ENTECH
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SOIL, GEOLOGY, GEOLOGIC HAZARD, AND WASTEWATER STUDY ARVIDSON SUBDIVISION 2310 WAKONDA WAY MONUMENT, COLORADO

Prepared for

Jenna and Matthew Arvidson
2310 Wakonda Way
Monument, Colorado 80132

Attn: Jenna and Matthew Arvidson

September 14, 2017

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford
Geologist

LLL/nc

Encl.

Entech Job No. 171248
AAprojects/2017/171248 countysoil/geo/ww

Reviewed by:

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

COLORADO LICENSED
JOSEPH COLLIN GOODE JR
23725
9.14.17
PROFESSIONAL ENGINEER

please add EPC project number to the cover of this document

TABLE OF CONTENTS

1.0 SUMMARY

Project Location

The project lies in a portion of the SE¼ of the SE¼ of Section 3, Township 11 South, Range 67 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 1¼ miles north of Monument, Colorado.

Project Description

Total acreage involved in the project is approximately 5 acres. The proposed site development consists of two single-family rural residential lots. The existing structure is to remain on Lot 1. The development will utilize an individual well and on-site wastewater treatment system.

Scope of Report

This report presents the results of our geologic evaluation, treatment of engineering geologic hazard study and wastewater study for individual on-site wastewater treatment systems.

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 potentially unstable slopes, shallow bedrock, and seasonal shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some impact 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.

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in a portion of the SE¼ of the SE¼ of Section 3, Township 11 South, Range 67 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 1¼ miles north of Monument, Colorado, northwest of Beacon Lite Road and Wakonda Way. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site varies of gradually to steeply sloping generally to the south and southwest, with moderate to steep slopes along the ridge that bisects the property. The steepest slopes are located along the road cut in the southwestern portion of the site on the north side of Wakonda Way. The drainages on-site flow in southerly and southwesterly directions through the western and southeastern portions of the site. 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 grazing and pasture land. The site contains primarily field grasses, weeds, cacti, yucca, Ponderosa Pines and scrub oak. The existing house located on Lot 1 will remain. An existing septic system and water well are located at the house. The septic system was previously abandoned and the house is now tied into Monument Sanitation sewer. El Paso County Health Department records for the septic are included in Appendix E. Site photographs, taken August 16, 2017, are included in Appendix A.

Total acreage involved in the proposed development is approximately 5 acres. Two single-family rural residential lots are proposed. The proposed lots are approximately 2.1 and 2.3 acres each. The new lot will be serviced by an individual well and on-site wastewater treatment system. The proposed Development Plan is presented in Figure 3.

Please state what time of year your inspection took place, and if the lack of water is normal for that time of year. Is this flow area something the home builder should avoid? if so, please show the limits of avoidance on one of your exhibits. or state mitigation measures.

3.0 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.

- The site will be evaluated for individual on-site wastewater treatment systems in accordance with El Paso Land Development Code.

which exhibit is this?

4.0 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 air 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 August 18, 2017.

Two (2) test pits were performed on Lot 2 to determine general suitability of the site for the use of an on-site wastewater treatment system and provide foundation recommendations. The locations of the test pits are indicated on the Development Plan/Test Boring Location Map, Figure 3. The 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. A Summary of Laboratory Test Results is presented in Table 1.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province along the Palmer Divide. Approximately 3 miles to the west 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 the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northeasterly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Tertiary to Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Arkose Formation. Overlying this formation are unconsolidated deposits of residual soils, and alluvial soils of the Quaternary Age. The residual soils are produced by the in-situ action of weathering of the bedrock on site. The alluvial soils were deposited by water in the drainages on site. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has mapped one soil type on the site (Figure 4). In general, it consists of gravelly loamy sands. The soils are described as follows:

Type	Description
41	Kettle Gravelly Loamy Sands, 8-40% slopes

Complete description of the soil type is presented in Appendix D. The soils have generally been described to have moderate to moderately rapid permeabilities. Roads may need to be designed to minimize frost-heave potential. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have slight to moderate erosion hazards.

5.3 Site Stratigraphy

The Monument Quadrangle Geology Map showing the site is presented in (Figure 5, Reference 4). The Geology Map prepared for the site is presented in (Figure 6). Four mappable units were identified on this site which are described as follows:

Qal **Recent Alluvium of Holocene Age:** These are recent deposits that have been deposited along the drainage that exist on-site. These materials typically consist of silty to clayey sands and sandy clays. Some of these alluviums contain highly organic soils.

Qaf **Artificial Fill of Holocene Age:** These are man-made fill deposits associated with the erosion berm in the southeast portion of Lot 1.

Qas_1 **Younger Piedmont-Slope Alluvium of Holocene Age:** These are sheetwash and stream-deposited alluvium associated with Monument Creek and its tributaries. These materials consist of gravelly to silty to clayey sands.

Tkd **Dawson Formation of Tertiary to Cretaceous Age:** The Dawson formation typically consists of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation is a variable layer of residual soil. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. These soils consisted of silty to clayey sands and sandy clays.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Monument Quadrangle* distributed by the Colorado Geological Survey in 2003 (Reference 4), 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 Denver 1^0 x 2^0 Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 6). The Test Pits and Profile Holes were also used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

5.4 Soil Conditions

The soils encountered in the Test Pits can be grouped into one general soil type. The test pit soils were classified using the USDA Textural Soil Classification and Unified Soil Classification System (USCS).

Soil Type 1 is a silty sandstone (SM). This material was encountered in both of the test pits. The sandstone was encountered at 1 foot and extended to the termination of the test pits (4 to 6 feet). A thin layer of residual soils and topsoil exists on top of the sandstone. The sandstone was encountered at dense to very dense states and moist conditions. Samples tested had 15 to 18 percent passing the No. 200 sieve. The sandstones are typically non-expansive, however; expansive clayey sandstone and claystone are common in the area.

The Test Pit Logs are presented in Appendix B. Laboratory Test Results are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

5.5 Groundwater

Groundwater was not encountered in the test pits which were excavated to depths of 4 to 6 feet. Areas of seasonal shallow groundwater have been mapped in low-lying areas and in the small drainages on-site. These areas are discussed in the following section. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time.

It should be noted that in the sandy materials on site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, detailed mapping has been performed on this site to produce an Geology/Engineering Geology Map (Figure 6). This map shows the location of various geologic conditions of which the developers should be cognizant during the planning, design and construction stages of the project. These hazards and the recommended mitigation techniques are as follows:

only soil types are shown, please show other constraints as listed in the report.

Expansive Soils

Expansive soils were not encountered in the test pits excavated on–site, however; expansive very clayey sandstone and claystone are commonly encountered within the Dawson Formation. These occurrences are typically sporadic; therefore, none have been indicated on the maps. These expansive soils, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and dealt with on an individual basis.

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. Another alternative in areas of highly expansive soils is the use of drilled pier foundation systems. Typical minimum pier depths are on the order of 20 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Floodplain and Seasonal Shallow Groundwater Area

The site is not mapped within any floodplains according to the FEMA Map No. 08041CO276F, dated March 17, 1997 (Figure 7, Reference 7). Areas of seasonal shallow groundwater were observed across the site. 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

along the southern portion of the site and in the smaller drainages in the western portion 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:

please call out these areas on one of the exhibits.

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.

Potentially Unstable Slopes

The slopes identified with this hazard exist along the road cut on the north side of Wakonda Way in the southern portion of the site. These slopes are stable in their present condition; however, considerable care must be exercised in these areas not to create a condition which would tend to activate instability.

Mitigation: These slopes lie along the southern property boundary, therefore, building from this project is not proposed on these slopes. The best mitigation for potentially unstable slopes is avoidance. The potential house location on Lot 2 is a sufficient distance away that potentially unstable slopes should not affect the proposed development.

6.1 Relevance of Geologic Conditions to Land Use Planning

As mentioned earlier in this report, we understand that the development will be rural residential. It is our opinion that the existing geologic and engineering geologic conditions will impose some minor constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the potentially unstable slope on the southwest side of the site that can be avoided. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

The upper materials are typically at medium dense states to very dense. The granular soils and sandstone bedrock encountered in the test pits should provide good support for foundations. Foundations anticipated for the site are standard spread footings bearing on medium dense sands or undisturbed sandstone. Areas containing arkosic sandstone will have high allowable bearing conditions. Difficult excavation should be anticipated in areas of shallow bedrock. Expansive layers may also be encountered in the soil and bedrock on this site. Areas of expansive soils encountered on site are sporadic; therefore, none have been indicated on the maps. Expansive clayey sandstone and claystone is common in the Dawson Formation, and may require mitigation if encountered at or within four feet of foundation grade. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development.

Areas of potentially seasonal shallow groundwater were encountered on site. These areas exists along a drainage swale located on the western side of Lot 2 and in the southeast side of Lot 1 along Wakonda Way. Water was not observed in the pond or drainages on-site. Due to the size of the lots and the proposed development, these areas can be avoided by construction. Structures should not block drainages. Leach fields should not be located in these areas due to the potential for periodic high groundwater conditions.

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design and construction or through avoidance. Investigation on each lot is recommended prior to construction.

Please call out extents on one of the exhibits.

7.0 ON-SITE WASTEWATER TREATMENT

please explain

The site was evaluated for individual on-site wastewater treatment systems in accordance with El Paso Land Development Code. Two (2) test pits were performed on the property. Test pits were located in potential location of future a system on Lot 2. The approximate locations of the Test Pits are indicated on Figure 3, on the Geology/Engineering Geology Map, Figure 6, and on the Septic Suitability Map, Figure 9. A table showing the results of the test pits is presented in Table 2. The specific percolation test results are presented in Appendix E of this report.

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has been mapped with one soil description. The Soil Survey Map (Reference 2) is presented in Figure 4, and the Soil Survey Description is presented in Appendix D. The soils are described as having moderate to moderately rapid percolation rates.

Soils encountered in the test pits consisted of gravelly sandy loam overlying silty sandstone. The limiting layers encountered in the test pits is the silty sandstone, which corresponds to an LTAR values of 0.30 gallons per day per square foot. The bedrock was encountered at approximately 1 foot in both of the test pits. These conditions will require a designed system.

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 site is evaluated and installed according to El Paso County and State Guidelines and properly maintained. Based on the testing performed as part of this investigation a designed system will be required. A Septic Suitability Map is presented in Figure 9. Additional testing may be required if the new field is not located in the tested area. 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.

please show
on the exhibit.

8.0 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), the area is not mapped with any aggregate deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 9), areas of the site are 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 "Fair" for industrial minerals. However, considering the silty to clayey nature of much of these materials and abundance of similar materials through the region and the close proximity to developed land, they would be considered to have little significance as an economic resource.

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.

9.0 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.

10.0 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some minor 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 is 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 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 Jenna and Matthew Arvidson, 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.

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT JENNA & MATTHEW ARVIDSON
PROJECT 2310 WAKANDA WAY
JOB NO. 171248

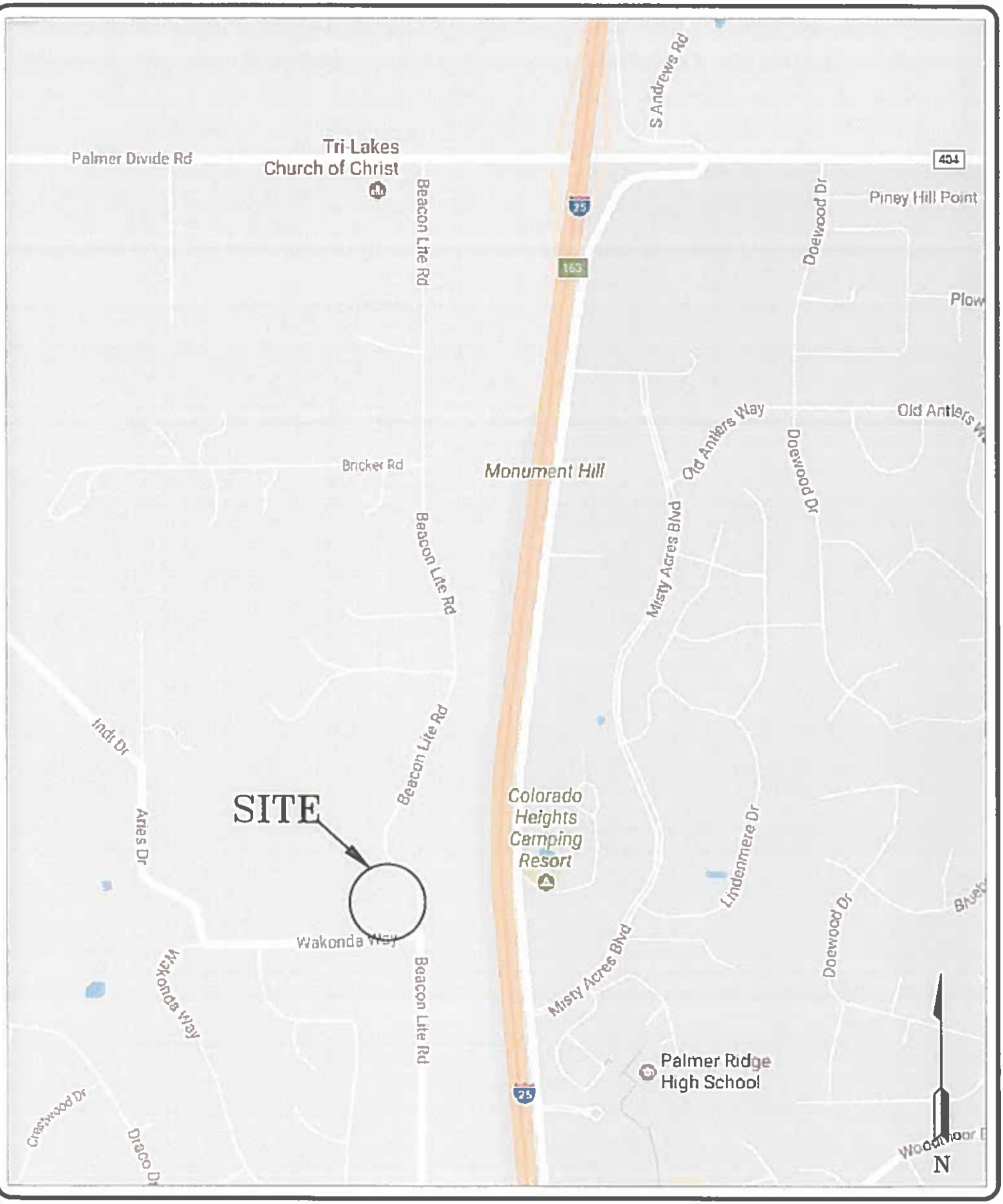
SOIL TYPE	TEST PIT NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	1-4			17.7						SM	SANDSTONE, SILTY
1	2	1-5			15.0						SM	SANDSTONE, SILTY

Table 2: Summary of Tactile Test Pit Results

Percolation Test No.	USDA Soil Classification	LTAR Value	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	3A*	0.30*	1	N/A
2	3A*	0.30*	1	N/A

*- Conditions that will require an engineered OWTS

FIGURES



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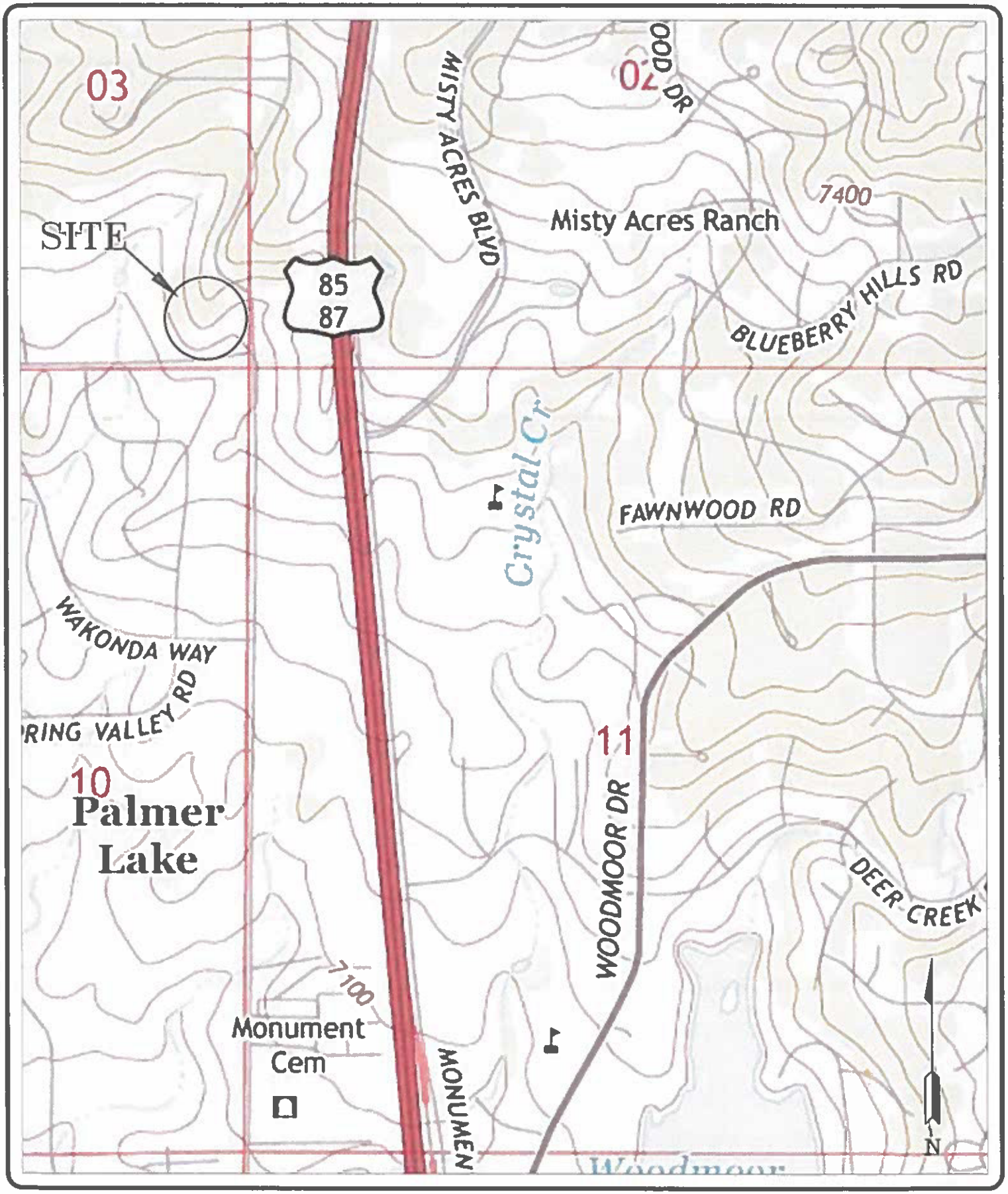
VICINITY MAP
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN:	DATE:	CHECKED:	DATE:
LLL	9/12/17		

JOB NO.: 171248

FIG NO.: 1



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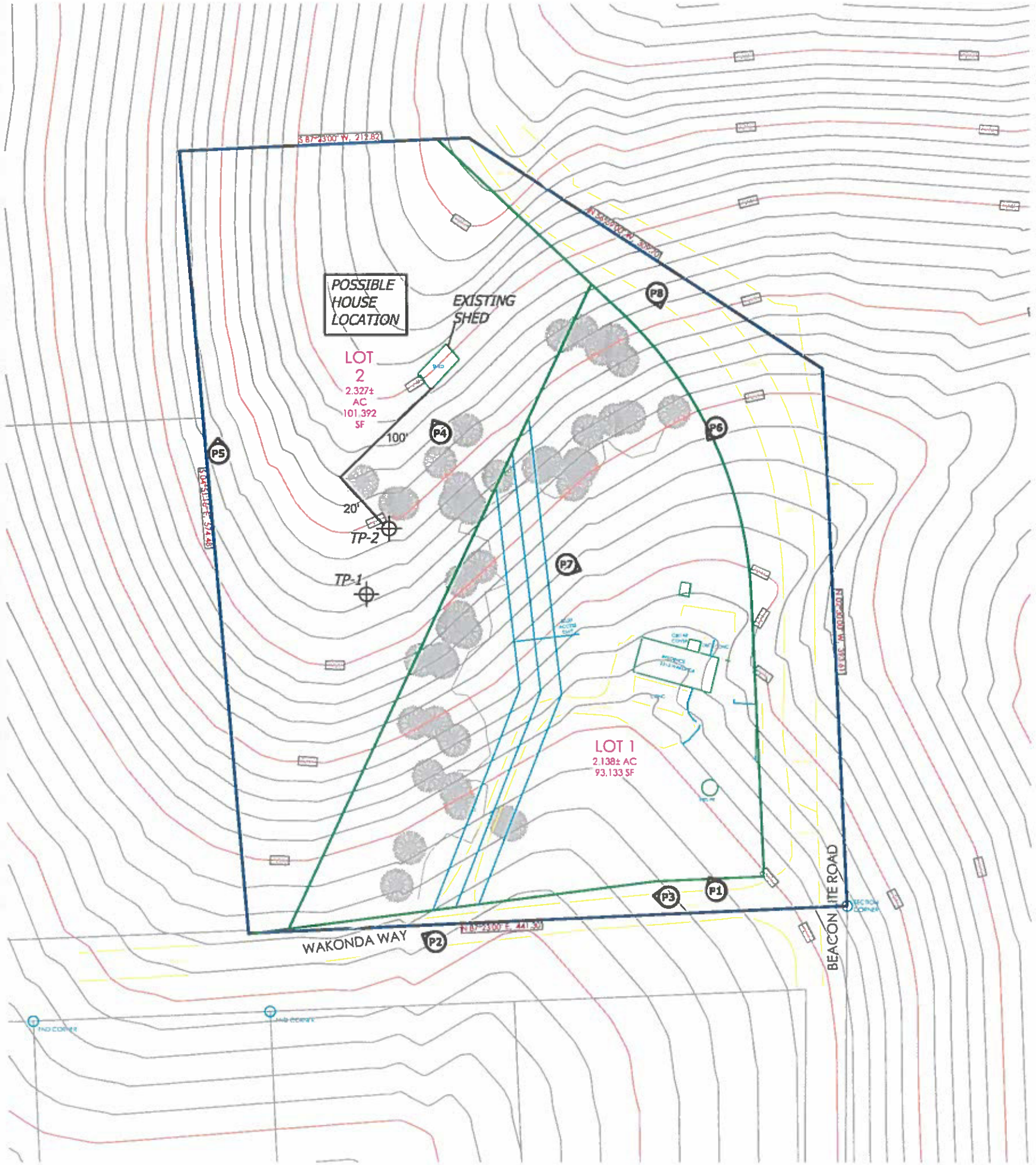
USGS MAP
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN:	DATE:	CHECKED:	DATE:
LLL	9/12/17		

JOB NO.: 171248

FIG NO.: 2



LEGEND:

TP- APPROXIMATE TEST PIT LOCATION AND NUMBER

-TP-1 (18' W X 48' S OF TP-2)

-TP-2 (100' SW X 20' SE OF THE S CORNER OF THE EXISTING SHED)

P2 - APPROXIMATE TEST PIT LOCATION AND NUMBER

REVISION	BY

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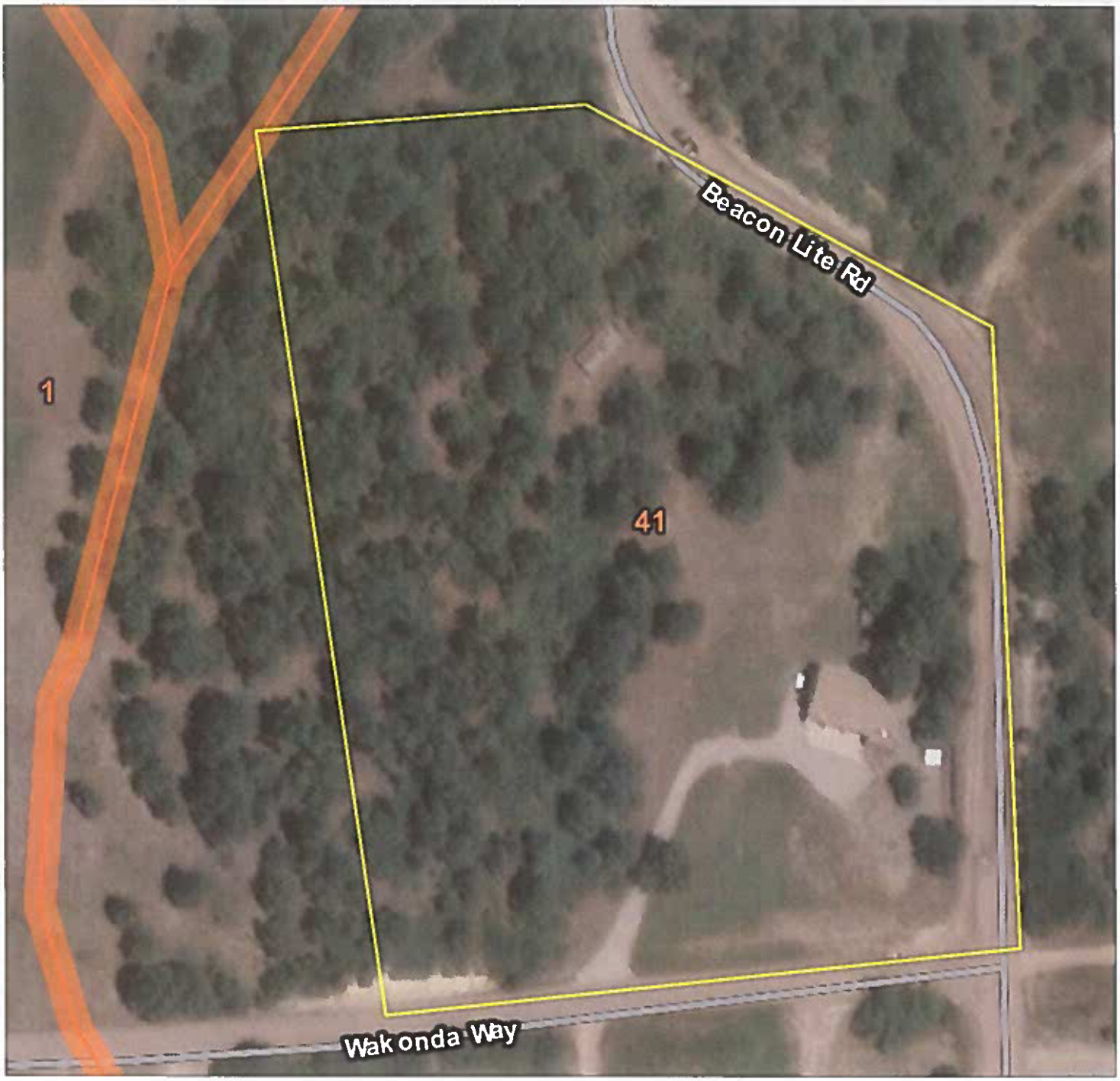
SITE PLAN/TEST PIT LOCATION MAP
ARVIDSON SUBDIVISION
2310 WAKONADA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN	LLL
CHECKED	
DATE	9/13/17
SCALE	AS SHOWN
JOB NO.	171248
FIGURE No.	3



N

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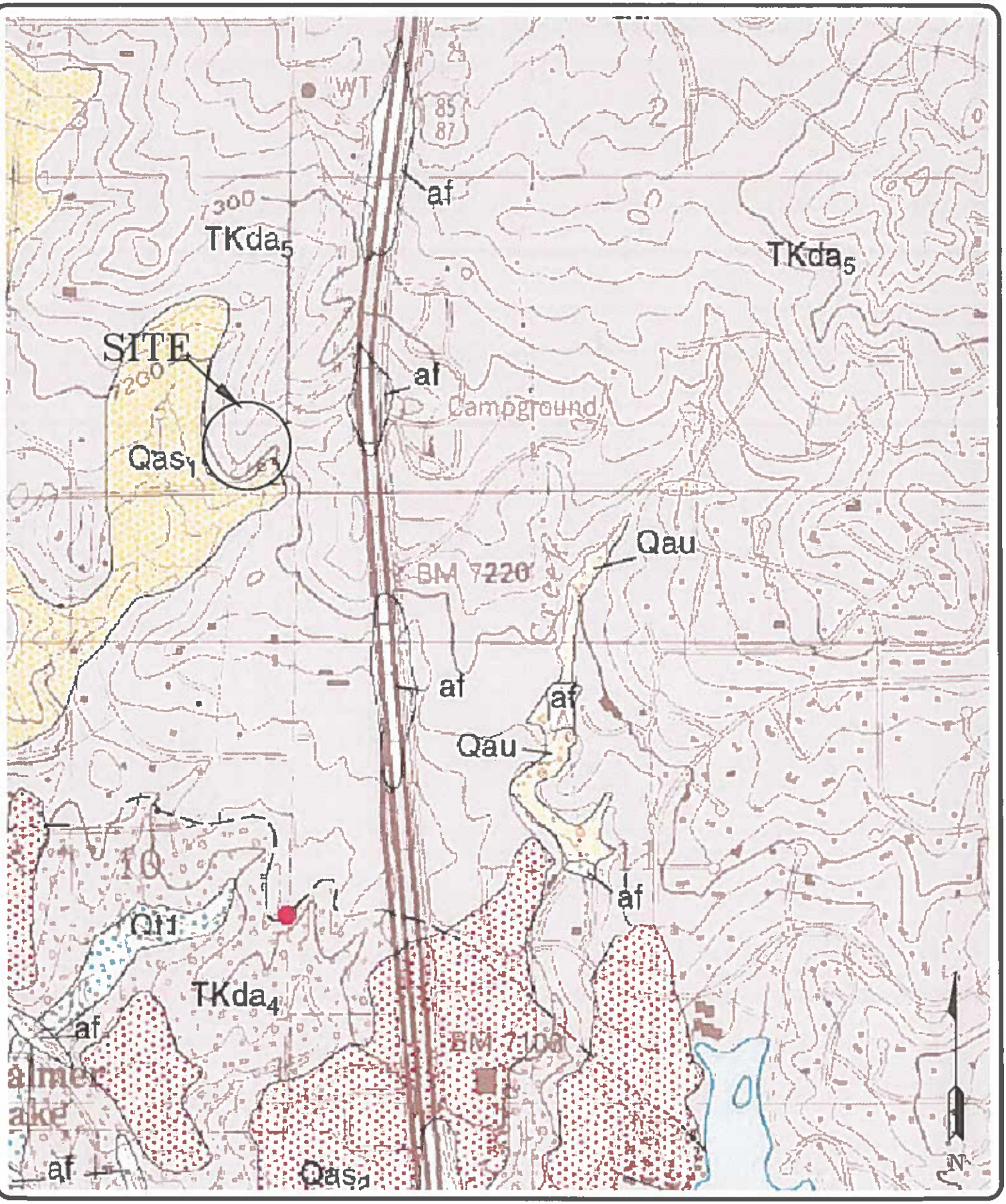
SCS MAP
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN:	DATE:	CHECKED:	DATE:
LLL	9/12/17		

JOB NO.: 171248

FIG NO.: 4



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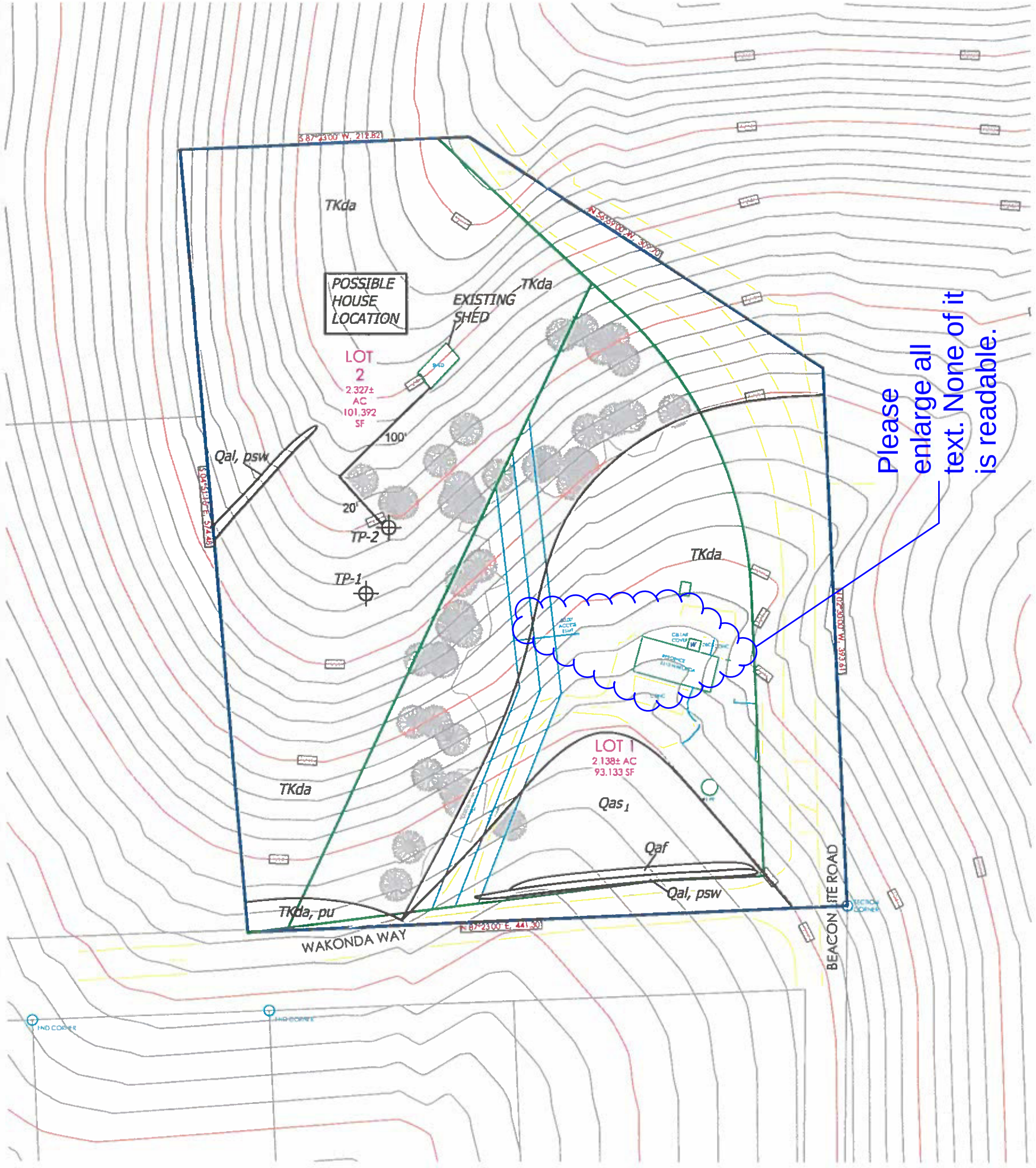
MONUMENT QUADRANGLE GEOLOGIC MAP
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN:	DATE:	CHECKED:	DATE:
LLL	9/12/17		

JOB NO.: 171248

FIG NO.: 5



LEGEND:

Qal - Alluvium of Holocene Age:
water deposited materials associated with small drainages on the property

Qaf - Artificial Fill of Holocene Age:
man-made fill deposist associeated with erosion berm

Qas_1 - Younger Piedmont-Slope Alluvium of Holocene and Late Pleistocene Age:
sheetwash and stream desposited alluvium associated with Monument Creek and its tributaries

TKda - Dawson Formation of Tertiary to Cretaceous Age:
arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone

pu - potentially unstable slopes

psw - potentially seasonal shallow groundwater area

⌖ - test pit location and number

-tp-1 (18' w x 48' s of tp-2)

-tp-2 (100' sw x 20' se of the s corner of the existing shed)

REVISION	BY

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

GEOLOGY/ENGINEERING GEOLOGY MAP
ARVIDSON SUBDIVISION
2310 WAKONADA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN	LLL
CHECKED	
DATE	9/14/17
SCALE	AS SHOWN
JOB NO.	171248
FIGURE No.	6

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

- (A)—(A) Cross section line
- (23)------(23) Transect line
- 97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4276000 M 1000-meter Universal Transverse Mercator grid tick values, zone 4
- 600000 FT 5000-foot grid tick values: Texas State Plane coordinate system, zone 3 (FIPSZONE 5103), Transverse Mercator projection
- DX5510 X Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M 2 Coastal Mile marker

MAP REPOSITORY

Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

November 20, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

September 30, 2004 – to change Special Flood Hazard Areas, to update map format, to reflect revised shoreline and to incorporate previously issued Letters of Map Revision.

3

ZONE X

SITE

UNINCORP(

(

NOTE: MAP AREA SHO

TOWNSHIP 11 SOUTH, I

SPRING

VALLEY

ROA

OAD

OLD ANTLERS WAY

N

REVISION	BY

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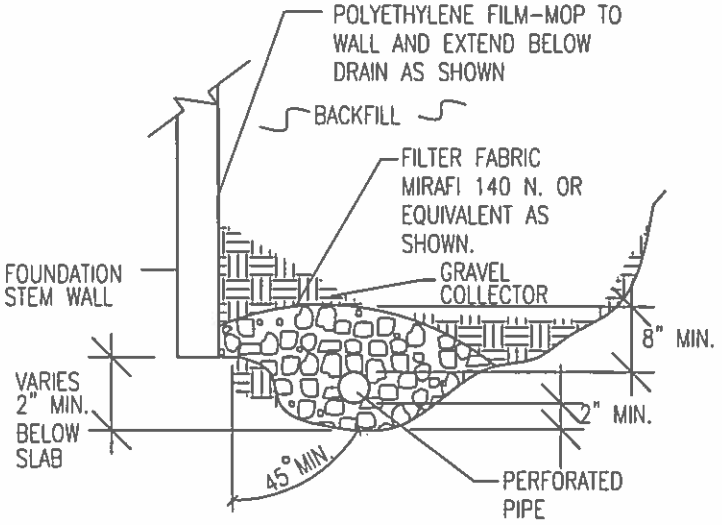
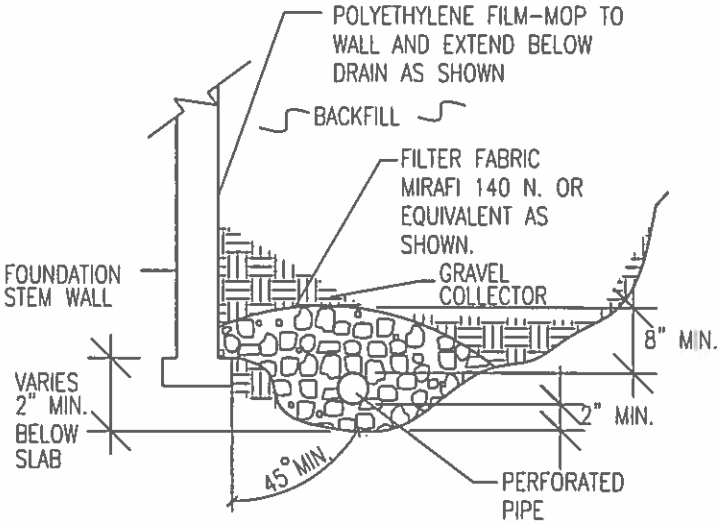
(719) 531-5599

FLOODPLAIN MAP
ARVIDSON SUBDIVISION
2310 WAKONDA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN	LLL
CHECKED	
DATE	9/12/17
SCALE	AS SHOWN
JOB NO.	171248
FIGURE No.	7





NOTES:

–GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS–85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

–PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4–INCH DIAMETER IS MOST OFTEN USED.

–ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON–PERFORATED PIPE.

–FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

–MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

–DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

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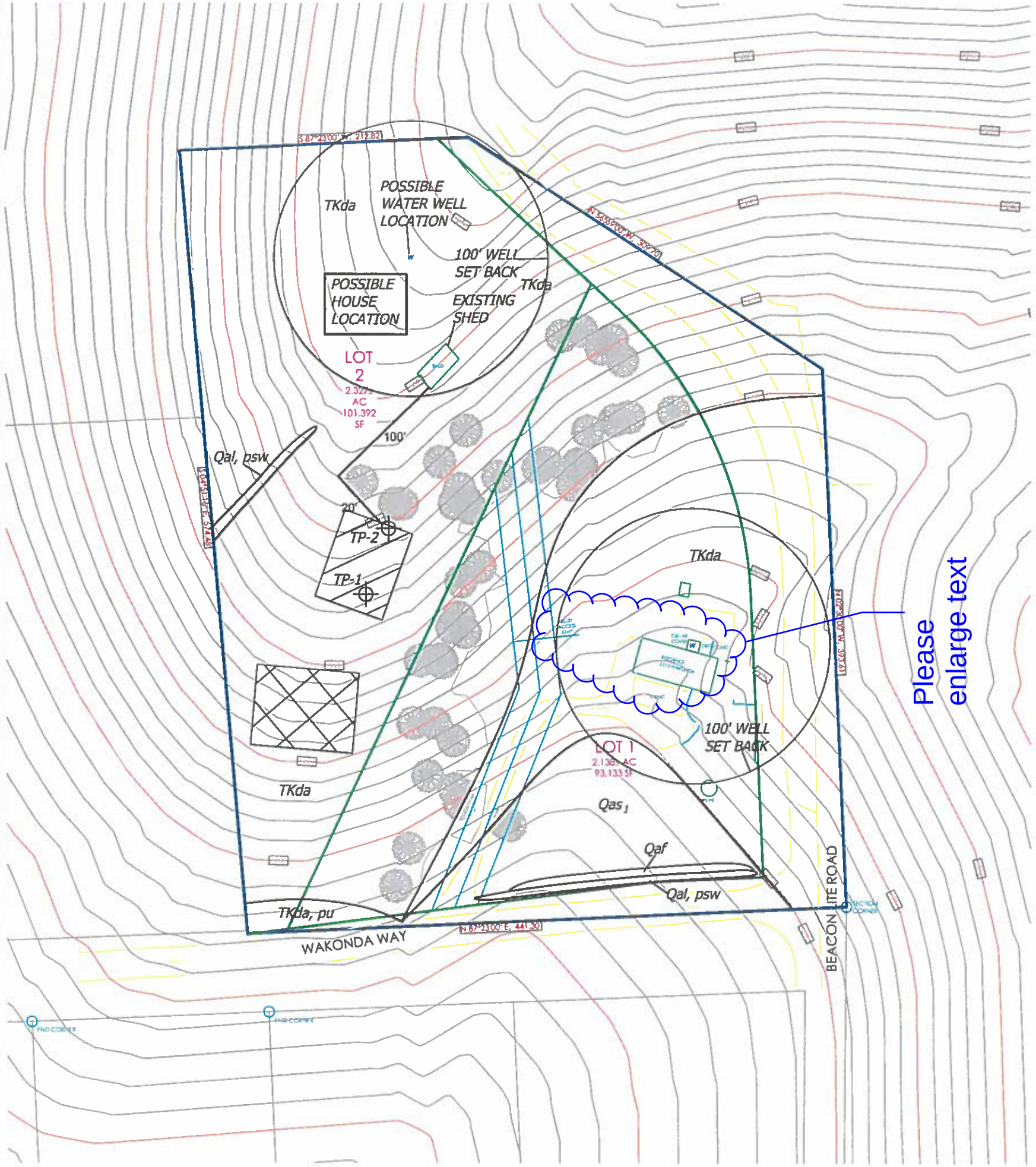
COLORADO SPRINGS, CO. 80907 (719) 531-5599

PERIMETER DRAIN DETAIL

DRAWN:	DATE DRAWN:	DESIGNED BY:	CHECKED:
		DS	LLL

JOB NO.: 171248

FIG. NO.: 8



LEGEND:

- POTENTIAL OWTS LOCATION

-POTENTIAL ALTERNATE OWTS LOCATION

*WATER WELLS MUST BE A MINIMUM OF 100 FT FROM OWTS ABSORPTION FIELDS

-TP-1 (18' W X 48' S OF TP-2)

-TP-2 (100' SW X 20' SE OF THE S CORNER OF THE EXISTING SHED)

REVISION	BY

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

OWTS SUITABILITY MAP
ARVIDSON SUBDIVISION
2310 WAKONADA WAY
MONUMENT, CO.
FOR: JENNA AND MATTHEW ARVIDSON

DRAWN	LLL
CHECKED	
DATE	9/14/17
SCALE	AS SHOWN
JOB NO.	171248
FIGURE No.	9

APPENDIX A: Site Photographs

1

Looking northwest from the southeast corner of the site.

August 16, 2017

2

Looking northwest at road cut along Wakonda Way.

August 16, 2017

Job No. 171248

3

Looking west from the southeast portion of the sitep.

August 16, 2017

4

Looking north towards old shed that is located on Lot 2.

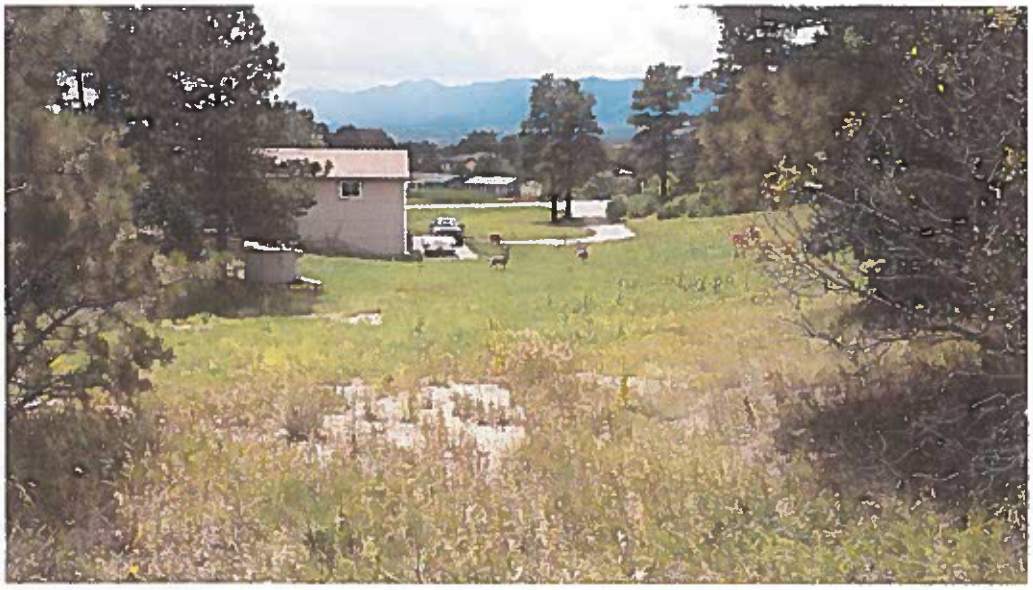
August 16, 2017

Job No. 171248

5

Looking north along the western property boundary of the site.

August 16, 2017



6

Looking south from the northern portion of the site.

August 16, 2017

Job No. 171248

7

Looking northeast from the central portion of the site.

August 16, 2017

8

Looking east along Beacon Lite Road on the northern side of the site.

August 16, 2017

Job No. 171248

APPENDIX B: Test Pit Logs

TEST PIT NO. 1
DATE EXCAVATED 8/17/2017
Job # 171172

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, gravelly sandy loam, fine to coarse grained, brown	1					
silty sandstone, fine to coarse grained, tan, moist	2			ma		3A
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					

TEST PIT NO. 2
DATE EXCAVATED 8/17/2017
CLIENT JENNA AND MATTHEW ARVIDSON
LOCATION 2310 WAKONAD WAY

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	USDA Soil Type
topsoil, gravelly sandy loam, fine to coarse grained, brown	1					
silty sandstone, fine to coarse grained, tan, moist	2			ma		3A
	3					
	4					
	5					
	6					
	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

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

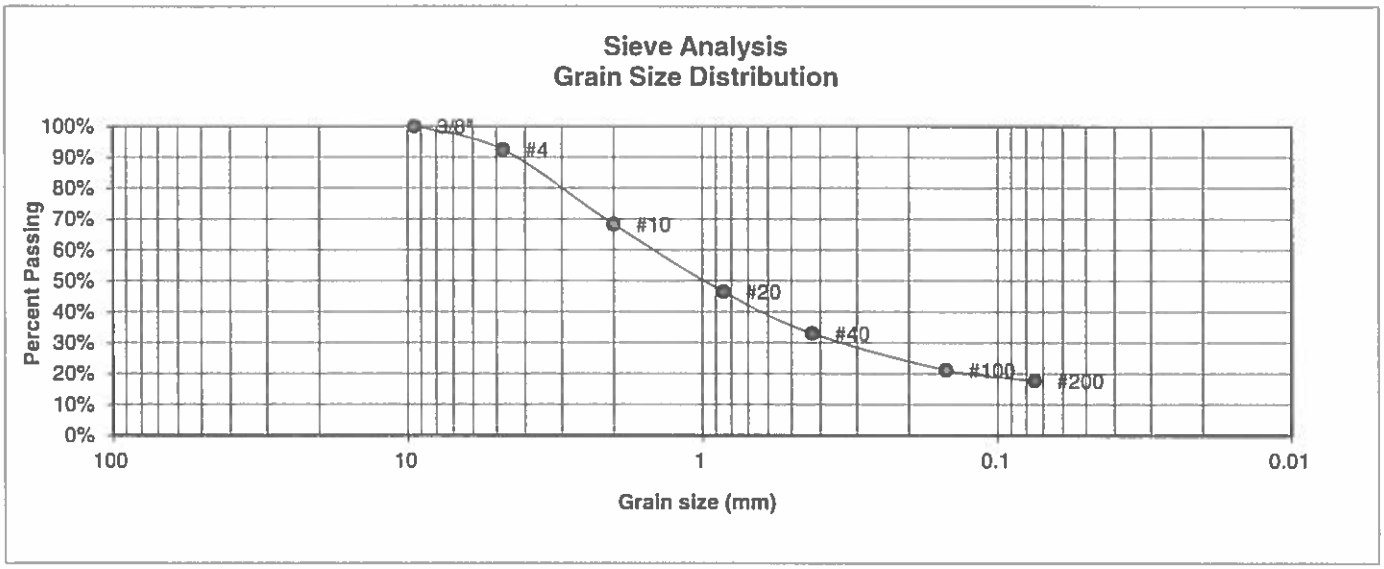
TEST PIT LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	9/12/17

JOB NO.: 171248
FIG NO.: B-1

APPENDIX C: Laboratory Test Results

BORING NO.	TP-1	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	1-4	AASHTO CLASSIFICATION		JOB NO.	171248
CLIENT	JENNA & MATTHEW ARVIDSON				
PROJECT	2310 WAKANDA WAY				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.4%
10	68.3%
20	46.5%
40	33.0%
100	21.2%
200	17.7%

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

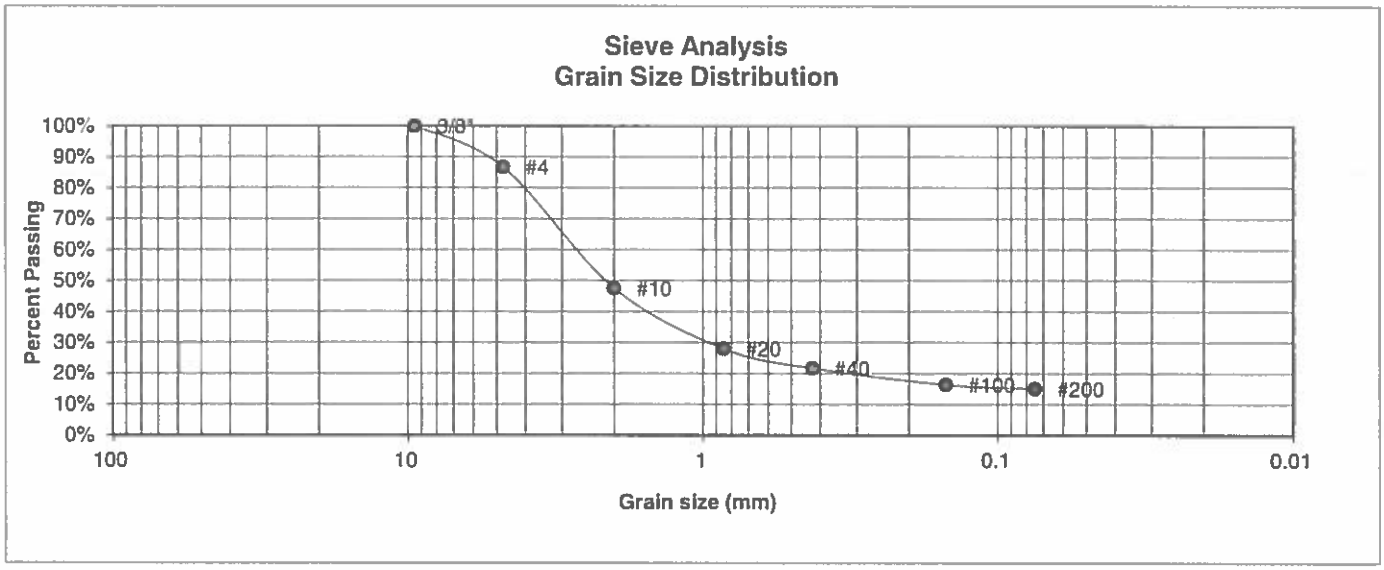
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	9/11/17

JOB NO.: 171248

FIG NO.: C-1

BORING NO.	TP-2	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	1-5	AASHTO CLASSIFICATION		JOB NO.	171248
CLIENT	JENNA & MATTHEW ARVIDSON				
PROJECT	2310 WAKANDA WAY				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	86.7%
10	47.5%
20	28.0%
40	21.7%
100	16.4%
200	15.0%

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	9/11/17

JOB NO. 171248

FIG NO. C-2

APPENDIX D: Soil Survey Descriptions

El Paso County Area, Colorado

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
Natural 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 storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
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 14, Sep 23, 2016

APPENDIX E: El Paso County Health Department

Septic Records

ON #

7103001034

Replacement of one existing, failed system

EL PASO COUNTY HEALTH DEPARTMENT
COLORADO SPRINGS, COLORADO

1637

SEWAGE DISPOSAL INSPECTION FORM

DATE 6/30/82 P

APPROVAL:
YES X NO ____

ENVIRONMENTALIST Robin Stroot

LOCATION (street number) 2310 Waconda Way OCCUPANT Virginia Tabor

LEGAL DESCRIPTION See attached

TYPE OF CONSTRUCTION Single Family NO. OF BEDROOMS 3

SYSTEM INSTALLED BY Russ Palmer

COMMERCIAL MFG. Yes SIZE 1250 gal

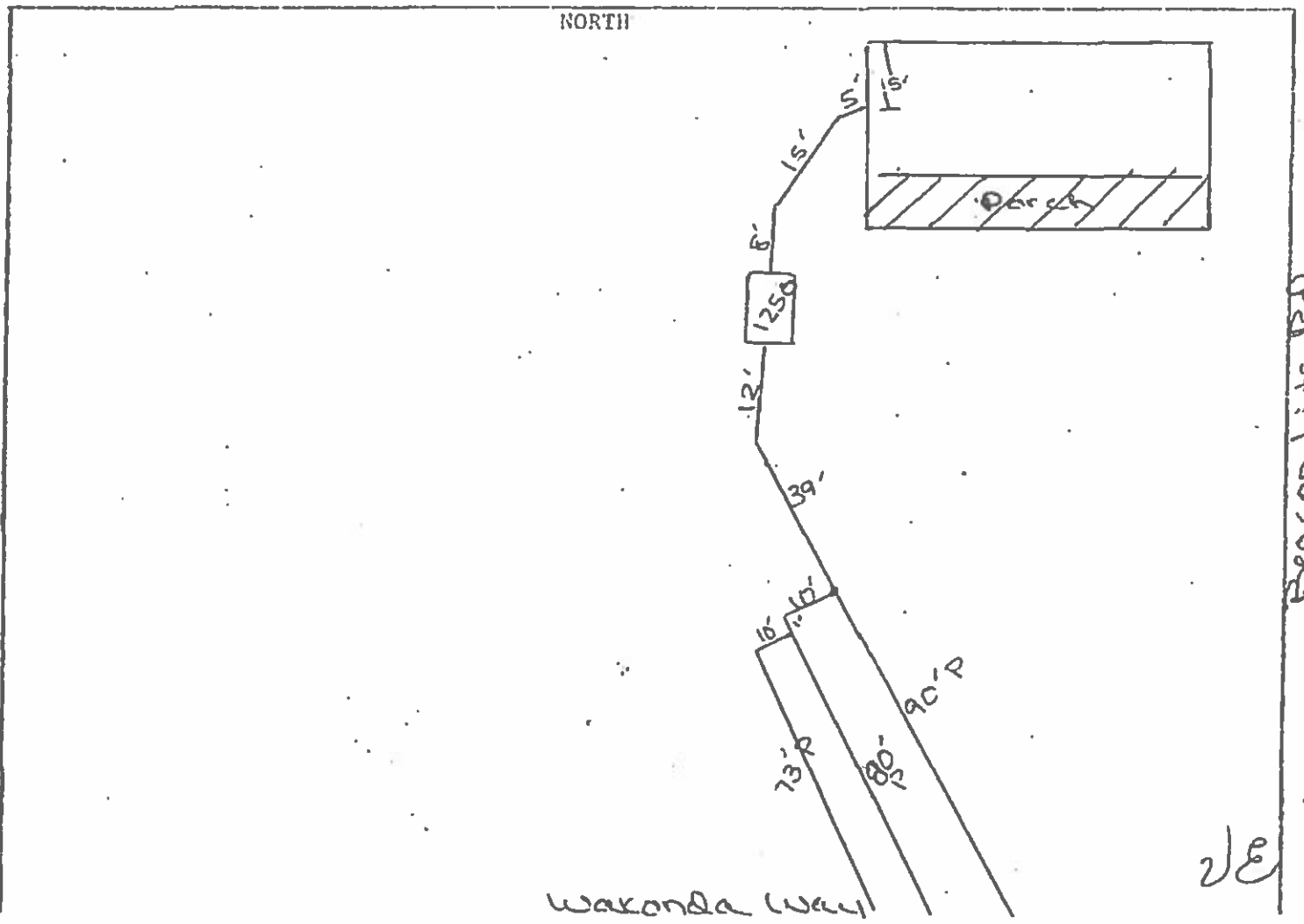
TYPE OF MATERIAL pre-cast concrete NO. COMPARTMENTS 2

WIDTH ____ LENGTH ____ DEPTH (total) ____ LIQ. CAP. 1250 gal

DISPOSAL FIELD: BED OR TRENCH DEPTH 36" WIDTH 36" LENGTH 242' SQ. FT. 726

DISTANCE BETWEEN LINES 10' ROCK river DEPTH 18" UNDER 6" OVER 2"

LEACHING PITS (NO.) ____ LINING MATERIAL ____ CAPACITY SQ. FT. ____



1637

Acres 5.01

EL PASO COUNTY • COUNTY HEALTH DEPARTMENT
501 North Foote Avenue . Colorado Springs, Colorado · 475-8240

Water Supply Well

PERMIT

Receipt No. 4438

TO CONSTRUCT, ALTER, REPAIR OR MODIFY AN INDIVIDUAL SEWAGE DISPOSAL SYSTEM

Issued To Virginia C. Taber Date 6/23/82

Address of Property 2310 Wakonda Way, Monument, CO.
(Permit valid at this address only)

Note: Need additional two (2) compartment septic tank for total capacity of 1250 gallons. Watch minimum distances

Sewage-Disposal System work to be performed by Ray's Diggins Phone

This Permit is issued in accordance with 25-10-106 Colorado Revised Statutes 1973, as amended. PERMIT EXPIRES upon completion-installation of sewage-disposal system or at the end of six (6) months from date of issue - whichever occurs first - (unless work is in progress).

This Permit does not denote approval of zoning and acreage requirements.

Permit Fee $130.00 ~~$50.00~~

Dr. John B. Muth, M.D.
Director, City-County Health Department

December 23,1982
Date of Expiration

Environmentalist

NOTE: LEAVE ENTIRE SEWAGE-DISPOSAL SYSTEM UNCOVERED FOR FINAL INSPECTION. 726 Sq. Ft.

24-HOUR ADVANCE NOTICE REQUIRED

Septic tank NA gals. Field 242 Feet of trench 36 inches wide
OR. Field 362 Feet of trench 24 inches wide

Seepage bed _____ ft. long _____ ft. wide. Seepage pit _____ sq. ft. _____ diam. _____ w/d

The Health Officer 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 times for the purpose of making such inspections as are necessary to determine compliance with requirements of this law.

Date 6-2-82

Annie — to load use —

EL PASO COUNTY HEALTH DEPARTMENT
501 NORTH FOOTE AVENUE
COLORADO SPRINGS, COLORADO
636-0125

Tax Schedule # 7103001034

Dick Varner

Application for permit to construct, Remodel, or Install a Sewage Disposal System.

Name of Owner VIRGINIA C. TABER Phone 594-6129

Address of Property 2310 WAKONDA WAY, MONUMENT, CO.

Legal Description of Property SEE ATTACHED SHEET.

Owner's Address (if different) 3275 TORO DR. COLORADO SPRINGS, CO. Phone 594-6129

Systems Contractor Ray's Diggins Address

Type of Construction Single family source and type of water supply WELL

Size of Lot 5.01 ACRES

The construction of the Sewage Disposal System will comply with all applicable Laws, Ordinances, Standards or Resolutions.

HEALTH DEPARTMENT USE ONLY

Permit Number Receipt Number

Number of Bedrooms 3 Tank Capacity existing 750 gallons Absorption area 726 Sq. Ft.

Remarks need add'n 2 comp septic tank for total capacity of 1250gal need 242 ft of 3' trench or * with minimum 362 ft of 2' trench distances

APPLICATION IS X APPROVED ( ) DENIED

ENVIRONMENTALIST Robin Shoaf DATE 19

PLOT PLAN WILL INCLUDE THE FOLLOWING

Plot plan may be drawn on the back of this sheet or on a seperate sheet.

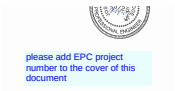
1. Streams, Lakes, Ponds, Irrigation Ditches and other Water Courses
2. North Direction
3. Location of Property Line
4. Buildings
5. Wells
6. Location of Proposed Septic System
7. Location of percolation test
8. Geographical features
9. Other Information as required

RECEIVED
By ..... JUN 3 1982
El Paso County Planning Department

EHS - 6/9/76 - SEWAGE

Markup Summary

dsdnijkamp (13)



Subject: Text Box
Page Label: 1
Lock: Locked
Author: dsdnijkamp

please add EPC project number to the cover of this document

Subject: Callout
Page Label: 4
Lock: Locked
Author: dsdnijkamp

Please state what time of year your inspection took place, and if the lack of water is normal for that time of year. Is this flow area something the home builder should avoid? if so, please show the limits of avoidance on one of your exhibits. or state mitigation measures.

Subject: Callout
Page Label: 5
Lock: Locked
Author: dsdnijkamp

which exhibit is this?

Subject: Ellipse
Page Label: 5
Lock: Locked
Author: dsdnijkamp

Subject: Callout
Page Label: 9
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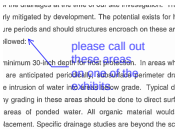
Author: dsdnijkamp

only soil types are shown, please show other constraints as listed in the report.



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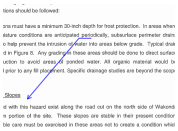
Author: dsdnijkamp

please call out these areas on one of the exhibits.



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Author: dsdnijkamp

Subject: Callout
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Author: dsdnijkamp

Please call out extents on one of the exhibits.

Subject: Callout
Page Label: 11
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Author: dsdnijkamp

Subject: Cloud+
Page Label: 12
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Author: dsdnijkamp

please show on the exhibit.

Subject: Cloud+
Page Label: 12
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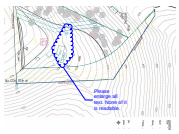
Author: dsdnijkamp

please explain



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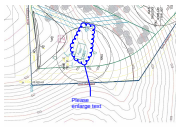
Author: dsdnijkamp

Please enlarge all text. None of it is readable.



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Author: dsdnijkamp

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