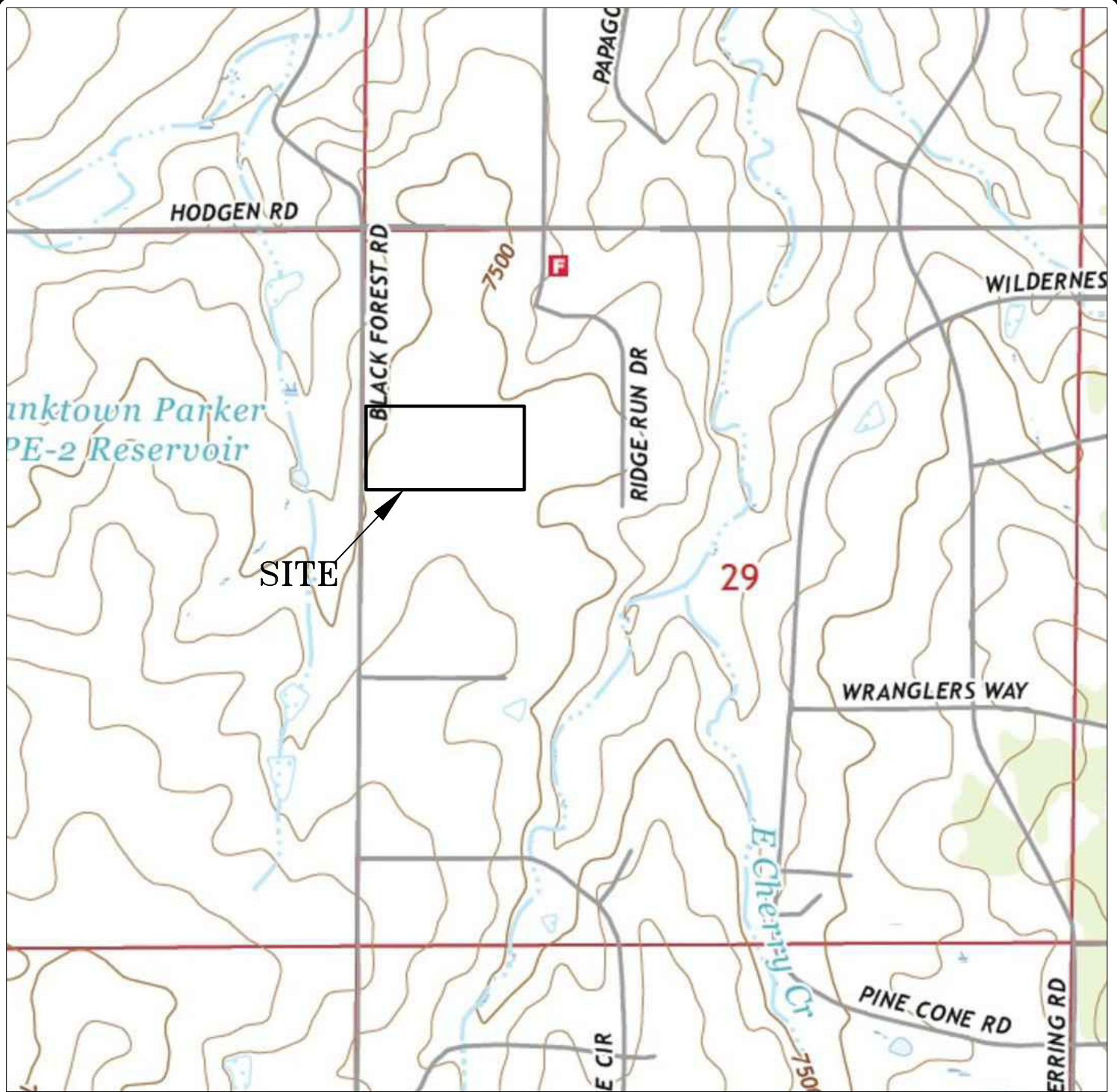
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DATE:

JOB NO.:  
221947

FIG NO.:  
1



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USGS TOPOGRAPHY MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

DRAWN:  
LLL

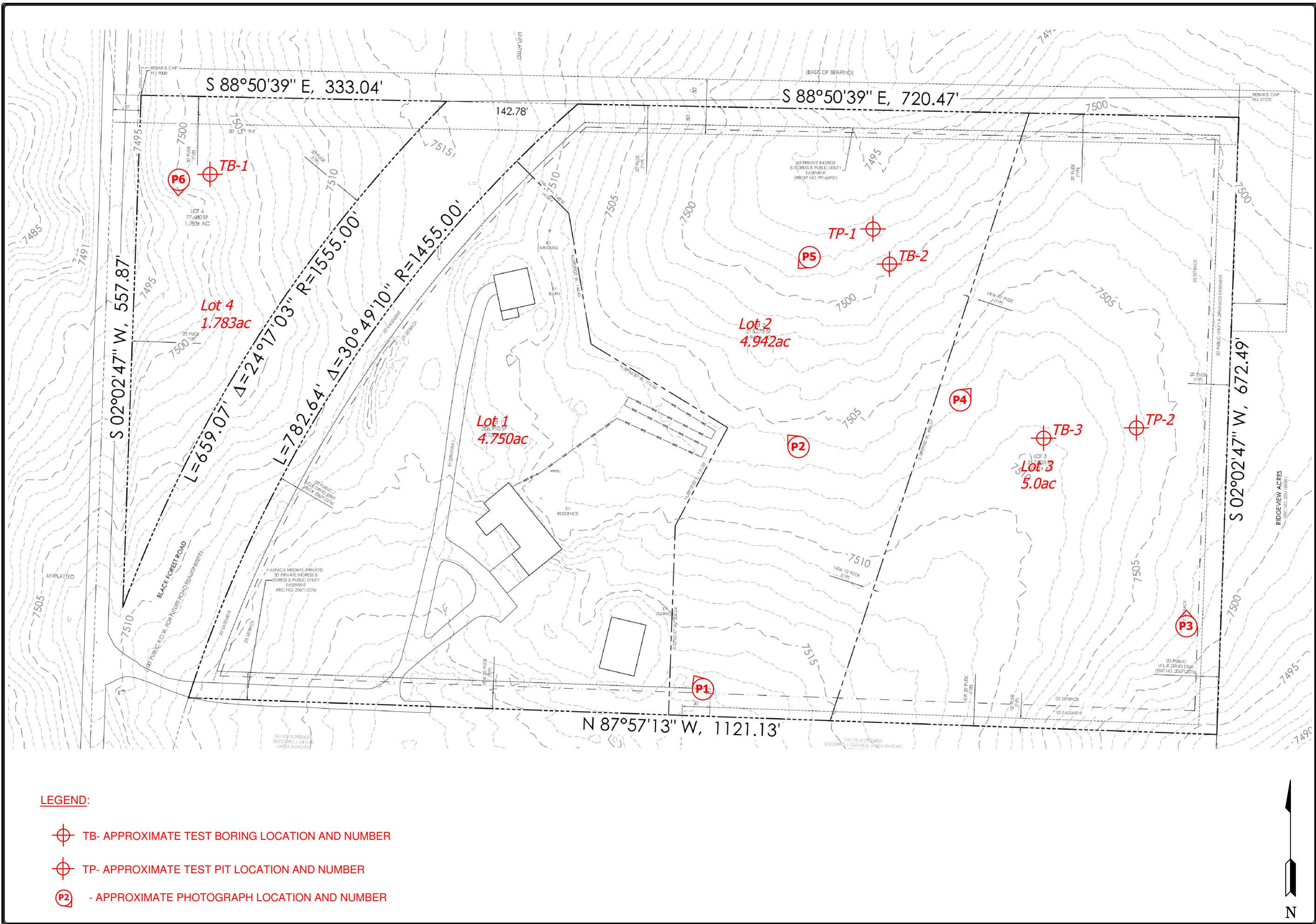
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JOB NO.:  
221947


FIG NO.:  
2



LEGEND:

- TB- APPROXIMATE TEST BORING LOCATION AND NUMBER
- TP- APPROXIMATE TEST PIT LOCATION AND NUMBER
- APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER

REVISION	BY



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SITE PLAN/TEST PIT LOCATION MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

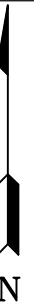
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DATE  
10/20/22

SCALE  
AS SHOWN

JOB NO.  
221947

FIGURE No.  
3



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SOIL SURVEY MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

DRAWN:  
LLL

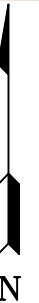
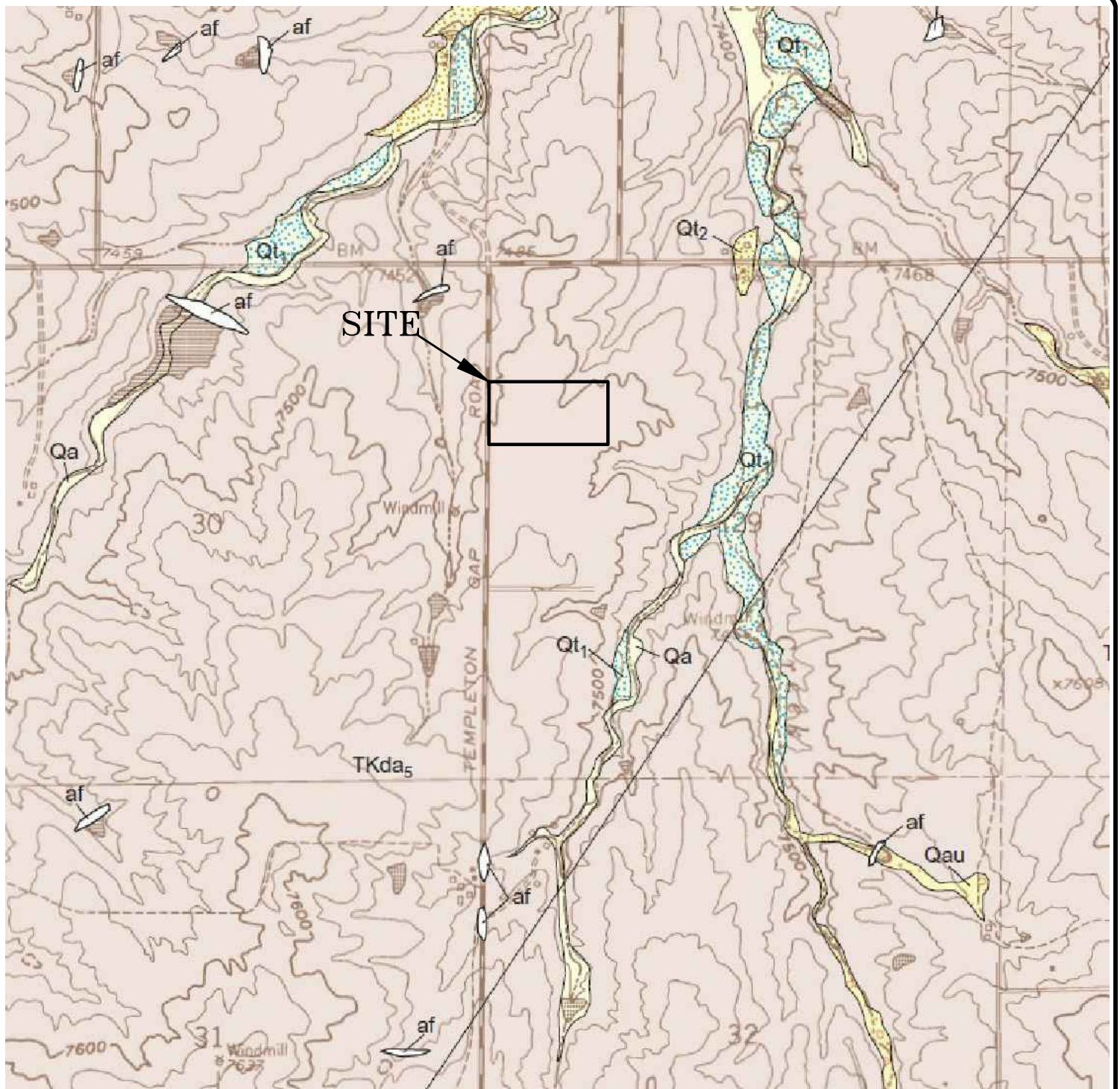
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FIG NO.:  
4



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BLACK FOREST QUADRANGLE GEOLOGIC MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

DRAWN:  
LLL

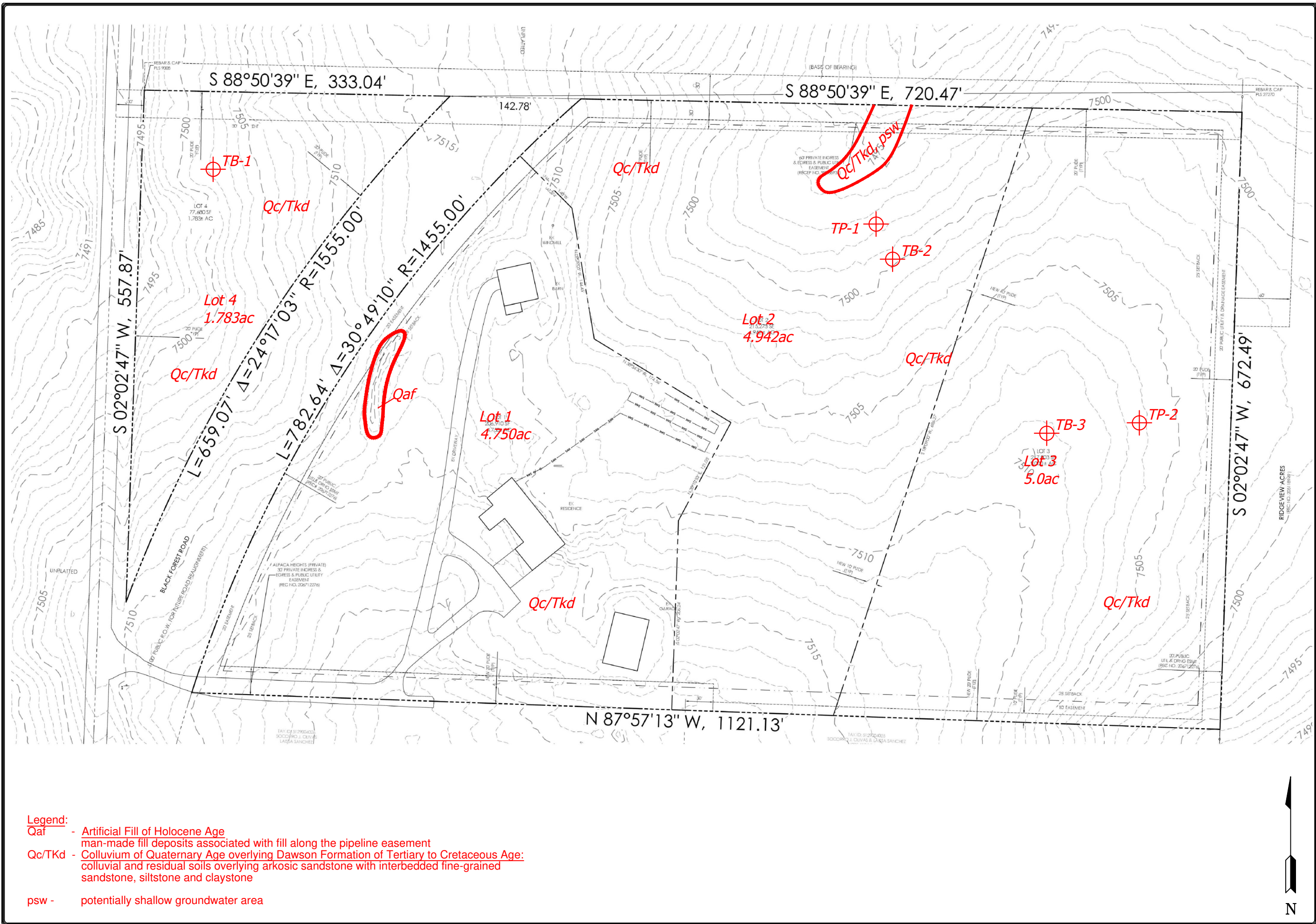
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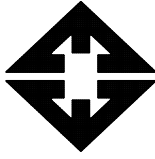
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221947

FIG NO.:  
5



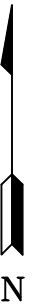
- Legend:**
- Qaf** - Artificial Fill of Holocene Age  
man-made fill deposits associated with fill along the pipeline easement
  - Qc/TKd** - Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age:  
colluvial and residual soils overlying arkosic sandstone with interbedded fine-grained  
sandstone, siltstone and claystone
  - psw** - potentially shallow groundwater area

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GEOLOGY/ENGINEERING GEOLOGY MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

DRAWN LLI CHECKED
DATE 10/20/22
SCALE AS SHOWN
JOB NO. 221947
FIGURE No. 6



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FEMA FLOODPLAIN MAP  
HILL SUBDIVISION  
ALPACA HEIGHTS & BLACK FOREST ROAD  
EL PASO COUNTY, CO.  
FOR: DOUG HILL

DRAWN:  
LLL

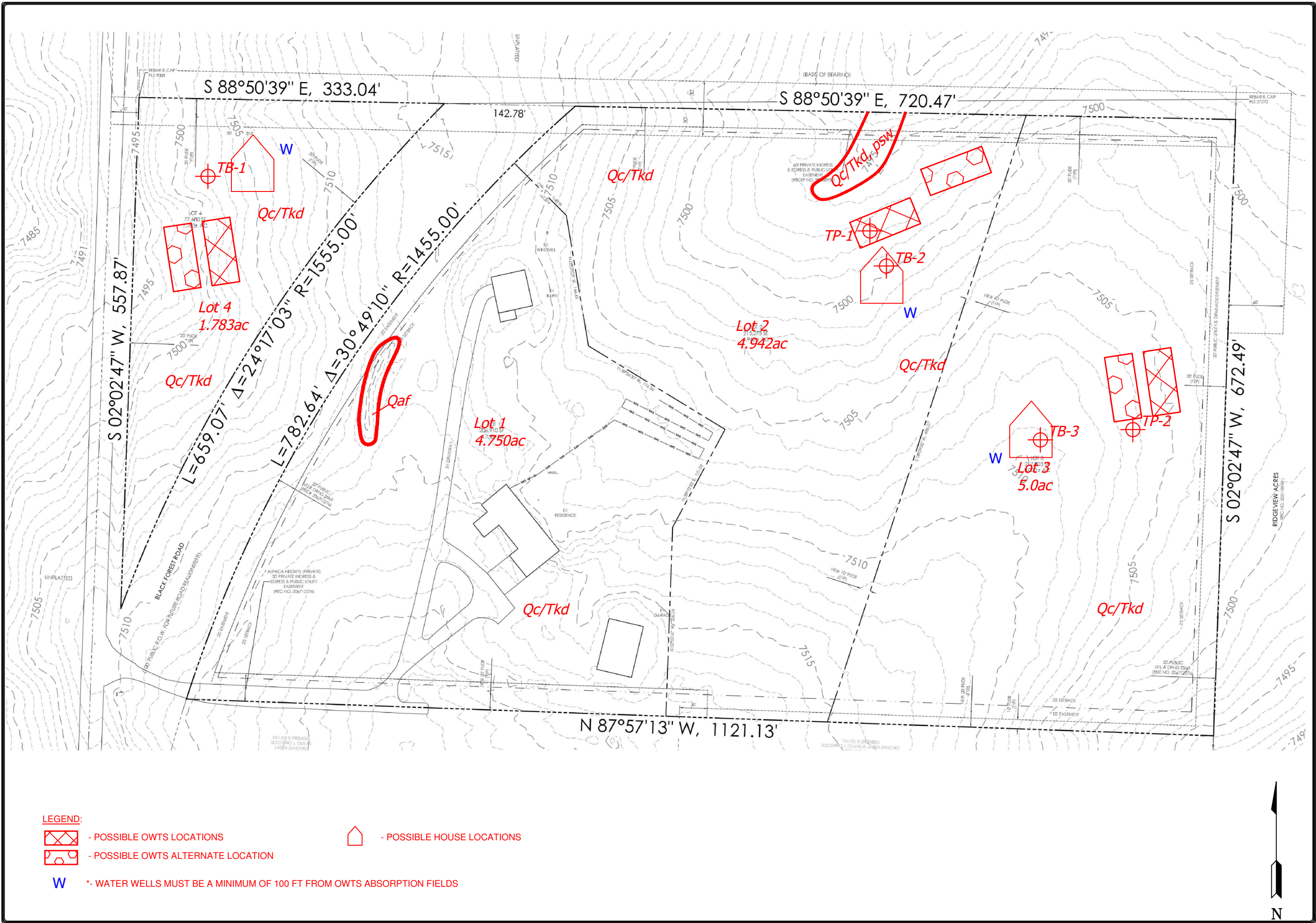
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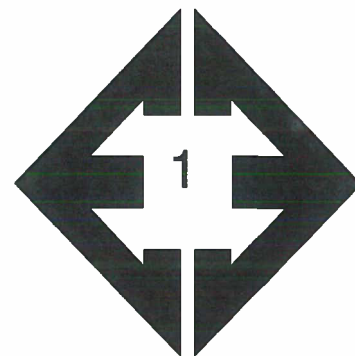
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FIG NO.:  
7

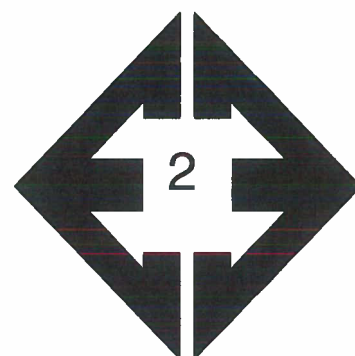


## **APPENDIX A: Photographs**



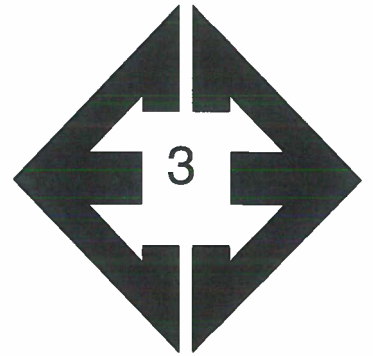
**Looking northwest  
from the southern  
portion of the site.**

September 21, 2022



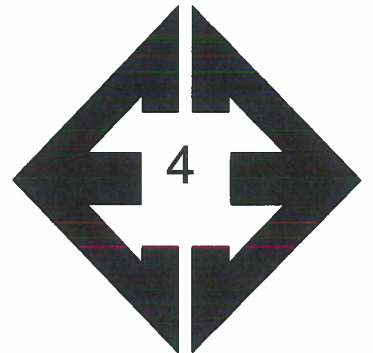
**Looking northwest  
from the central  
portion of the site.**

September 21, 2022



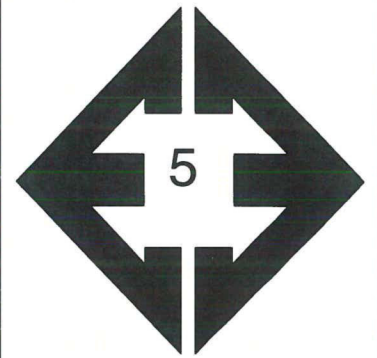
**Looking north along  
from the southeastern  
portion of the site.**

September 21, 2022



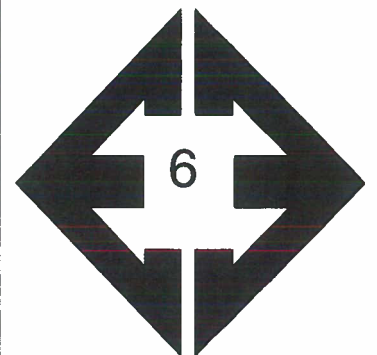
**Looking northeast  
from the southern  
portion of the site.**

September 21, 2022



**Looking southwest  
from the northeastern  
portion of the site.**

September 21, 2022



**Looking south from  
the northwestern  
portion of the site.**

September 28, 2022

## **APPENDIX B: Test Boring & Test Pit Logs**

TEST BORING NO. 1  
 DATE DRILLED 9/28/2022  
 Job # 221947

TEST BORING NO. 2  
 DATE DRILLED 9/28/2022  
 CLIENT DOUG HILL  
 LOCATION ALPACA HTS. & BLACK FOREST

REMARKS

DRY TO 17', 9/29/22

SAND, SLIGHTLY SILTY, FINE  
 TO COARSE GRAINED, TAN,  
 MEDIUM DENSE, MOIST

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			28	5.1	1
5			20	9.1	1
10			18	9.6	1
15			50 6"	6.4	3
20			50 6"	7.5	3

REMARKS

DRY TO 19', 9/29/22

SAND, SLIGHTLY SILTY, FINE  
 TO COARSE GRAINED, TAN,  
 MEDIUM DENSE, DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			27	2.3	1
5			18	1.0	1
10			20	5.1	1
15			18	6.8	1
20			24	4.0	1



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TEST BORING LOG

DRAWN:

DATE:

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 LLL

DATE:  
 10/4/22

JOB NO.:  
 221947

FIG NO.:  
 B-1

TEST BORING NO. 3  
 DATE DRILLED 9/28/2022  
 Job # 221947

TEST BORING NO.  
 DATE DRILLED  
 CLIENT DOUG HILL  
 LOCATION ALPACA HTS. & BLACK FOREST

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 18', 9/29/22													
CLAY, VERY SANDY, TAN, STIFF, MOIST													
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST TO DRY	5			18	8.0	2		5					
	10			20	5.6	1		10					
	15			33	2.5	1		15					
	20			27	4.2	1		20					
				18	3.8	1							



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### TEST BORING LOG

DRAWN:

DATE:

CHECKED:  
 LLL













DATE:  
 10/4/22














JOB NO.:  
 221947

FIG NO.:  
 B-2

TEST PIT NO. 1  
 DATE EXCAVATED 9/29/2022  
 Job # 221947

TEST PIT NO. 2  
 DATE EXCAVATED 9/29/2022  
 CLIENT DOUG HILL  
 LOCATION ALPACA HTS & BLACK FOREST RD

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil (0-4 inches)	1					
sandy clay, fine to medium grained, brown, moist	2			bl	m	4
	3					
	4					
	5			bl	m	4
	6					
	7					
	8					
	9					
	10					

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
refusal @ 6-feet 0-inches	1					
topsoil (0-4 inches)	2			bl	m	4
sandy clay, fine to medium grained, brown, moist	3					
	4			bl	m	4
	5					
	6			bl	m	4
	7					
	8					
	9					
	10					

Soil Structure Shape  
 granular - gr  
 platy - pl  
 blocky - bl  
 prismatic - pr  
 single grain - sg  
 massive - ma

Soil Structure Grade  
 weak - w  
 moderate - m  
 strong - s  
 loose - l



**ENTECH  
 ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

## TEST PIT LOG

DRAWN:  
jhr

DATE:  
10/3/2022

CHECKED:  
LLL

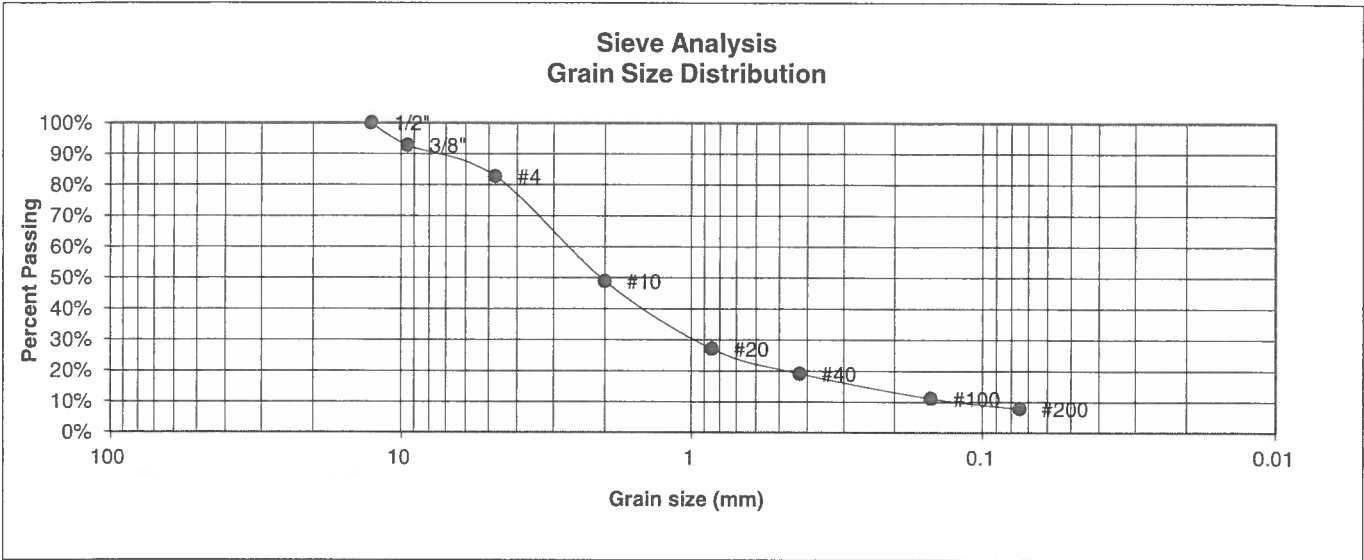
DATE:  
10/4/22

JOB NO.:  
221947

FIG NO.:  
B-3

## **APPENDIX C: Laboratory Test Results**

BORING NO.	2	UNIFIED CLASSIFICATION	SM-SW	TEST BY	BL
DEPTH(ft)	5	AASHTO CLASSIFICATION		JOB NO.	221947
CLIENT	DOUG HILL				
PROJECT	ALPACA HTS. & BLACK FOREST				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	92.7%
4	82.7%
10	48.9%
20	27.1%
40	19.1%
100	11.1%
200	7.8%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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



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505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

### LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LL

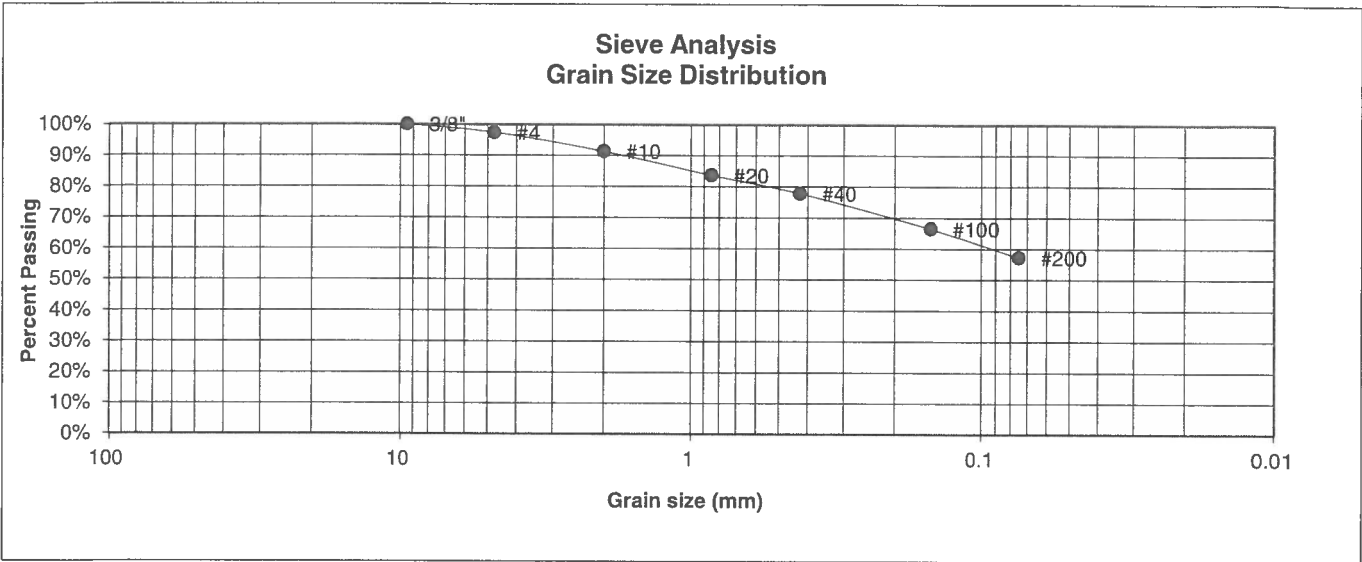
10/4/22

JOB NO.:  
221947

FIG NO.:

C-1

BORING NO.	3	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	221947
CLIENT	DOUG HILL				
PROJECT	ALPACA HTS. & BLACK FOREST				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.3%
10	91.3%
20	83.7%
40	77.8%
100	66.5%
200	57.2%

Atterberg  
Limits  
Plastic Limit  
Liquid Limit  
Plastic Index

<u>Swell</u>	
Moisture at start	7.9%
Moisture at finish	20.9%
Moisture increase	13.0%
Initial dry density (pcf)	103
Swell (psf)	580



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COLORADO SPRINGS, COLORADO 80907

### LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

LL

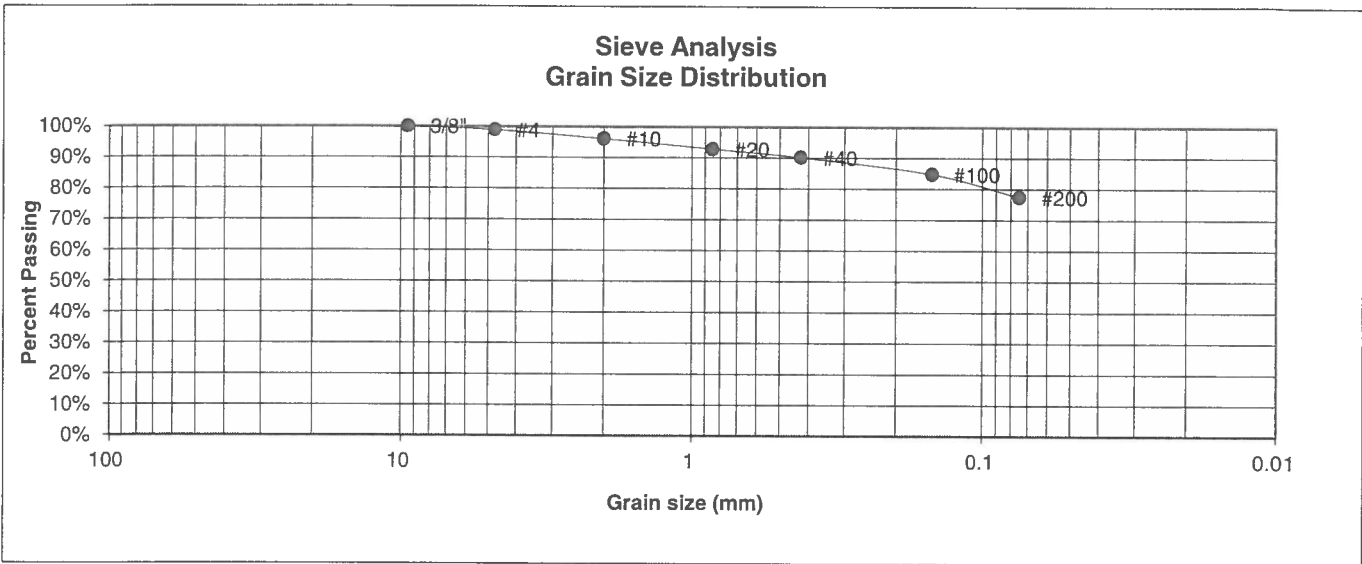
10/4/22

JOB NO.:  
221947

FIG NO.:

C-2

BORING NO.	TP-1	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	2	AASHTO CLASSIFICATION		JOB NO.	221947
CLIENT	DOUG HILL				
PROJECT	ALPACA HEIGHTS AND BLACK FOREST				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.9%
10	96.0%
20	92.8%
40	90.1%
100	84.8%
200	77.4%

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:

LL

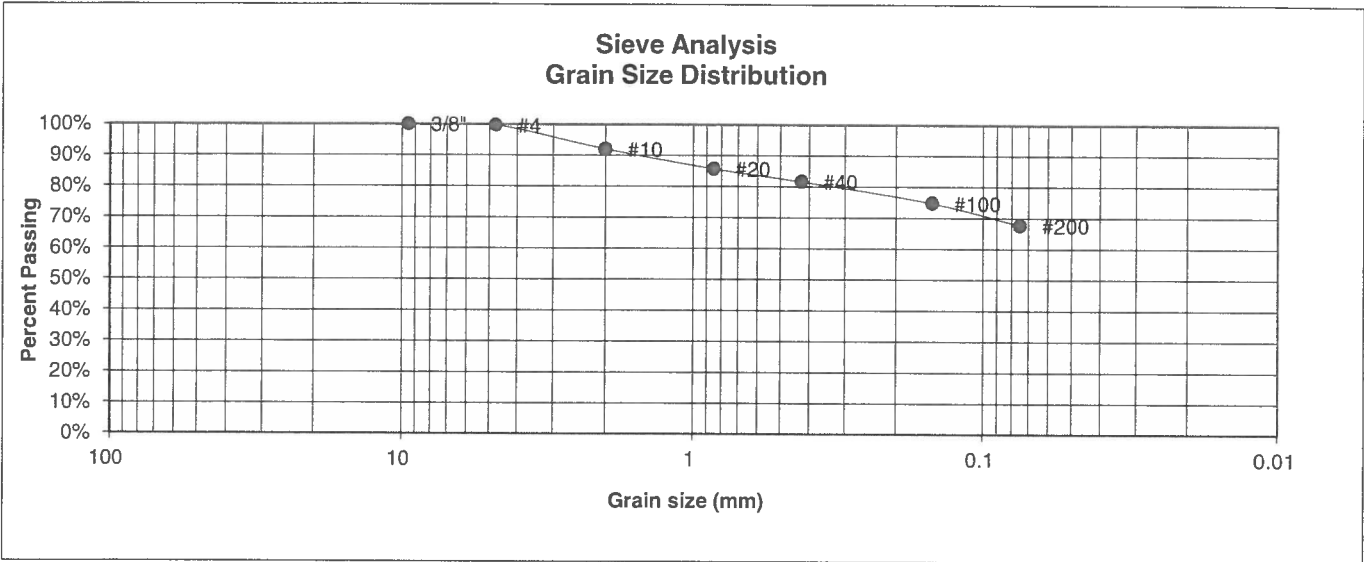
10/4/22

JOB NO.:  
221947

FIG NO.:

C-3

BORING NO.	TP-2	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	4	AASHTO CLASSIFICATION		JOB NO.	221947
CLIENT	DOUG HILL				
PROJECT	ALPACA HEIGHTS AND BLACK FOREST				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.6%
10	92.0%
20	85.7%
40	81.6%
100	74.7%
200	67.6%

Atterberg  
Limits  
Plastic Limit  
Liquid Limit  
Plastic Index

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



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ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

### LABORATORY TEST RESULTS

DRAWN:

DATE:

CHECKED:  
LL

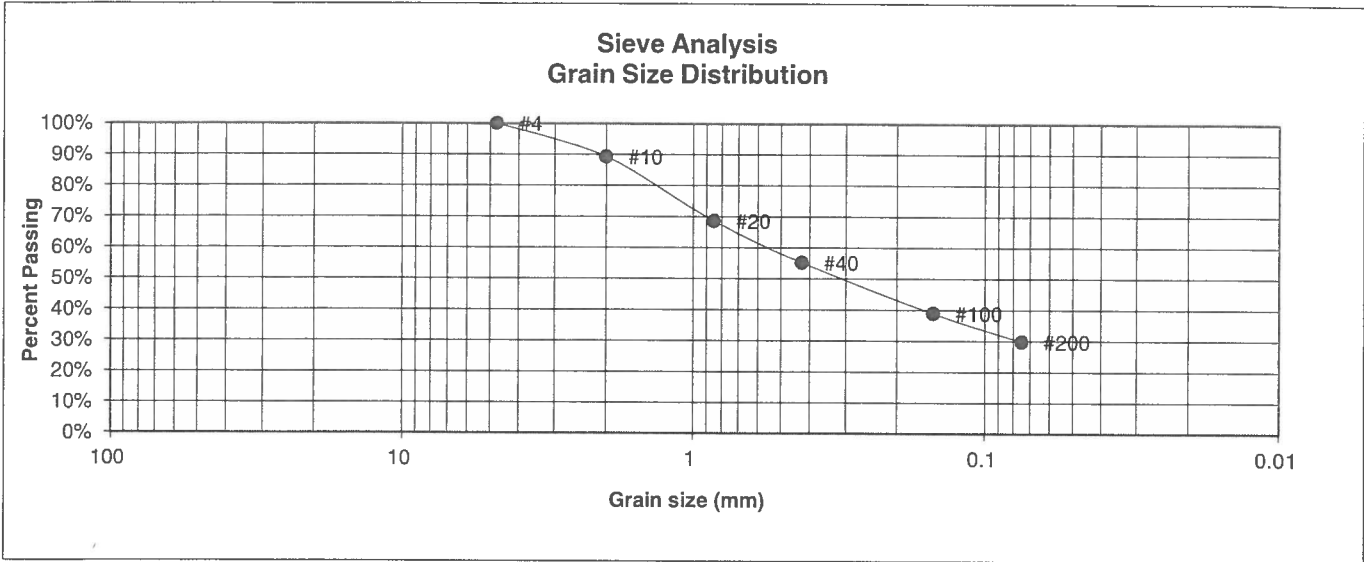
DATE:  
10/4/22

JOB NO.:  
221947

FIG NO.:

C-4

BORING NO.	1	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	15	AASHTO CLASSIFICATION		JOB NO.	221947
CLIENT	DOUG HILL				
PROJECT	ALPACA HTS. & BLACK FOREST				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	89.2%
20	68.6%
40	55.2%
100	38.9%
200	29.8%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

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:

LL

DATE:

10/4/22

JOB NO.:  
221947

FIG NO.:

C-5

## **APPENDIX D: Soil Survey Descriptions**

## El Paso County Area, Colorado

### 15—Brussett loam, 3 to 5 percent slopes

#### Map Unit Setting

*National map unit symbol:* 367k

*Elevation:* 7,200 to 7,500 feet

*Frost-free period:* 115 to 125 days

*Farmland classification:* Prime farmland if irrigated

#### Map Unit Composition

*Brussett and similar soils:* 85 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Brussett

##### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Eolian deposits

##### Typical profile

*A - 0 to 8 inches:* loam

*BA - 8 to 12 inches:* loam

*Bt - 12 to 26 inches:* clay loam

*Bk - 26 to 60 inches:* silt loam

##### Properties and qualities

*Slope:* 3 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Low

*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

*Calcium carbonate, maximum content:* 5 percent

*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Available water supply, 0 to 60 inches:* High (about 9.1 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Ecological site:* R048AY222CO - Loamy Park

*Hydric soil rating:* No

### **Minor Components**

#### **Other soils**

*Percent of map unit:*

*Hydric soil rating:* No

## **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 20, Sep 2, 2022

## El Paso County Area, Colorado

### 68—Peyton-Pring complex, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369f

*Elevation:* 6,800 to 7,600 feet

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Peyton and similar soils:* 40 percent

*Pring and similar soils:* 30 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Peyton

##### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

##### Typical profile

*A - 0 to 12 inches:* sandy loam

*Bt - 12 to 25 inches:* sandy clay loam

*BC - 25 to 35 inches:* sandy loam

*C - 35 to 60 inches:* sandy loam

##### Properties and qualities

*Slope:* 3 to 5 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Low

*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 7.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4c

*Hydrologic Soil Group:* B

*Ecological site:* R049XY216CO - Sandy Divide

*Hydric soil rating:* No

## Description of Pring

### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Arkosic alluvium derived from sedimentary rock

### Typical profile

*A - 0 to 14 inches:* coarse sandy loam

*C - 14 to 60 inches:* gravelly sandy loam

### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well 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 6.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* B

*Ecological site:* R048AY222CO - Loamy Park

*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

## Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 20, Sep 2, 2022

## **APPENDIX E: El Paso County Health Department Septic Records**

ON 0032229

EL PASO COUNTY DEPARTMENT OF HEALTH AND ENVIRONMENT  
INDIVIDUAL SEWAGE DISPOSAL SYSTEM INSPECTION FORM

Permit #

Date May 13, 2005

APPROVED: Yes ☒ No ☐

Environmental Health Specialist:

Brad Wallace

Address 6910 Alpacas Heights

Owner STEWART

Legal Description TR in NW 4 Sec. 29-11-65

Residence ☒ # Bedrooms 4 Commercial ☐ System Installer J+K Excavating

SEPTIC TANK:

Commercial ☒ Noncommercial ☐ Construction Material Concrete Capacity Gallon 1,500

DISPOSAL FIELD:

Trench: Depth (Range) Width Total Length Sq. Ft.

Bed: Depth (Range) Length Width Sq. Ft.

Depth of Rock Under PVC Type of cover on Rock

DRYWELLS: # of Pits Rings (Pit 1) Rings (Pit 2) Working Depth #1 #2

Size (L x W) #1 #2 Total Sq. Ft.

ROCKLESS SYSTEMS:

Standard Chamber: Type Infiltrators #Chambers 59 Sq. Ft./Chamber 15.5 Bed Trench X

High Profile Units: Type Chamber #Chambers Sq. Ft./Chamber Bed Trench

Reduction Allowed 40 % Sq. Ft. Required 1,524 Depth (Range) 30" - 36"

Sq. Ft. Installed Equivalent Sq. Ft. Installed with Reduction 1,524 FT<sup>2</sup>

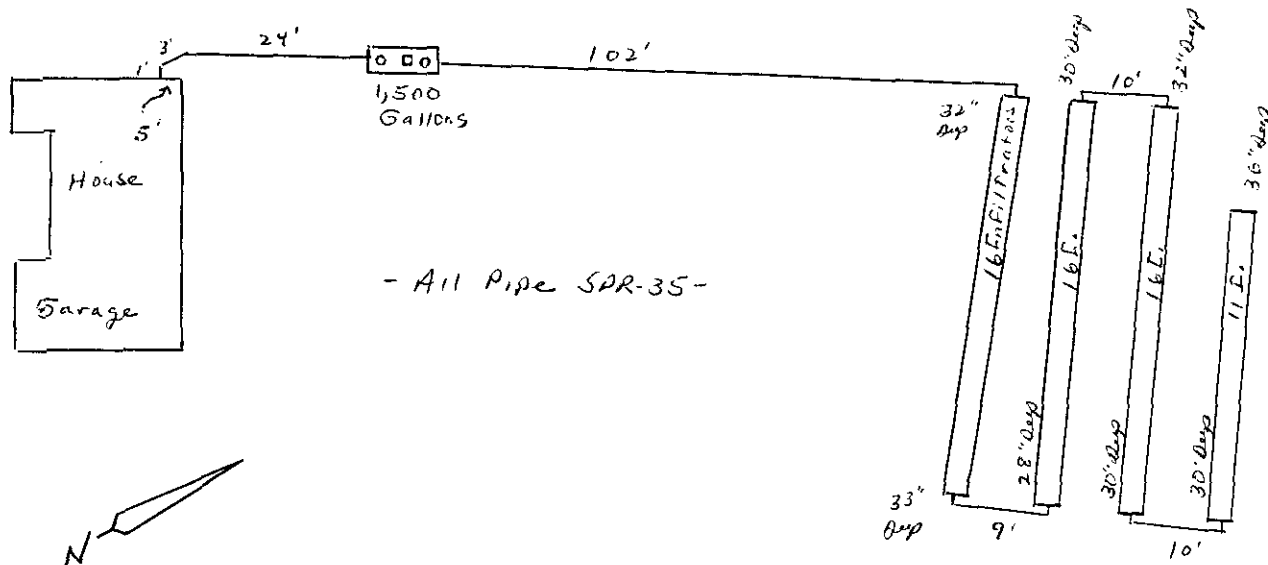
Engineer Design: Y (N) Engineering Firm

Approval letter provided? Y N

Well installed at time of septic system inspection? Y (N) Public Water?

\*Approval will be revoked if in the future the well is found to be within 50 feet of the septic tank and/or 100 feet of the disposal field.

NOTES:



EL PASO COUNTY  
DEPARTMENT OF HEALTH AND ENVIRONMENT  
301 S Union Blvd, Colorado Springs, Colorado 719-575-8636

INDIVIDUAL SEWAGE DISPOSAL SYSTEM PERMIT

222

OWNER NAME: CHARLES AND HELEN STEWART  
ADDRESS: 6910 ALPACA HEIGHTS  
CITY, STATE, ZIP: COLORADO SPRINGS CO 80908  
INSTALLED BY:

PERMIT NUMBER: ON0006324  
DATE PERMITTED: 4/7/2005  
PHONE NUMBER: 7194885594

This permit is issued in accordance with 25-10-107 Colorado Revised Statutes. PERMIT EXPIRES upon completion-installation of sewage-disposal system or at the end of twelve (12) months from date of issue- whichever occurs first-(unless work is in progress). If both a building and an ISDS permit are issued for the same property and construction has not commenced prior to the expiration date of the building permit, the ISDS permit shall expire at the same time as the building permit. This permit is revokable if all stated requirements are not met.

Sewage disposal system to be installed by an El Paso County Licensed System Contractor or the property owner.

THIS PERMIT DOES NOT DENOTE APPROVAL OF ZONING AND ACREAGE REQUIREMENTS.

*Rosemary C. Baker-Martin*

DIRECTOR, EL PASO COUNTY DEPARTMENT OF HEALTH AND ENVIRONMENT

PERMIT EXPIRATION DATE :  
Expires twelve months from date of issue

*Brad Walker* 578-3127  
ENVIRONMENTALIST / PHONE NUMBER\*

\* NOTE: FOR INSPECTIONS CALL 575-8699 BEFORE 8:30 A.M. OF THE DAY TO BE INSPECTED.  
(WEEKENDS & HOLIDAYS EXCLUDED)

LEAVE THE ENTIRE SEWAGE DISPOSAL SYSTEM UNCOVERED FOR FINAL INSPECTION.

WATER SOURCE: WELL

MINIMUM SEPTIC TANK SIZE : 1,500 GALLONS MINIMUM ABSORPTION AREA REQUIRED 1,524 SQ FT

PLANNING DEPARTMENT



ENUMERATION



FLOOD PLAIN



WASTEWATER



COMMENTS:

INSTALL LEACH FIELD IN AREA AND AVERAGE DEPTH (34 INCHES) OF PERCOLATION TEST. RUNOFF FROM HOUSE MUST NOT FLOW INTO LEACH FIELD AREA. LEACH FIELD AREA MUST NOT BE COMPACTED BY VEHICLE OR LIVESTOCK TRAFFIC, A BARRIER IS RECOMMENDED.

The Health Office shall assume no responsibility in case of failure or inadequacy of a sewage-disposal system, beyond consulting in good faith with the property owner or representative. Free access to the property shall be authorized at reasonable time for the purpose of making such inspections as are necessary to determine compliance with requirements of this law.

FOR ADMINISTRATIVE USE ONLY

Permit Ready: *4-7-05* Called \_\_\_\_\_ Mailed \_\_\_\_\_

Final Inspection Requested: BY: *John - JOK*

Date Called In: *5/13/05 7:16*

Phone # *331-4324*

Septic Site will be ready: *afternoon*

*481-2417*

## EL PASO COUNTY ENVIRONMENTAL HEALTH SERVICES

301 South Union Boulevard • Colorado Springs, CO • 80910-3123 • (719) 578-3125 • Fax: (719) 578-3188

ALL PAYMENTS ARE DUE AT TIME OF SUBMITTAL IN CASH OR CHECK

## APPLICATION FOR AN ON-SITE WASTEWATER TREATMENT SYSTEM PERMIT

☒ NEW CONSTRUCTION ☐ MINOR REPAIR ☐ MAJOR REPAIR/ADD

Owner

Daytime Phone

Address of Property

City &amp; Zip

Legal Description

Owner's MAILING Address

City, State &amp; Zip

Lot Size

Tax Schedule #

Type of Building:

☒ Frame☐ Modular☐ Mobile☐ Commercial☐ Manufactured☐ Other

Water Supply:

☒ Well or Spring☐ Cistern☐ Public

Inside City Limits:

☒ No☐ Yes-City☐ MAIL PERMIT OR☒ PICK UP PERMIT☐ THERE IS AN ADDITIONAL RESIDENCE ON THIS PROPERTY

MAXIMUM POTENTIAL NUMBER OF BEDROOMS

Percolation Test Attached ☒ Y ☐ NBasement ☒ Y ☐ NGarbage Disposal ☒ Y ☐ NClothes Washer ☒ Y ☐ N

I have supplied a plot plan as described on the back of this form. I acknowledge the completeness of the application is conditional upon such further mandatory and additional tests and reports as may be required by the Department to be made and furnished by an applicant for purposes of evaluating the application, and issuance of the permit is subject to such terms and conditions as deemed necessary to ensure compliance with rules and regulations adopted pursuant to C.R.S. 25-10-107 et. seq. I hereby certify all represented to be true and correct to the best of my knowledge and belief, and are designed to be relied on by the El Paso County Department of Health and Environment in evaluating the same for purposes of issuing the permit applied for herein. I further understand any falsification or misrepresentation may result in the denial of the application or revocation of any permit granted based upon said application and in legal action for perjury as provided by law.

OWNER'S SIGNATURE

Date

You will be notified by telephone when your permit is ready for pick up. Please allow a minimum of 10 days for new septic.

## DEPARTMENT OF HEALTH USE ONLY

Minimum Tank Capacity

Minimum Absorption Area

Date of Site Inspection

REMARKS

1,500 Gallons  
1524 FT<sup>2</sup>  
4-6-05

Install Leach Field in area and average depth (34")  
of perc test. Runoff from house must NOT flow into  
Leach Field area. Leach Field area must not be compacted  
by vehicle or livestock traffic, a barrier is recommended.

EHS INSPECTOR

DATE

APPROVED

DENIED

## FEES AS OF 01/01/04:

NEW CONSTRUCTION \$483.00 + Planning Department Surcharge of \$30. = \$513.00

MAJOR REPAIR/ADDITION \$489.00

MINOR REPAIR/ADDITION \$263.00

DATE TO PLANNING / WASTEWATER:

DATE TO FLOODPLAIN/ENUMERATIONS

PLEASE COMPLETE THE BACK OF THIS FORM

1) We require an original of your **PERCOLATION (PERC) TEST** with an original professional engineer's (PE) stamp and signature as well as a plot of the percolation test hole locations with measurements from a fixed reference point.

2) **PROPI**  
**ROAD**  
**RETUI**

COUNTY HEALTH  
DEPARTMENT

**OT NUMBER MUST BE POSTED AND CLEARLY VISIBLE FROM  
BE CLEARLY MARKED OR AN ADDITIONAL CHARGE FOR A  
MAY BE ASSESSED.**

3) A **PLO**

1) a no

2) prop

3) prop

not to scale) on an 8 1/2 x 11 sheet of paper. The plot plan must include:

1) buildings (proposed or existing)

2) proposed septic-system site

3) alternate septic system site

4) driveway (proposed or

5) existing and name of

6) adjoining street)

4) Initial a  
**PLAN.**

W

Ci

5) Initial an  
**PLOT P**

04-01-2005 FRI 470  
457.00  
OWS ENTY BURCH. 119.00  
5067L 525.00  
TOTAL 525.00  
CHECK 517.00  
CHARGE 20.00  
CHANGE 5.00

ires that apply to your property and **INCLUDE** them on your **PLOT**

Adjacent property well(s)

Subsoil drain

Waterline

within 100 feet of your proposed septic system and **INCLUDE** on your

Lake(s)

Stream(s)

Natural drainage course(s)

Dry Gulch(es)

6) **GIVE COMPLETE DIRECTIONS TO THE PROPERTY FROM A MAIN HIGHWAY**

I-25 North to the monument / Hwy 105 Exit

to EAST on Hwy 105 to Hwy 83

Take 83 South to Hodgen Rd.

turn left (east) on Hodgen to Black Forest Rd.

Turn Right (south) on Black Forest Road

property located on left hand side.

turn left onto Alpaca Heights.