

Architectural
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SOIL, GEOLOGY, AND WASTEWATER STUDY

**8330 Mustang Place
Lot 10, Pawnee Rancheros, Filing No. 2
El Paso County, Colorado**

PREPARED FOR:

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JOB NO. 186431

January 26, 2022

**Respectfully Submitted,
RMG – Rocky Mountain Group**

**Reviewed by,
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El Paso County Health Department – Sewage Disposal System Permit

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in lot 3 of Section 4, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado, and is generally located north and east of the intersection of Woodmen Road and Marksheffel Road. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing Land Use

The site currently consists of one parcel (per the El Paso County Assessor's website) of approximately 5.37 acres:

- Schedule No. 5304002017, current land use is classified as single-family residence with well and septic

The current zoning is "RR-5, CAD-O" – *Residential Rural, Commercial Airport District*. The parcel is mostly developed with a single-family modular home, detached garage, and two barn structures.

1.3 Project Description

The site consists of approximately 5.37 acres and is mostly developed. An existing single-story modular residence with detached garage is located near the central, eastern portion of the lot. Two one-story barn structures are north and east of the residence. It is our understanding the existing 5.37 acres is to be subdivided into a total of two lots. The westernmost parcel is to be approximately 2.685 acres, and is to contain a new single-family residence, well, and septic. The easternmost parcel is also to be approximately 2.685 acres, and is to retain the existing residence, well, and septic. The Proposed Lot Layout is presented in Figure 2.

The new lot is to be serviced by an on-site wastewater treatment system (OWTS) and an individual water supply well. The site is to be accessed from Mustang Place.

2.0 QUALIFICATIONS OF PREPARERS

This Soil, Geology, and Wastewater Study was prepared by a professional geologist as defined by Colorado Revised Statutes section 34-1-201(3) and by a qualified geotechnical engineer as defined by policy statement 15, "Engineering in Designated Natural Hazards Areas" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. (Ord. 96-74; Ord. 01-42)

The principle investigators for this study are Kelli Zigler P.G., and Tony Munger, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 21 years of experience in the geological and geotechnical engineering field. Ms. Kelli Zigler holds a B.S. in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Tony Munger, P.E. is a licensed professional engineer with over 21 years of experience in the construction engineering (residential) field. Mr. Munger holds a B.S. in Architectural Engineering from the University of Wyoming.

3.0 STUDY OVERVIEW

The purpose of this investigation is to characterize the general geotechnical, geologic site conditions, and on-site wastewater treatment system (OWTS) feasibility and present our opinions of the potential effect of these conditions on the proposed development within El Paso County, Colorado. As such, our services exclude evaluation of the environmental and/or human, health related work products or recommendations previously prepared, by others, for this project.

Revisions to the conclusions presented in this report may be issued based upon submission of the Development Plan. This study has been prepared in accordance with the requirements outlined in the El Paso County Land Development Code (LDC) specifically Chapter 8, last updated August 27, 2019. Applicable sections include 8.4.8 and 8.4.9, and the El Paso County Engineering Criteria Manual (ECM), specifically Appendix C last updated July 9, 2019.

3.1 Scope and Objective

The scope of this study is to include a physical reconnaissance of the site and a review of pertinent, publically available documents including, but not limited to, previous geologic and geotechnical reports, overhead and remote sensing imagery, published geology and/or hazard maps, design documents, etc.

The objectives of our study are to:

- Identify geologic conditions present on the site
- Analyze potential negative impacts of these conditions on the proposed site development
- Analyze potential negative impacts to surrounding properties and/or public services resulting from the proposed site development as it relates to existing geologic conditions
- Provide our opinion of suitable techniques that may be utilized to mitigate any potential negative impacts identified herein

This report presents the findings of the study performed by RMG-Rocky Mountain Group relating to the geologic conditions of the above-referenced site. Revisions and modifications to this report may be issued subsequently by RMG, based upon:

- Additional observations made during grading and construction which may indicate conditions that require re-evaluation of some of the criteria presented in this report
- Review of pertinent documents (development plans, plat maps, drainage reports/plans, etc.) not available at the time of this study
- Comments received from the governing jurisdiction and/or their consultants subsequent to submission of this document

3.2 Site Evaluation Techniques

The information included in this report has been compiled from several sources, including:

- Field reconnaissance
- Geologic and topographic maps
- Review of selected publicly available, pertinent engineering reports
- Available aerial photographs
- Test pit subsurface exploration

- Visual and tactile characterization of representative site soil and rock samples
- Geologic research and analysis
- Proposed lot layout prepared by Michael Cartmell

Geophysical investigations were not considered necessary for characterization of the site geology. Monitoring programs, which typically include instrumentation and/or observations for changes in groundwater, surface water flows, slope stability, subsidence, and similar conditions, are not known to exist and were not considered applicable for the scope of this report.

3.3 Additional Documents

Additional documents reviewed during the performance of this study are included in Appendix A.

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The site is mostly developed. The site is generally located north and east of the intersection of Woodmen Road and Marksheffel Road in El Paso County, Colorado and comprises approximately 5.37 acres. The site is zoned “RR-5, CAD-O” - *Rural Residential, Commercial Airport District*. Adjacent properties to the west, east, and south are zoned “RR-5, CAD-O” - *Rural Residential, Commercial Airport District*. The property to the north is zoned “RR-5” – *Rural Residential*.

4.2 Topography

Based on our site reconnaissance on October 29, 2021 and the USGS 2019 topographic map of the Falcon NW Quadrangle, the site generally slopes down from north to south with an elevation difference of approximately 11 feet across the site. An apparent low-lying drainage traverses the western portion of the site from north to south. The drainage area can be seen in Figure 6, Engineering and Geology Map. The water levels within the low-lying drainage area are anticipated to vary, depending upon local precipitation events.

4.3 Vegetation

The site vegetation primarily consists of native grasses and weeds. Deciduous trees surround the existing residence.

4.4 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1999, CGS surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. Historically, the site was vacant land prior to 1983. A graded dirt driveway and structure were reportedly constructed around 1983. The existing residence and barn structures were reportedly constructed in 1999.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

It is our understanding the existing 5.37 acres is to be subdivided into a total of two lots. The westernmost lot is to be approximately 2.685 acres, and is to contain a new single-family residence, well, and septic. The easternmost parcel is also to be approximately 2.685 acres, and is to retain the existing residence, well, and septic.

5.1 Test Pit Excavations

Two test pits were performed by RMG on November 4, 2021 to explore the subsurface soils underlying the proposed on-site wastewater treatment systems. The number of test pits is in accordance with the Regulations of the El Paso County Board of Health, Chapter 8, On-site Wastewater Treatment Systems (OWTS) as required by 8.5.D.3.a.

The test pits were excavated to 8 feet below the existing ground surface. Additional information is provided in **Section 9.0, On-site Disposal of Wastewater.**

5.2 OWTS Visual and Tactile Evaluation

A visual and tactile evaluation was performed by RMG for this investigation. The soils were evaluated to determine the soils types and structure. Neither bedrock nor limiting layers were encountered in the test pits. The soil descriptions of the test pit evaluation are presented in Figure 4, Test Pit Logs.

5.3 Groundwater

Groundwater was not encountered in the test pits performed by RMG. No indications of redoximorphic conditions were observed.

Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

The site is located within the central portion of the Great Plains Physiographic Province. A major structural feature known as the Rampart Range Fault is located approximately 12 miles west of the site. The Rampart Range Fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern portion of a large structural feature known as the Denver Basin. In general, the geology at the site consists of Middle alluvium (early Holocene and late Pleistocene) and Alluvial sand, silt, clay, and gravel (post-Piney Creek alluvium, Piney Creek Alluvium, and pre-Piney Creek alluvium of Hunt, 1954, and Scott, 1960; Broadway Alluvium) overlying the bedrock of the Upper part of the Dawson Formation. The alluvium generally consist sand, silt, clay, and gravel. The upper part of the Dawson Formation is generally comprised of the arkosic sandstone, claystone, mudstone, and conglomerate and localized coal beds.

6.1 Subsurface Soil Conditions

The subsurface soils encountered in the RMG test pit excavations were classified using the United States Department of Agriculture (USDA) soil descriptions. The on-site soils classified as sand.

The classifications shown on the logs are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

6.2 Bedrock Conditions

Bedrock (as defined by the USDA) was not encountered in the test pit excavations performed for this investigation. In general, the bedrock beneath the site is considered to be part of the Upper Dawson Formation which consists of very thick-bedded to massive, cross-bedded, light-colored arkose, pebbly arkose, and arkosic pebble conglomerate. The sandstone is poorly sorted with moderate to high clay content. The sandstone is generally permeable, well drained, and has good foundation characteristics. The Dawson sandstone is generally not considered a limiting layer for OWTS.

6.3 U.S. Soil Conservation Service

The U.S. Soil Conservation Service along with United States Department of Agriculture (USDA) identifies the site soil as:

- 19 – Columbine gravelly sandy loam, 0 to 3 percent slopes. Properties of the loam include well drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be very low, frequency of flooding and ponding is none, and landforms include flood plains, fan terraces, and fans.
- 71 – Pring coarse sandy loam, 3 to 8 percent slopes. Properties of the loam include well drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be low, frequency of flooding and ponding is none, and landforms include hills.

The USDA Soil Survey Map is presented in Figure 5.

6.4 General Geologic Conditions

Based on our field observations and review of relevant geologic maps, a geologic map was prepared which identifies the geologic conditions affecting the development. The geologic conditions affecting the development are presented in the Engineering and Geology Map, Figure 6.

The site generally consists of alluvium deposits overlying sandstone bedrock. Five geologic units were mapped at the site as:

- *TKda – Dawson formation* – The unit is dominated by very thick-bedded to massive, cross-bedded, light-colored arkose, pebbly arkose, and arkosic pebble conglomerate. The unit is estimated to be about 300-500 feet thick in the quadrangle.

- *Qam* – Middle alluvium (early Holocene and late Pleistocene) – Chiefly pale-brown, light-yellowish-brown, and grayish-brown poorly sorted sand, silty and clayey sand, and beds of very fine to medium pebble gravel. Unit underlies a terrace that is 10-15 ft higher than stream channels, except along Cottonwood Creek and its tributaries where *Qam* is as much as 40 ft higher than the channel. A soil profile consisting of an A/ Bw / BC/ C horizon sequence (Blendon soil series, Larsen, 1981) is developed in the upper few feet of *Qam*. Estimated thickness is 10-30ft.
- *asa* – Alluvial sand, silt, clay, and gravel (post-Piney Creek alluvium, Piney Creek Alluvium, and pre-Piney Creek alluvium of Hunt, 1954, and Scott, 1960; Broadway Alluvium)
- *psw* – Potentially Seasonally Wet Area – Drainage area traverses the western portion of the site from north to south.
- *af* – Artificial fill Area – Artificial fill placed around 1983 and 1999 during construction of the existing structures on the property.

6.5 Engineering Geology

Charles Robinson and Associates (1977) have mapped one environmental engineering unit at the site as:

- 2A – Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5-12%).

6.6 Structural Features

Structural features such as schistosity, folds, zones of contortion or crushing, joints, shear zones or faults were not observed on the site, in the surrounding area, or in the soil samples collected for laboratory testing.

6.7 Surficial (Unconsolidated) Deposits

Lake and pond sediments, swamp accumulations, sand dunes, marine terrace deposits, talus accumulations, creep, or slope wash were not observed on the site. Slump and slide debris were also not observed on the site.

6.8 Features of Special Significance

Features of special significance such as accelerated erosion, (advancing gully head, badlands, or cliff reentrants) were not observed on the property. Features indicating settlement or subsidence such as fissures, scarplets, and offset reference features were not observed on the study site or surrounding areas. Features indicating creep, slump, or slide masses in bedrock and surficial deposits were not observed on the property.

6.9 Drainage of Water and Groundwater

The overall topography of the site slopes down from north to south. It is anticipated the direction of surface water and groundwater generally flow in the same direction. Groundwater was not encountered in the test pits performed for this study, and is not anticipated to affect shallow foundations. A low-lying drainage area traverses the western portion of the site from north to south and is anticipated to be potentially seasonally wet. The drainage area is anticipated to be outside the vicinity of the proposed single-family residence.

6.10 Flooding and Surface Drainage

Based on our review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0533G and the online ArcGIS El Paso County Risk Map, the entire site lies outside of identified regulatory floodway and 100 or 500-year floodplains. The site lies in Zone X. Zone X is defined by FEMA as an area of minimal flood hazard that is determined to be outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The FEMA Map is presented in Figure 7.

7.0 ECONOMIC GEOLOGY

Under the provision of House Bill 1529, it was made a policy by the State of Colorado to preserve for extraction commercial mineral resources located in a populous county. Review of the *El Paso Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction, Map 1* indicates the site is identified as Upland Deposits. These deposits contain sand, gravel, silt, and clay. Remnants of older streams deposited on topographic highs or bench like features are present.

According to the *Geologic Map of the Falcon NW Quadrangle, El Paso County, Colorado*, Open-File Report 03-8 Economic Geology section, fossil fuels have not been economically significant in the Falcon NW quadrangle as they have elsewhere in the Colorado Springs area, including in the Elsmere quadrangle to the immediate south. Coal-bearing strata are too far below the surface in the Falcon NW quadrangle to be exploited. According to the records of the Colorado Oil and Gas Conservation Commission, no wells have been drilled for oil and gas in the map area. Nonmetallic resources, namely, eolian sand and alluvial sand and gravel, have been mined at several localities in the Falcon NW quadrangle. The most extensive mining has been in the central part of the quadrangle (secs. 32 and 33, T. 12 S., R. 65 W. and secs. 5, and 7, T. 13 S., R. 65 W.), which is the only part of the map area where mining is ongoing. In addition, borrow pits have been excavated in the east-central (sec. 2, T. 13 S., R. 65 W.) and southeast (secs. 23 and 26, T. 13 S., R. 65 W.) parts of the quadrangle. Alluvium derived from the Dawson Formation has been mined at several places in the Colorado Springs area because many deposits contain large amounts of clean (minimal silt and clay), coarse-grained sand that consists chiefly of quartz, has a high silica content (Schwochow and others, 1974).

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

The El Paso County Engineering Criteria Manual recognizes and delineates the difference between geologic hazards and constraints. A *geologic hazard* is one of several types of adverse geologic conditions capable of causing significant damage or loss of property and life. Geologic hazards are defined in Section C.2.2 Sub-section E.1 of the ECM. A *geologic constraint* is one of several types of adverse geologic conditions capable of limiting or restricting construction on a particular site. Geologic constraints are defined in Section C.2.2 Sub-section E.2 of the ECM (1.15 Definitions of Specific Terms and Phrases). The following geologic constraints were considered in the preparation of this report. They are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flow-Fans/Mudslides
- Compressible Soils
- Floodplains
- Ground Subsidence
- Landslides
- Rockfall
- Ponding water
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, accelerated erosion along creek banks and drainage ways
- Corrosive Minerals
- History of landfill or uncontrolled/undocumented fill placement

The following section presents the geologic conditions that have been identified on the property:

8.1 Faults and Seismicity

Based on review of the Earthquake and Late Cenozoic Fault and Fold Map Server provided by CGS located at <http://dnrwebmapgdev.state.co.us/CGSONline/> and the recorded information dating back to November of 1900, Colorado Springs has not experienced a recorded earthquake with a magnitude greater than 1.6 during that period. The nearest recorded earthquakes over 1.6 occurred in December of 1995 in Manitou Springs, which experienced magnitudes ranging between 2.8 to 3.5. Additional earthquakes over 1.6 occurred between 1926 and 2001 in Woodland Park, which experienced magnitudes ranging from 2.7 to 3.3. Both of these locations are located near the Ute Pass Fault, which is greater than 10 miles from the subject site.

Earthquakes felt at this site will most likely result from minor shifting of the granite mass within the Pikes Peak Batholith, which includes pull from minor movements along faults found in the Denver basin. It is our opinion that ground motions resulting from minor earthquakes may affect structures (and the surrounding area) at this site if minor shifting were to occur.

Mitigation

The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.193g for a short period (S_s) and 0.056g for a 1-second period (S_1). Based on the results of our experience with similar subsurface conditions, we recommend the site be classified as Site Class D, with average shear wave velocities ranging from 2,500 to 5,000 feet per second for the materials in the upper 100 feet.

8.2 Radon

"Radon Act 51 passed by Congress set the natural outdoor level of radon gas (0.4 pCi/L) as the target radon level for indoor radon levels".

Northern El Paso County and the 80908 zip code in which the site is located, has an EPA assigned Radon Zone of 1. A radon Zone of 1 predicts an average indoor radon screening level greater than 0.4 pCi/L (picocuries per liter), which is above the recommended levels assigned by the EPA. *The EPA recommends corrective measures to reduce exposure to radon gas.*

All of the State of Colorado is considered EPA Zone 1 based on the information provided at https://county-radon.info/CO/El_Paso.html. Elevated hazardous levels of radon from naturally occurring sources are not anticipated at this site.

Mitigation

Radon hazards are best mitigated at the building design and construction phases. Providing increased ventilation of basements, crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations and below-grade walls can help mitigate radon hazards. Passive radon mitigation systems are also available.

Passive and active mitigation procedures are commonly employed in this region to effectively reduce the buildup of radon gas. Measures that can be taken after the residence is enclosed during construction include installing a blower connected to the foundation drain and sealing the joints and cracks in concrete floors and foundation walls. If the occurrence of radon is a concern, it is recommended that the residence be tested after they are enclosed and commonly utilized techniques are in place to minimize the risk.

8.3 Expansive Soils and Bedrock

Based on the test pits performed by RMG for this investigation and our experience with similar materials in this area, the sand generally possess low swell potential. However, the Dawson formation is known to have moderate to high swell potential in some locations. It is anticipated that expansive soil/bedrock may be encountered at depths anticipated to affect residential foundations. If these materials are encountered in the excavations for the proposed residences, they can readily be mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Foundation design and construction are typically adjusted for expansive soils. Mitigation of expansive soils may include overexcavation and replacement with non-expansive structural fill. Drilled piers are not anticipated. Floor slabs bearing directly on expansive soils are expected to experience movement. Overexcavation and replacement with compacted non-expansive soils can be successful in reducing slab movement.

If expansive soils or bedrock are encountered during construction, mitigation of these expansive materials should follow the recommendations presented in a lot-specific subsurface soil investigation performed for each proposed structure.

9.0 ON-SITE WASTEWATER TREATMENT SYSTEMS

It is our understanding that On-site Wastewater Treatment Systems (OWTS) are proposed for the development. The site was evaluated in general accordance with the El Paso Land Development Code, specifically sections 8.4.8. Two 8-foot deep test pits were performed across the site to obtain a general understanding of the soil and bedrock conditions. The Test Pits Logs are presented in Figure 4.

The soil encountered in the test pits consisted of sand. Limiting layers were not encountered in the test pits. The long term acceptance rate (LTAR) associated with the soil observed in the test pits is 0.80 (soil type 1) gallons per day per square foot. Signs of seasonal groundwater were not observed in the test pits.

Contamination of surface and subsurface water resources should not occur provided the OWTS sites are evaluated and installed according to the El Paso County Board of Health Guidelines and property maintained.

Treatment areas at a minimum, must achieve the following:

- Treatment areas must be 4 feet above groundwater or bedrock as defined by the Definitions 8.3.4 of the Regulations of the El Paso County Board of Health, Chapter 8 OWTS Regulations, most recently amended May 23, 2018;
- Each lot (after purchase but prior to construction of an OWTS) will require an OWTS Site Evaluation report prepared per *the Regulations of the El Paso County Board of Health, Chapter 8 OWTS Regulations*. During the site reconnaissance, a minimum of two 8-foot deep test pits will need to be excavated in the vicinity of the proposed treatment area;
- Comply with any physical setback requirements of Table 7-1 of the El Paso County Department of Health and Environment (EPCHDE);
- Treatment areas are to be located a minimum of 100 feet from any well (existing or proposed), including those located on adjacent properties per Table 7-2 per the EPCHDE;
- Each lot shall be designed to ensure that a minimum of 2 sites are appropriate for an OWTS and do not fall within the restricted areas identified on the Engineering and Geology Map, Figure 6, (e.g. existing ponds, existing septic fields that may remain).

It is our opinion that if the EPCHDE physical setback requirements are met for each lot, there are no restrictions on the placement of the individual On-site Wastewater Treatment Systems.

Soil and groundwater conditions at the site are suitable for individual treatment systems. It should be noted that the LTAR values stated above are for the test pit locations performed for this report only. The LTAR values may change throughout the site. If an LTAR value of less than 0.35 (or soil types 3 to 5) are encountered at the time of the site specific OWTS evaluation, an "engineered system" will be required.

10.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic conditions (as described in Section 8.0 of this report) found to be present at this site include faults/seismicity, radon, and expansive soils and bedrock. It is our opinion that these conditions can be satisfactorily mitigated through proper engineering, design, and construction practices.

11.0 ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site for future development. Unless indicated otherwise, the test pits, laboratory test results, conclusions and recommendations presented in this report are not intended for use for design and construction.

A lot-specific subsurface soil investigation will be required for all proposed structures including (but not limited to) residences, retaining wall (if proposed), etc.

12.0 CONCLUSIONS

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic conditions identified are considered typical for the Front Range region of Colorado. Mitigation of geologic conditions is most effectively accomplished by avoidance. However, where avoidance is not a practical or acceptable alternative, geologic conditions should be mitigated by implementing appropriate planning, engineering, and suitable construction practices.

In addition to the previously identified mitigation alternatives, surface and subsurface drainage systems should be considered. Exterior, perimeter foundation drains should be installed around below-grade habitable or storage spaces. A typical perimeter drain detail is presented in Figure 10. Surface water should be efficiently removed from the building area to prevent ponding and infiltration into the subsurface soil.

We believe the sand will classify as Type C material as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type C materials be laid back at ratios no steeper than 1 ½:1 (34°) (horizontal to vertical) unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer.

Long term cut slopes in the upper soil should be limited to no steeper than 3:1 (horizontal to vertical). Flatter slopes will likely be necessary should groundwater conditions occur. It is recommended that long term fill slopes be no steeper than 3:1 (horizontal to vertical).

Revisions and modifications to the conclusions and recommendations presented in this report may be issued subsequently by RMG based upon additional observations made during grading and construction, which may indicate conditions that require re-evaluation of some of the criteria presented in this report.

It is important for the Owner(s) of the property to read and understand this report, and to carefully familiarize themselves with the geologic hazards associated with construction in this area. This report only addresses the geologic constraints contained within the boundaries of the site referenced above.

The foundation systems for the proposed single-family residential structures and any retention/detention facilities should be designed and constructed based upon recommendations developed in a site-specific subsurface soil investigation.

13.0 CLOSING

This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, environmental assessment of the site, or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to, biological or toxicological issues, are beyond the scope of this report. If the owner is concerned about the potential for such contamination or conditions, other studies should be undertaken.

This report has been prepared for **Michael Cartmell** in accordance with generally accepted geotechnical engineering and engineering geology practices. The conclusions and recommendations in this report are based in part upon data obtained from review of available topographic and geologic maps, review of available reports of previous studies conducted in the site vicinity, a site reconnaissance, and research of

available published information, soil test borings, soil laboratory testing, and engineering analyses. The nature and extent of variations may not become evident until construction activities begin. If variations then become evident, RMG should be retained to re-evaluate the recommendations of this report, if necessary.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers and engineering geologists practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied, is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

APPENDIX A

Additional Reference Documents

1. *Proposed Lot Layout Map, 8330 Mustang Place El Paso County, Colorado*, prepared by Michael Cartmell
2. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 08041C0533G*, Federal Emergency Management Agency (FEMA), effective December 7, 2018.
3. *Geologic Map of the Falcon NW Quadrangle, El Paso County, Colorado*, Madole, R.F., 2003, Colorado Geological Survey Open-File Report OF03-08.
4. *Falcon NW Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
5. *Falcon NW Quadrangle, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
6. *Pikes Peak Regional Building Department*: <https://www.pprbd.org/>.
7. El Paso County Assessor Website <https://property.spatalest.com/co/elpaso/#/property/5304002017> Schedule No. 5304002017
8. *Colorado Geological Survey, USGS Geologic Map Viewer*: <http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/>.
9. *Historical Aerials*: <https://www.historicaerials.com/viewer>, Images dated 1947, 1952, 1955, 1960, 1969, 1983, 1999, 2005, 2009, 2011, 2013, 2015, and 2017.
10. *USGS Historical Topographic Map Explorer*: <http://historicalmaps.arcgis.com/usgs/> Colorado Springs, Falcon NW Quadrangle dated 1898, 1909, 1948, 1969, 1981 and 1989.
11. *Google Earth Pro*, Imagery dated 1999, 2004, 2005, 2006, 2011, 2013, 2015, 2017, 2019 and 2020.

APPENDIX B
El Paso County Health Department – Sewage Disposal System
Permit

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

Permit # 23104
Date 07-07-09

P

APPROVED: Yes No Environmental Health Specialist: GUSTAVO ALVAREZ
5304002017

Address 8330 MUSTANG PL Owner NICOLEE JACKSON
Legal Description LOT 10 PIONEER RANCHEROS FILING # 2
Residence # Bedrooms Commercial System Installer KUNAU DRILLING

SEPTIC TANK:
Commercial Noncommercial Construction Material CONCRETE Capacity Gallon 1250

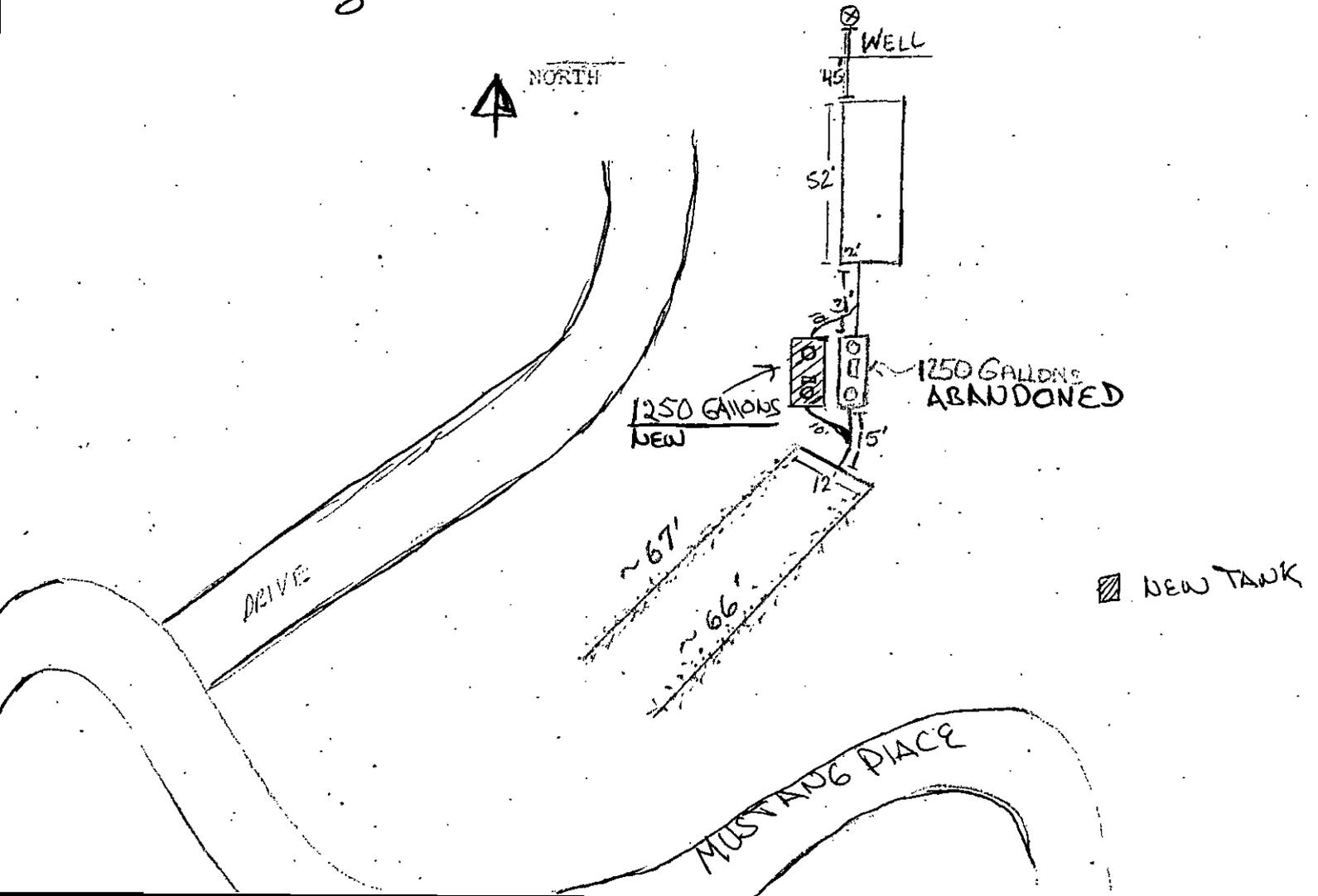
DISPOSAL FIELD:
Trench: Depth (Range) Width 3' Total Length 133' Sq. Ft. 399 ft² (1/10/84 report)
Bed: Depth (Range) Length Width Sq. Ft.
Depth of Rock Under PVC Type of cover on Rock

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 #Chambers Sq. Ft./Chamber Bed Trench
High Profile Units: Type Chamber #Chambers Sq. Ft./Chamber Bed Trench
Reduction Allowed % Sq. Ft. Required Depth (Range)
Sq. Ft. Installed Equivalent Sq. Ft. Installed with Reduction 399 ft² (per 1/10/84 report)
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: EXISTING SYSTEM, NEW 1250 GALLONS TANK
THE 1984 TANK WAS CRUSHED, BACK FILLED AND COMPACTED BY
KUNAU DRILLING.



**EL PASO COUNTY
DEPARTMENT OF HEALTH AND ENVIRONMENT
301 S Union Blvd, Colorado Springs, Colorado 719-575-8635
ONSITE WASTE WATER SYSTEM PERMIT**

OWNER NAME:	NICOLE JACKSON	PERMIT NUMBER:	0023104
ADDRESS:	8330 MUSTANG PL		
CITY, STATE, ZIP:	COLORADO SPRINGS, CO 80908	DATE PERMITTED :	07/01/2009
PHONE NUMBER:	(719) 964-6081 (Home Phone)		

This permit is issued in accordance with 25-10-207 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 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.

PERMIT EXPIRATION DATE: 07/01/2010
Expires twelve months from date of issue

Janet Christensen
578-3141

WATER SOURCE: Well or Spring

MINIMUM SEPTIC TANK SIZE:	1250	GALLONS	MINIMUM ABSORPTION AREA REQUIRED	N/A	SQ FT
---------------------------	------	---------	----------------------------------	-----	-------

PLANNING DEPARTMENT	<input type="checkbox"/>	ENUMERATION	<input type="checkbox"/>	FLOOD PLAIN	<input type="checkbox"/>	WASTEWATER	<input type="checkbox"/>
---------------------	--------------------------	-------------	--------------------------	-------------	--------------------------	------------	--------------------------

COMMENTS:

8699

*** FOR INSPECTIONS CALL 575-8635 BEFORE 8:30 A.M. OF THE DAY TO BE INSPECTED.
(WEEKENDS & HOLIDAYS EXCLUDED)
LEAVE THE ENTIRE SEWAGE DISPOSAL SYSTEM UNCOVERED FOR FINAL INSPECTION**

PERMIT IS FOR REPLACEMENT OF EXISTING 1250 GALLON SEPTIC TANK WITH NEW SEPTIC TANK. EXISTING SEPTIC TANK MUST BE PROPERLY ABANDONED BY EITHER CRUSHING OR FILLING IN WITH DIRT. SEPTIC TANK MUST BE PUMPED BY LICENSED SYSTEMS CLEANER. HEALTH DEPT. MUST INSPECT NEW SEPTIC TANK INSTALLATION PRIOR TO BACKFILL.

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 ADMINISTRATOR USE ONLY

Permit Ready:

Called

Mailed

Faxed - 7/1/09 2:45pm PR

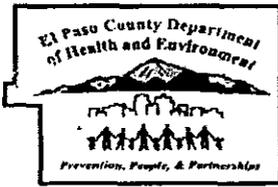
Final Inspection Requested:

BY: *Kunau drilling*

Date Called In: *07-07-09*

Phone # *683-3720*

Septic Site will be ready: *Now*



EL PASO COUNTY DEPARTMENT OF HEALTH & ENVIRONMENT
301 South Union Boulevard • Colorado Springs, CO • 80910-3123 •
(719) 575-8635 • Fax: (719) 578-3188

Record I.D. 23104

***ALL PAYMENTS ARE DUE AT TIME OF SUBMITTAL IN CASH, CHECK, or MAJOR CREDIT CARD**

APPLICATION FOR AN ONSITE WASTEWATER SYSTEM PERMIT

NEW PERMIT MINOR REPAIR PERMIT MAJOR REPAIR PERMIT

PR
7/1/04
2:30pm

Owner NICOLE E. JACKSON Daytime Phone 719-964-6081
Address of Property 8330 Mustang Pl City & Zip COLORADO SPRINGS, 80908
Legal Description lot 10 Pawnee Rancheros, Filing # 2.
Owner's MAILING Address 8330 MUSTANG PL. City, State & Zip COLORADO SPRINGS, CO. 80908
Lot Size 5.37 Tax Schedule # 530400 #17 2017
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 FAX - FAX TO AND # To Kunau 683-3717

MAXIMUM POTENTIAL NUMBER OF BEDROOMS 3
Percolation Test Attached N Basement Y N Garbage Disposal Y N Clothes Washer 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/OWNER'S AGENT SIGNATURE Frances J. Jackson for Nicole E. Jackson Date 1 July 09

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

DEPARTMENT OF HEALTH USE ONLY		
<u>1250</u>	<u>N/A</u>	<u>N/A</u>
Minimum Tank Capacity	Minimum Absorption Area	Date of Site Inspection
REMARKS <u>Permit is for replacement of existing 1250 gallon septic tank with new septic tank. Existing septic tank must be properly abandoned by either crushing or filling in with dirt. Septic tank must be pumped by licensed systems cleaner. Health dept. must inspect new septic tank installation prior to backfill.</u>		
EHS INSPECTOR <u>Jana Christman</u>	DATE <u>07/01/09</u>	APPROVED <input checked="" type="checkbox"/> DENIED <input type="checkbox"/>

CURRENT FEES AS APPROVED BY EL PASO COUNTY BOARD OF HEALTH
New Permit: \$304.50 EPCDHE costs + \$23.00 State Surcharge + \$177.50 EPC Planning Surcharge = \$505.00
Major repair permit: \$316.00 + \$23.00 State Surcharge = \$339.00
Minor repair permit: \$131.00 + \$23.00 State Surcharge = \$154.00
DATE TO LAND DEVELOPMENT/WASTEWATER: _____
DATE TO FLOODPLAIN/ENUMERATIONS: _____

1) We require an original of your **PERCOLATION (PERC) TEST** with an original licensed engineer's (PE) stamp and signature as well as a plot of the percolation test hole locations with measurements from a fixed reference point. (A faxed copy directly from the engineering firm to this office is acceptable.)

2) **PROPERTY ADDRESS OR LOT NUMBER MUST BE POSTED AND CLEARLY VISIBLE FROM ROAD. PERC HOLES MUST BE CLEARLY MARKED. OR AN ADDITIONAL CHARGE FOR A RETURN TRIP TO THE SITE MAY BE ASSESSED.**

3) A **PLOT PLAN** must be drawn (not to scale) on an 8 ½ x 11 inch sheet of paper. The plot plan must include:

- | | | |
|---|---|--|
| 1) a north bearing | 5) proposed septic system site | 8) Distance of percolation test to two property lines. |
| 2) property lines | 6) alternate septic system site | |
| 3) property dimensions | 7) driveway (proposed or existing and name of adjoining street) | |
| 4) all buildings (proposed or existing) | | |

4) Initial any of the following features that apply to your property and **INCLUDE** them on your **PLOT PLAN**.

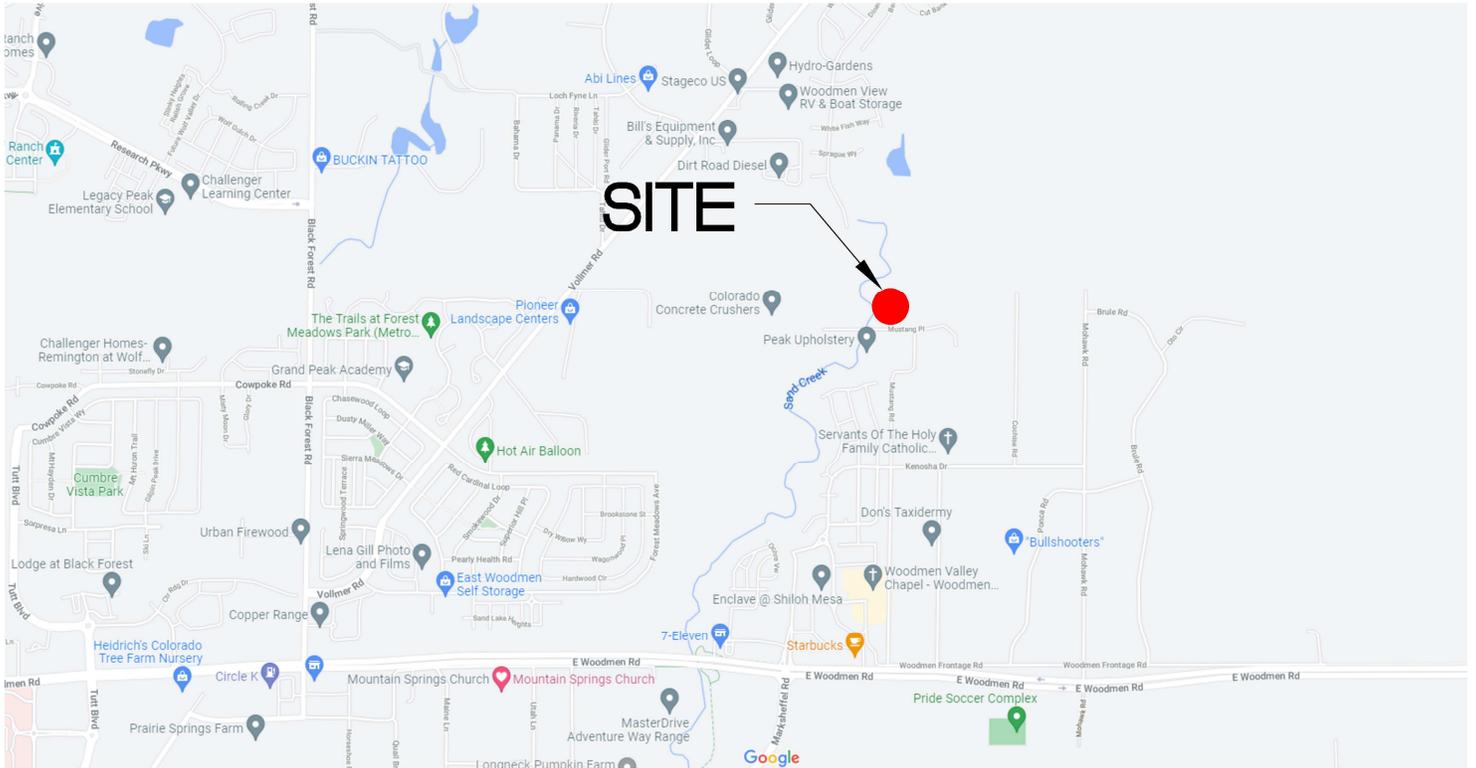
- | | | |
|----------------------------------|--|--|
| <input type="checkbox"/> Well(s) | <input type="checkbox"/> Adjacent property well(s) | <input type="checkbox"/> Subsoil drain |
| <input type="checkbox"/> Cistern | <input type="checkbox"/> Water line | |

5) Initial any of the following that are within 100 feet of your proposed septic system and **INCLUDE** on your **PLOT PLAN**.

- | | |
|--|---|
| <input type="checkbox"/> Spring(s) | <input type="checkbox"/> Lake(s) |
| <input type="checkbox"/> Pond(s) | <input type="checkbox"/> Stream(s) |
| <input type="checkbox"/> Dry Gulch(es) | <input type="checkbox"/> Natural drainage course(s) |

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

FIGURES



NOT TO SCALE



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SITE VICINITY MAP

**8330 MUSTANG PLACE
 LOT 10, PAWNEE RANCHEROS, FILING NO. 2
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL**

JOB No. 186431

FIG No. 1

DATE 1-26-2022

ASSUMED PROPERTY BOUNDARY

ASSUMED PROPERTY BOUNDARY



PROPOSED HOUSE

PROPOSED LOT LINE

DRIVE

Mustang Pl

MUSTANG PLACE



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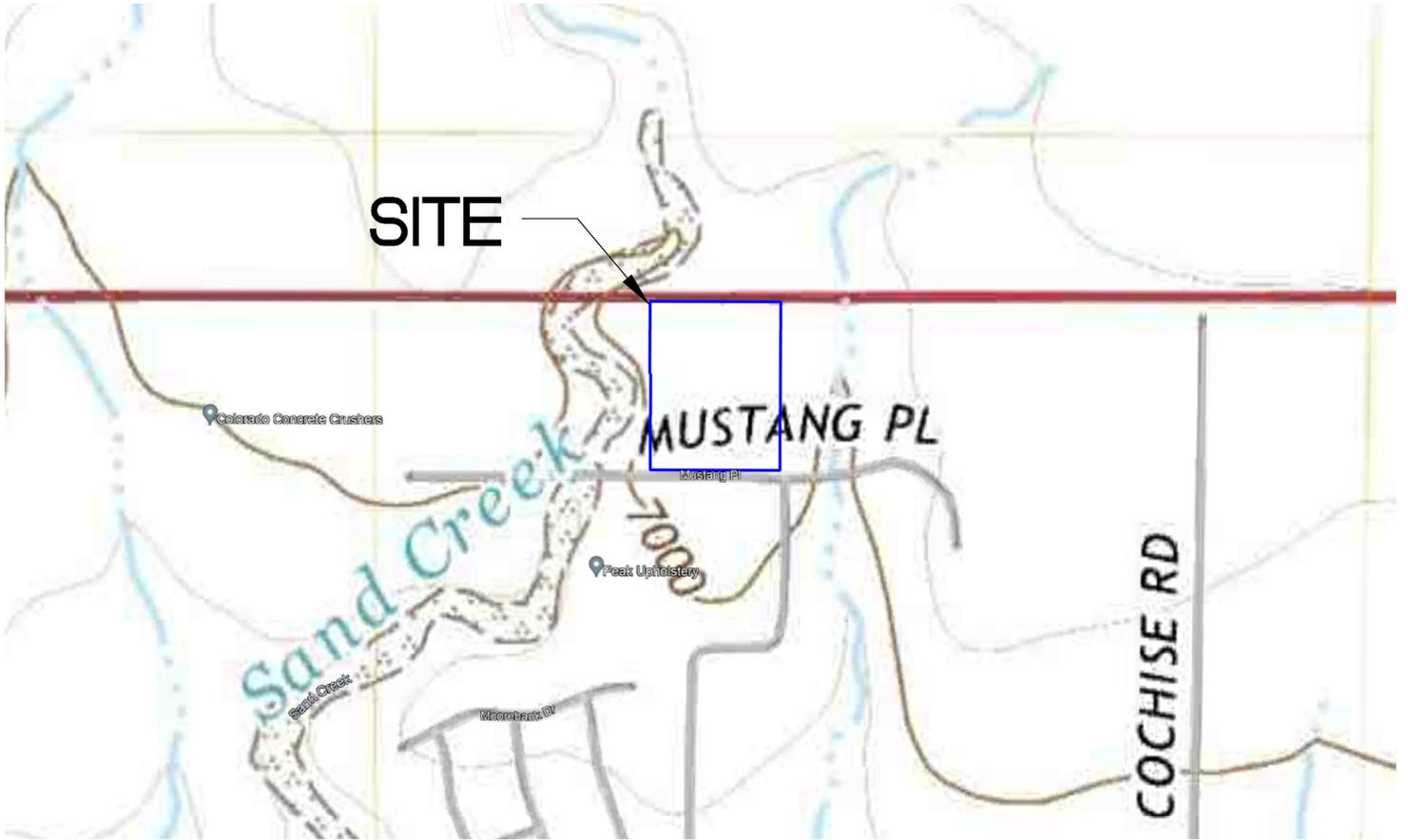
PROPOSED LOT LAYOUT

8330 MUSTANG PLACE
LOT 10, PAWNEE RANCHEROS, FILING NO. 2
EL PASO COUNTY, COLORADO
MICHAEL CARTMELL

JOB No. 186431

FIG No. 2

DATE 1-26-2022



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USGS TOPO MAP

8330 MUSTANG PLACE
 LOT 10, PAWNEE RANCHEROS, FILING NO. 2
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL

JOB No. 186431

FIG No. 3

DATE 1-26-2022

TEST PIT TP-1			
DATE OBSERVED: 11/04/21			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 8.0 FT SAND (STRUCTURELESS)	0ft 2ft 4ft 6ft 8ft		1

TEST PIT TP-2			
DATE OBSERVED: 11/04/21			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 8.0 FT SAND (STRUCTURELESS)	0ft 2ft 4ft 6ft 8ft		1

SOIL DESCRIPTIONS



SAND



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TEST PIT LOGS

**8330 MUSTANG PLACE
LOT 10, PAWNEE RANCHEROS, FILING NO. 2
EL PASO COUNTY, COLORADO
MICHAEL CARTMELL**

JOB No. 186431

DATE 1-26-2022

FIGURE No. 4



19 - Columbine gravelly sandy loam, 0 to 3 percent slopes
 71 - Pring coarse sandy loam, 3 to 8 percent slopes



NOT TO SCALE



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USDA SOIL SURVEY

8330 MUSTANG PLACE
 LOT 10, PAWNEE RANCHEROS, FILING NO. 2
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL

JOB No. 186431

FIG No. 5

DATE 1-26-2022



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Woodland Park Office:
 (719) 687-6077

Monument Office:
 (719) 488-2145

Pueblo / Canon City:
 (719) 544-7750

Geologic

cac - Arkosic loamy colluvium and sheetwash alluvium

tdu - Upper part of Dawson Arkose - arkosic sandstone, conglomerate, and shale

psw - Potentially Seasonally Wet Area

af - Artificial Fill Area

Engineering

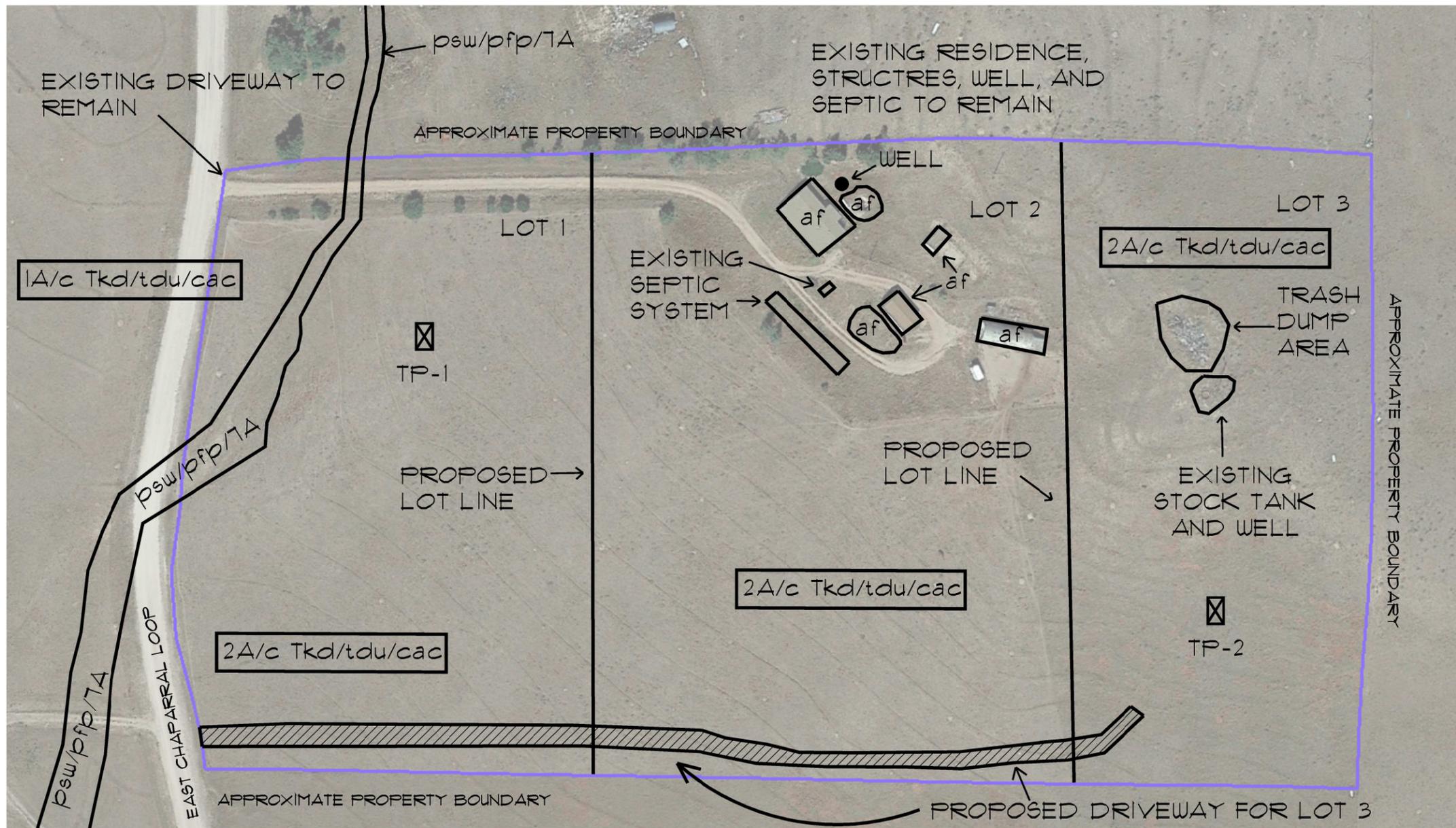
1A - Stable alluvium, colluvium and bedrock on flat to gentle slopes (0-5%)

2A - Stable alluvium, colluvium and bedrock on gentle to moderate slopes (5-12%)

TA - Physiographic floodplain

c Tkd - Colluvium, Dawson Formation (Upper Part)

⊠ DENOTES APPROXIMATE LOCATION OF TEST PITS



15435 EAST CHAPARRAL LOOP
 LOT 62, PEYTON RANCHES
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL

ENGINEER:	TFM
DRAWN BY:	KCR
CHECKED BY:	TFM
ISSUED:	1-26-2022

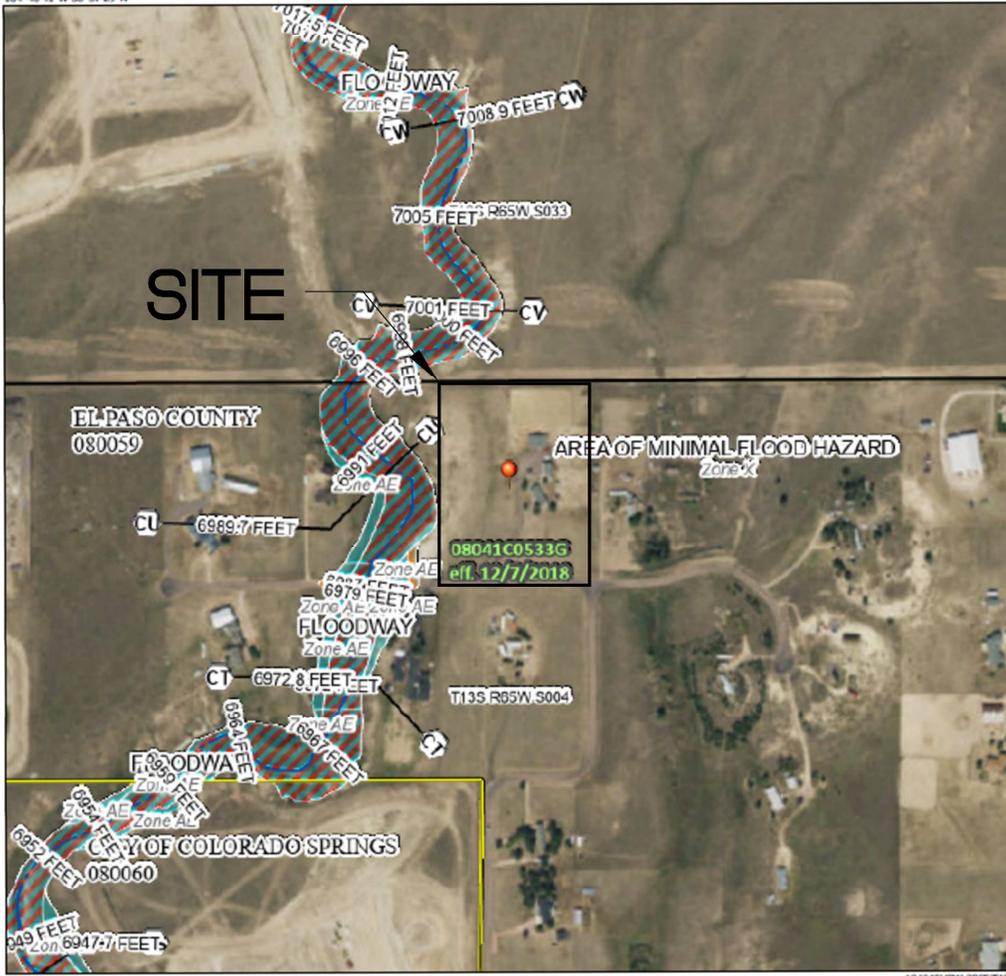
ENGINEERING AND GEOLOGY MAP

SHEET No. FIG-6

National Flood Hazard Layer FIRMette



104°40'41"W 38°57'29"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000
 Basemap: USGS National Map: Orthoimagery; Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
	With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
	Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
	Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
	Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
	Effective LOMRs
	Area of Undetermined Flood Hazard <i>Zone D</i>
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
	17.5 Coastal Transect
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/30/2021 at 1:36 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



NOT TO SCALE

ARCHITECTS
RMG
 ENGINEERS
 ROCKY MOUNTAIN GROUP

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FEMA MAP

8330 MUSTANG PLACE
 LOT 10, PAWNEE RANCHEROS, FILING NO. 2
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL

JOB No. 186431

FIG No. 7

DATE 1-26-2022



APPROXIMATE PROPERTY BOUNDARY

⊗ TP-1

⊗ TP-2

Mustang Pl MUSTANG PLACE



NOT TO SCALE



DENOTES APPROXIMATE LOCATION OF TEST PITS



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TEST PIT LOCATION MAP

8330 MUSTANG PLACE
 LOT 10, PAWNEE RANCHEROS, FILING NO. 2
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL

JOB No. 186431

FIG No. 8

DATE 1-26-2022



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DENOTES APPROXIMATE PRIMARY AND ALTERNATE SEPTIC LOCATIONS



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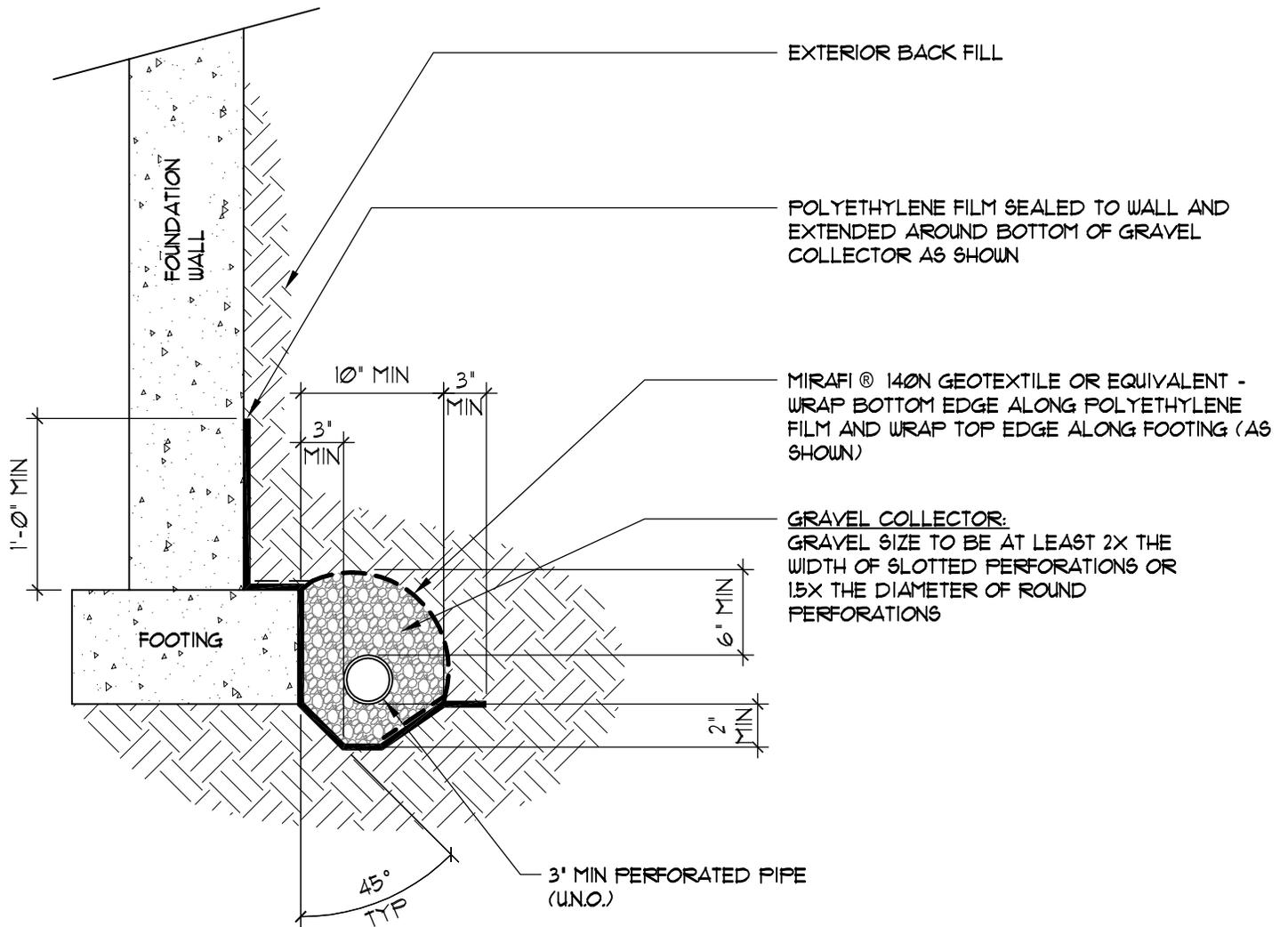
SEPTIC SUITABILITY MAP

8330 MUSTANG PLACE
 LOT 10, PAWNEE RANCHEROS, FILING NO. 2
 EL PASO COUNTY, COLORADO
 MICHAEL CARTMELL

JOB No. 186431

FIG No. 9

DATE 1-26-2022



GENERAL NOTES:

1. BOTTOM OF DRAIN PIPE SHALL BE AT OR BELOW BOTTOM OF FOOTING AT ALL LOCATIONS
2. ALL DRAIN PIPE SHALL BE PERFORATED PLASTIC, WITH THE EXCEPTION OF THE DISCHARGE PORTION WHICH SHALL BE SOLID, NON-PERFORATED PIPE.
3. DRAIN PIPE SHALL HAVE POSITIVE FALL THROUGHOUT.
4. DRAIN PIPE SHALL BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. IF A GRAVITY OUTFALL CANNOT BE ACHIEVED, THEN A SUMP PIT AND PUMP SHALL BE USED.
5. ALL DRAIN COMPONENTS SHALL BE RATED/APPROVED BY THE MANUFACTURER FOR THE INSTALLED DEPTH AND APPLICATION
6. DRAIN SYSTEM, INCLUDING THE OUTFALL OF THE DRAIN, SHALL BE OBSERVED BY QUALIFIED PERSONNEL PRIOR TO BACKFILLING TO VERIFY INSTALLATION.



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PERIMETER DRAIN

FIG No. 10