Structural
Geotechnical

Materials Testing
Forensic

SOIL AND GEOLOGY STUDY

Proposed Subdivsion
County Line Rd

EPC Schedule No. 7104200012
El Paso County, Colorado

PREPARED FOR:

Roger & Mary Sung
3195 County Line Rd.
Monument, CO 80132

JOB NO. 199069

July 1, 2025

Respectfully Submitted,

RMG Engineers

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Reviewed by,

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1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the NW¼ of Section 36, Township 13 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located east of the intersection of County Line Road and Highway 105. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Proposed Land Use and Project Description

The total calculated area of the included parcels, as recorded on the El Paso County (EPC) Assessors website, is currently 331.36 acres. The proposed site development is to consist of rezoning and subdividing the parcels into 78 lots ranging between 2.5 and 5.0 acres each. The included parcels are as follows:

- **El Paso County Parcel Number 7105424044** – the site is currently labeled as Star View Circle, is currently classified as forest land and is undeveloped vacant land which consists of 14.4 acres.
- **El Paso County Parcel Number 7104200012** – the site is currently addressed as 910 County Line Rd, is currently not zoned, currently is classified as forest land and is undeveloped vacant land which consists of 141.93 acres.
- **El Paso County Parcel Number 7104000002** – the site is currently labeled as County Line Rd, is currently zoned RR-5 – Residential Rural, is undeveloped vacant land, and consists of 34.29 acres.
- **El Paso County Parcel Number 7104000001** – the site is currently addressed as 20040 Capella Dr. is currently zoned RR-5 Residential Rural, is undeveloped vacant land, and consists of 49.84 acres.
- **El Paso County Parcel Number 7104001010** – the site is currently addressed as 3275 County Line Rd, is currently zoned RR-5 Residential Rural, and contains an existing church, which has an associated well and septic system, and consists of 46.62 acres.
- **El Paso County Parcel Number 7103000028** – the site is currently addressed as 3195 County Line Rd, is currently zoned RR-5 Residential Rural, and contains a former youth center, which has an associated well and septic system, and consists of 44.28 acres.

It is our understanding that the parcels are to be subdivided into 78 lots ranging between 2.5 and 5.0 acres each. Of the 331.36 acres, approximately 112.57 acres are to remain as open space. The subdivision is to be accessed along the northern property boundary, from two locations along County Line Road east of Spruce Mountain. One additional potential future access is proposed along the western property boundary. Each lot is to be serviced by an individual wastewater treatment system and a well. Preliminary grading plans were still in process at the time of this study, but it is our understanding that grading is anticipated to be minor, with construction occurring near the existing grades. The Proposed Lot Layout, Figure 2, outlines the proposed subdivision and the general boundaries of our investigation.

The majority of the property is undeveloped but there are two existing structures on the property. The existing church and former youth center structures are to remain, and are not included in the overall total of lots. Additionally, the House of Prayer and Retreat is to remain on proposed Lot 1. Two stock ponds are located near the northern portion of the site, on proposed lots 50 and 58. The ponds will likely be emptied and filled in with soil. The parcels addressed as 3195 and 3275 County Line Road have associated septic

fields and wells. It is uncertain at this time if the septic fields and wells will remain. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

This letter is to provide information for the on-site wastewater report per the On-Site Wastewater Treatment Systems (OWTS) Regulations of the El Paso County Board of Health pursuant to Chapter 8.

2.0 QUALIFICATIONS OF PREPARERS

This *Soil and Geology 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 principal 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 24 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 is a licensed professional engineer with over 24 years of experience in the construction engineering (residential) field. Mr. Munger holds a Bachelor of Science in Architectural Engineering from the University of Wyoming. Mr. Munger has supervised and performed numerous geological and geotechnical field investigation programs in Colorado.

3.0 STUDY OVERVIEW

The purpose of this investigation is to characterize the general geotechnical and geologic site conditions, and present our opinions of the potential effect of these conditions on the proposed single-family residential development within the referenced proposed development. 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.

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 Engineering Criteria Manual (ECM), specifically Appendix C last updated July 9, 2019.

This report presents the findings of the study performed by RMG relating to the geotechnical and geologic conditions of the above-referenced site. 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.

3.1 Scope and Objective

The scope of this study included a physical reconnaissance of the site and a review of pertinent, publicly 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. Our services

exclude the evaluation of the environmental and/or human, health-related work products or recommendations previously prepared, by others, for this project.

The objectives of our study are to:

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

This report presents the findings of the study performed by RMG 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:

- Field reconnaissance
- Geologic and topographic maps
- Review of selected publicly available, pertinent engineering reports by RMG and others
- Available aerial photographs
- Exploratory soil test borings and test pits by RMG
- Laboratory testing of representative site soil and rock samples
- Geologic research and analysis
- Site development plans prepared by others

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 Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for this site were not available for our review. However, investigations in the area were reviewed and are listed below:

1. *Wastewater Study, County Line Road, El Paso County, Colorado,* prepared by RMG Engineers, dated June 20, 2025.

2. *Soil and Geology Study, Red Rock Acres, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 189879, dated February 22, 2023.
3. *Wastewater Study, Red Rock Acres, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 189879, dated February 22, 2023.
4. *Soils and Geology Study, Elephant Rock Villas, Lot 2, Rancho Iraceme Sub., Filing No. 2. Town of Palmer Lake, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 190736, last amended January 4, 2023.

The findings, conclusions and recommendations contained in those reports and the reports referenced within Appendix A were considered during the preparation of this report.

3.4 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 subject site is mostly vacant, fairly undisturbed land that has historically been used for open space and church/religious related activities. The site is bound to the north by County Line Road, to the east by the Meiers subdivision (5-acre lots), to the south by the Colorado Estates subdivision (2.5-acre lots), and to the west by East Palmer Lake commercial development and Lake Shadows Palmer Lake subdivision.

Topographically, the site consists of undulating to gently rolling hills that generally slope down to the north. Steeper slopes, heavily vegetated terrain, and rock outcrops are located along the southern property boundary.

Vegetation across the northern portion of the site consists of low-lying grasses, weeds, yuccas, and scattered trees. The vegetation and trees are much denser on the southern portion of the site. The lots located along the southern portion of the site, atop and below the ridge, are heavily vegetated with dense pine trees, scrub oak, and low-lying brush.

4.2 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1999, and historical photos by historicaerials.com dating back to 1947. 1947 shows the site and surrounding area as undisturbed land with defined drainages. The church and youth center, located near the center of the property, were constructed prior to 1983. Depending on the time of the year and the lighting, the broad off-site drainages appear to be well-defined and contained. Since 1983, the surrounding residential areas were developed but the subject site had seen few changes. Overall, the site has undergone minor surficial changes.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

Once the subdivision is approved, it is our understanding that each lot (other than Lot 1) is to contain a single-family residence, well, and On-site Wastewater Treatment System (OWTS). Test borings and test pits were spaced across the site to capture the soil, bedrock, and groundwater conditions across the site.

5.1 RMG Site Exploration

The subsurface conditions across the site were explored by RMG by drilling fifteen (15) exploratory borings. The test borings were performed on May 12 and May 22, and extended to 20 to 35 feet below the existing ground surface. Additionally, fifteen (15) test pits were also observed on May 21, 2025. The approximate locations of the test borings and test pits are presented on the Test Pit/Boring Location Plan, Figure 3.

The test borings were drilled with a power-driven, continuous-flight auger drill rig. Samples were obtained during drilling of the test boring in general accordance with ASTM D-1586 and D-3550, utilizing a 2-inch O.D. Split Barrel Sampler and a 2½-inch O.D. California Sampler, respectively. An Explanation of Test Boring Logs is presented in Figure 4. The Test Boring Logs are presented in Figures 5 through 12. The test pit logs and soil descriptions are presented in the Wastewater Study, included in Appendix C.

5.2 RMG Laboratory Testing

The moisture content for the recovered samples was obtained in the laboratory. Grain-size analysis, Atterberg Limits, and Denver Swell/Consolidation tests were performed on selected samples for purposes of classification and to develop pertinent engineering properties. A Summary of Laboratory Test Results is presented in Figure 13. Soil Classification Data are presented in Figure 14 through 16. The Denver Swell/Consolidation tests are presented in Figures 17 and 18.

5.3 Test Pit Excavations: OWTS Visual and Tactile Evaluation

The 15 test pits noted above were performed to explore the subsurface soils surrounding the existing 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. Visual and tactile evaluations were performed in conjunction with this investigation. The soils were evaluated to determine the soil types and structures.

The test pits were excavated to approximately 8 feet below the existing ground surface. Bedrock was observed in one of the test pits (TP-3) and was encountered in approximately half of the test borings. The depth of bedrock will vary across the property and between test pits. Bedrock is considered a restrictive layer for the OWTS. Evidence of seasonally fluctuating surface water and/or perched water was observed in one of the test pits (TP-7). Groundwater is also considered a restrictive layer for the OWTS.

Other than TP-7, no other test pits had indications of redoximorphic features (*color patterns in soil that are caused by the oxidation and reduction of iron and manganese*), underlying the topsoil. Additional information is provided in Section 9.0, On-site Disposal of Wastewater.

5.4 Groundwater

Water was encountered in three of the test borings at the time of drilling. Due to the location of the site in relation to public trails and open space, only the test borings that encountered water at the time of drilling were left open for a follow-up water check. The depth of water ranged between 5 and 6 feet below the ground surface in the test borings at the time of drilling and between 2 and 6 feet at the time of the follow-up water check.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

6.1 Geologic Conditions

The site physiographically lies in the western portion of the Great Plains Physiographic Province south of the Palmer Divide. Approximately 6 miles to the west is a major structural feature known as the Rampart Range Fault. The fault marks the boundary between the Great Plains Physiographic and Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. 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 upper Cretaceous and Paleocene Age. The residual soils are produced by the in-situ weathering of the bedrock.

6.2 Subsurface Soil Conditions

The subsurface soils encountered in the test borings performed by RMG were classified using the Unified Soil Classification System (USCS). The laboratory testing performed revealed the on-site soils and bedrock classified as sandy clay (CL), clayey sand (SC), and well-graded silty sand (SW-SM). Visually, the bedrock encountered included sandstone (SM to SC) and claystone (CL).

The subsurface soils encountered in the test pit excavations were classified using the United States Department of Agriculture (USDA) soil classification system. The on-site soils classified into 7 different varieties of soil, including a combination of sandy clay loam, sandy clay, sand, silty clay, loamy sand, clay, and soil containing more than 35% rock (Soil Type R).

6.3 Bedrock Conditions

Bedrock was encountered in approximately half the test borings and one of the test pit excavations performed for this investigation. In general, the bedrock (as defined by Colorado Geological Survey) beneath the site is considered to be part of the Dawson Formation which consists of about half silty sandstone and conglomerate, and half interbedded layers of shale, claystone, and siltstone. The Dawson formation is thickly bedded to massive, generally light-colored arkose, pebbly, and pebble conglomerate. The sandstones are poorly sorted with high clay contents. The sandstone is generally semi-permeable, somewhat well-drained, and has good foundation characteristics. The claystone (if encountered) is generally non-permeable, not well-drained, and is not suitable for foundations. The Dawson formation is generally considered a restrictive layer for OWTS.

The sandstone bedrock was encountered in the test borings at depths ranging between 2 and 31 feet below the surface. Claystone bedrock was not encountered in our test borings, but may be encountered at various depths across the site, at the time of site development and/or the lot specific subsurface soil investigations. Based on our observations, the sandstone and claystone generally increases in depth as the surface topography increases in elevation.

6.4 U.S. Soil Conservation Service

The U.S. Soil Conservation Service along with USDA has identified the soils on the property from two different maps, the Castle Rock Area and the El Paso County Area. The following are from the Castle Rock Area, the northern portion of the site.

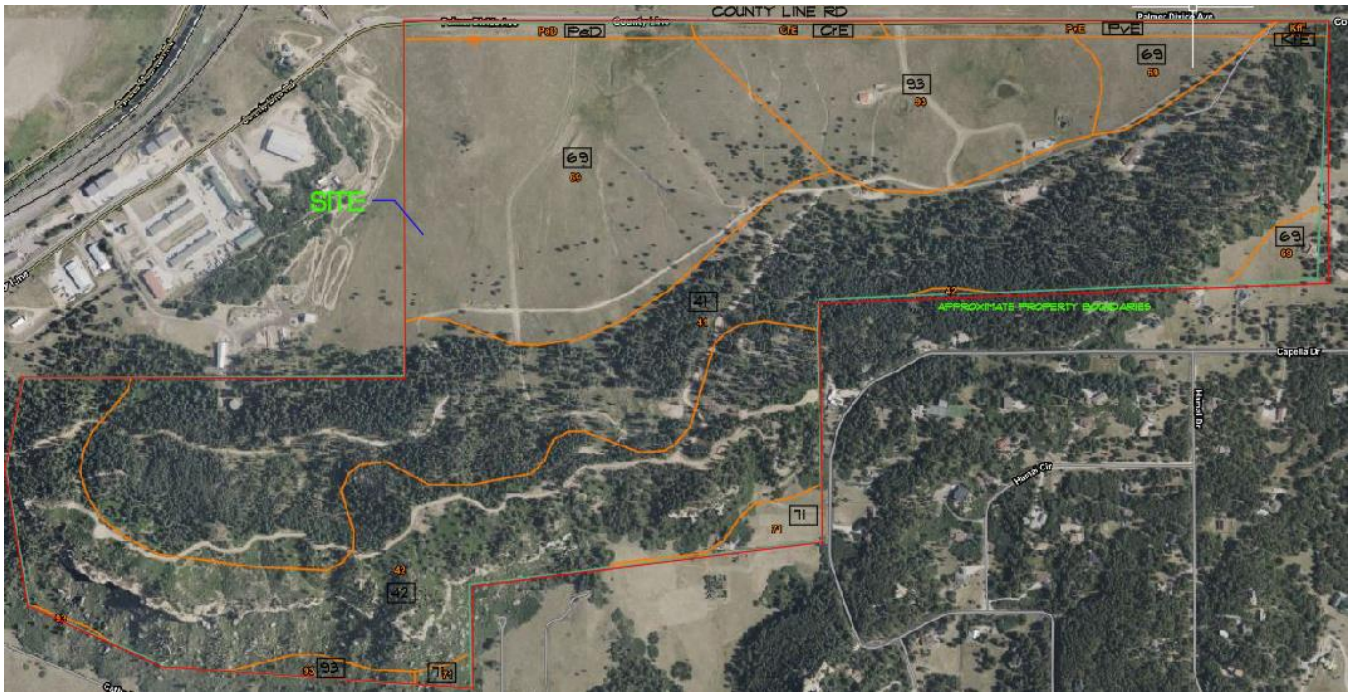
- **CrE – Crowfoot-Tomah sandy loams,** *5 to 25 percent slopes*. The Crowfoot-Tomah sandy loams were mapped by the USDA to be located along County Line Road. Properties of the Crowfoot-Tomah sandy loams include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be none to low, frequency of flooding and ponding is none. Landforms for the Crowfoot setting include ridges, hills, and alluvial fans. Landforms for the Tomah setting include alluvial fans, hills, and ridges.
- **KfF – Kettle-Falcon complex,** *9 to 65 percent slopes.* The Kettle-Falcon complex was also mapped by the USDA to be located along County Line Road. Properties of the Kettle-Falcon complex include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be low for the Kettle setting and very high for the Falcon setting, frequency of flooding and ponding is none. Landforms for the Kettle setting include ridges and hills. Landforms for the Falcon setting include cliffs.
- **PeD – Peyton sandy loam,** *3 to 9 percent slopes*. The Peyton sandy loam was also mapped by the USDA to be located along County Line Road. Properties of the Peyton sandy loam include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and ponding is none. Landforms include valley sides, plateaus, and mesas.
- **PvE – Pring and Kippen gravelly sandy loams,** *1 to 25 percent slopes*. The Pring and Kippen gravelly sandy loams were also mapped by the USDA to be located along County Line Road. Properties of the Pring and Kippen gravelly sandy loams include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and ponding is none. Landforms include valley sides, plateaus, and mesas.

The following are from the El Paso County Area, the remainder of the site

- **41 – Kettle gravelly loamy sand**, *8 to 40 percent slopes*. The Kettle gravelly loamy sand was mapped by the USDA to be located along the southern portion of the property. The Kettle gravelly loamy sand encompasses approximately 10.5 acres for a total of 27.9 percent of the property. Properties of the Kettle gravelly loamy sand include, somewhat excessively drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms are depressions.
- **42 – Kettle-Rock outcrop complex**, Properties of the Kettle-Rock outcrop complex include, well-drained soils, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms include hills.
- **69 – Peyton-Pring complex**, *8 to 15 percent slopes.* Properties of the Peyton-Pring complex include, well-drained soils, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms include hills.
- **71 – Pring coarse sandy loam**, *3 to 8 percent slopes*. The Pring coarse sandy loam encompasses approximately 1.8 percent of the property. Properties of the Pring coarse sandy loam include, well-drained soil, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be low, frequency of flooding is none and ponding is none. Landforms include hills.

- **93 – Tomah-Crowfoot complex**, *8 to 15 percent slopes.* The Tomah-Crowfoot complex was mapped by the USDA to encompass the northwest corner of the property. Properties of the Tomah-Crowfoot complex 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 below.



6.5 General Geologic Conditions

Based on our field observations and review of relevant geologic maps, a geologic map was prepared to identify the geologic conditions affecting the development. The geologic units present on the site are presented in the Engineering and Geology Map, Figure 19.

The site generally consists of silty to clayey sand and clay overlying the Dawson Formation. The silty sand is generally permeable, well-drained, and has good foundation characteristics. As the clay content increases, the permeability and foundation characteristics decline. The sandstone and claystone will likely be encountered across the site at various depths. The geologic units mapped at the site were as follows:

- ***Qc – Colluvium deposits, undivided (Holocene to late Pleistocene)*** - Colluvium is loose, unconsolidated accumulation of soil, rock fragments, and sediment that has moved downslope primarily by gravity-driven processes (i.e., mass wasting), often in combination with minor water transport.
- ***QTg_4 – Gravel deposit (early Pleistocene or late Eocene?)*** - refers to an older, high-standing gravel deposit of uncertain age.
- ***Qcs – Colluvium and sheetwash alluvium deposits, undivided (Holocene and late Pleistocene)*** - represents an ancient gravel deposit preserved as isolated high benches in the Monument Quadrangle. While its exact age is uncertain, its stratigraphic position suggests deposition by

ancestral high-energy streams. It is geotechnically favorable in most settings but must be evaluated for local cementation, fines content, and erosional context.

- ***Tkda – Dawson Formation, (Upper Cretaceous and Paleocene)*** – the unit is generally drab colored; which includes shades of grey, yellow and brown. Pebbles are mostly granitic, quarts, feldspar, with pebbles ranging up to 2 inches in diameter. This unit is approximately 1,350 feet thick in this area. The sandstone was encountered in the test borings at depths as shallow as 2 feet and deeper than 25 feet.
- ***Rf*** – ***Rockfall*** – areas that are prone to rockfall.
- ***sw – seasonally wet areas*** – low-lying areas that may contain surface water during heavy precipitation events (rain, snow melt).
- ***ss – steep slopes*** – slopes along the exposed outcrops / cliffs along the southern portion of the site could be potentially unstable. These cliffs should not be disturbed by the proposed development. It is recommended a 50-foot setback be maintained from the top of the cliff banks unless detailed rockfall and slope stability analyses are performed to demonstrate adequate factors of safety. This setback area is to be designated as a "No Build Area".

6.6 Structural Features

Structural features such as schistocity, folds, zones of contortion or crushing, joints, shear zones or faults were not observed on the site, or in the surrounding area.

6.7 Surficial (Unconsolidated) Deposits

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. The alluvial deposits are non-marine terrace deposits that have been reworked from conglomerates in the Dawson Formation up-valley, along nearby creeks, and transported to the site.

6.8 Groundwater

The site contains existing structures. Topographically, the site is lowest near the northern portion of the site where open fields and tall grasses exist. Elevations gradually increase to the south and east with gentle rolling terrain, eventually terminating at the rock outcrops and cliffs near the southern portion of the property.

Water was encountered in three of the test borings at the time of drilling. When checked 16 days after drilling, the same three borings had water at the time of the follow-up water check. The depth of water ranged between 2 and 6 feet below the ground surface in the three test borings. Due to the shallow water encountered along the northern portion of the site, additional yearlong groundwater monitoring will be required to determine the feasibility of below ground habitable space (crawlspace and basement foundations) for the proposed future residences. Additional discussion is included in **Section 8.3, Ponding Surface Water and Shallow Groundwater.**

6.9 Engineering Geology

The environmental engineering units on-site are discussed below:

- **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%).
- **3B** – Expansive and potentially expansive soil and bedrock on flat to moderate slopes (0-12%).
- **4A** – Potentially unstable colluvium and bedrock on moderate to steep slopes (12-24%).
- **5A** – Rockfall and potential rockfall hazard and talus deposits.

The engineering and geology units are presented in the Engineering and Geology Map, Figure 19.

6.10 Features of Special Significance

Features of special significance such as accelerated erosion, advancing gully head, badlands, or cliff reentrants were not observed on the northern portion of the property. Features indicating settlement or subsidence such as fissures, scarplets, and offset reference features were not observed on the property or surrounding areas.

Features indicating creep, slump, or slide masses in bedrock and surficial deposits were not observed on the site.

6.11 Flooding and Surface Drainage

Based on our review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0044G and the online ArcGIS Pikes Peak Regional Floodplain Map, the entire site lies outside the 100-year and 500-year floodplains. The FEMA Map is presented below.

7.0 ECONOMIC MINERAL RESOURCES

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 eolian deposits or not mapped. Extraction of the sand resource is not considered to be economical compared to materials available elsewhere within the county.

According to the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands*, the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped "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.

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

The El Paso County Engineering Criteria Manual recognizes and delineates the difference between 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 conditions were considered in the preparation of this report, and do not pose a significant risk to the proposed development:

- Avalanches
- Debris Flow-Fans/Mudslides
- Floodplain / Floodway
- Ground Subsidence
- Landslides
- Steeply Dipping Bedrock
- Undocumented/Uncontrolled Fill

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

8.1 Expansive Soils and Bedrock - *constraint*

Based on the laboratory testing performed by RMG and on the results presented in the previous investigations, referenced herein, the sandy clay and claystone generally possesses low to moderate swell potential. Expansive clay soils and claystone bedrock were encountered on this site and may require mitigation prior to construction of the proposed residences.

Mitigation

Localized overexcavation below the proposed foundations and replacement with structural fill is anticipated to be the preferred mitigation for expansive soils. Expansive soils and/or bedrock were encountered at depths expected to affect foundation components and/or floor slabs. Expansive soils and/or bedrock (if encountered) may require overexcavation up to depths of 3 to 4 feet where encountered. Moisture-conditioning and recompacting the on-site clays (if desired) may also be considered for mitigation of expansive materials, but may result in differing overexcavation depths and foundation design parameters. Floor slabs bearing directly on expansive material should be expected to experience a higher degree of movement. Overexcavation and replacement below the floor slabs has been successful in reducing slab movement. If slab movement cannot be tolerated, drilled straight-shaft piers below foundation components is an alternative to the overexcavation and replacement.

The final determination of mitigation alternatives and foundation design criteria were determined in site-specific subsurface soil investigations for each lot. Provided that appropriate mitigations and/or foundation design adjustments were implemented, the presence of expansive soils is not considered to pose a risk to the structures.

8.2 Compressible Soils - *constraint*

Compressible soils include both compressive and collapsible soils. Compressible soils are prone to volumetric change when subjected to an increased load. Collapsible soils are metastable in that they are prone to volumetric change (collapse) on wetting and loading. Based on our investigation, the surficial soils at this site generally possess low compressibility potential.

Mitigation

If loose soils are encountered beneath the foundations, mitigation will be required. Due to the variability of the soil/bedrock conditions across the site and the anticipated 2.5-acre lot sizes, "mass" subexcavation of very loose to loose materials is not currently proposed, nor are we proposing it at this time.

Localized overexcavation below the proposed foundations and replacement with structural fill is anticipated to be the preferred mitigation. If very loose to loose soils are encountered during the open excavation observation, they may require removal and recompaction of up to 2 to 3 feet of loose soil. The use of track-mounted excavation equipment, or other low ground pressure equipment, is recommended on loose soils to reduce the likelihood of loss of stability during excavation.

The final determination of mitigation alternatives and foundation design criteria are to be determined in site-specific subsurface soil investigations for each lot. Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of compressible soils is not considered to pose a risk to the proposed structures.

8.3 Ponding Surface Water and Shallow Groundwater– *constraint*

Based on our site observations and review of the Palmer Lake Quadrangle Geologic Map, Colorado and Google Earth images dating back to December 1955, springs do not appear to originate on the subject site but low-lying areas that collect and pond water are present along the northern portion of the site.

Water was encountered in three of the test borings at the time of drilling and when checked 16 days subsequent to drilling. The depth of water ranged between 2 and 6 feet below the ground surface in the test borings. Due to the potential for seasonal fluctuations in groundwater, 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. Groundwater information obtained for the current investigation (performed prior to the land development phase) may or may not be representative of the conditions present at the time of construction.

Furthermore, the development processes (reshaping of the ground surface, installation of buried utilities, installation of an underdrain below the roadways, etc.) can significantly alter the depth and flow paths of the subsurface water. The construction of surrounding lots can also alter the amount and depth of subsurface groundwater below a given lot. The potential exists for elevated groundwater levels and/or ponding surface water during high moisture periods, and will affect a portion of **Lots 12-17, 49-51, 53-55, 57-59, 61, 65, 66, and 75-77.** Additionally, **Lots 45-48, 49, 55, 56, 64, 65, 78, and 12**, currently paralleling

County Line Road, have indications of surface runoff along the roadway. If structures encroach on these areas, the following mitigations should be followed.

Mitigation

Depending on the time of year, particularly early spring to early summer with heavy precipitation events, the areas denoted *sw – seasonally wet* on Figure 19, the Engineering and Geology Map may pose access difficulties for heavy equipment. RMG drilling operations encountered difficulty in accessing TB-6, TB-12, and TB-13. These areas encountered shallow groundwater. Generally, in areas with shallow groundwater, below-ground habitable space is not recommended until further investigation determines the depth of groundwater throughout the year will remain a minimum of 6 feet below bottom of proposed foundations.

To date, RMG has not been provided with cut/fill plans or a site grading plan. As such, we are unable to map areas where groundwater will be likely to impact below-grade habitable space. Therefore, basement construction should be restricted except where one of the following conditions apply:

- A year-long groundwater monitoring study has been undertaken, and the results indicate that groundwater is sufficiently deep to allow basement construction;
- The proposed site grading will result in at least 14 feet of separation between the proposed ground surface and the groundwater elevation;

If a minimum separation of 6 feet from the bottom of foundation components and groundwater cannot be maintained, below-grade habitable space shall not be utilized.

Alternatives to the year-long groundwater monitoring study would be to elevate the foundations above the zone of groundwater influence. Areas of shallow groundwater may exhibit unstable subsurface conditions in terms of bearing support of construction equipment during overlot grading and/or at the time of residential construction.

If groundwater conditions encountered at the time of foundation excavation result in either water flow into the excavation or destabilization of the foundation bearing soils, stabilization techniques should be implemented. Various stabilization methods can be employed and can be discussed at the time of construction. However, a method that affords potentially a reduced amount of overexcavation (versus other methods) and provides increased performance under moderately to severely unstable conditions is the use of a layered geogrid and structural fill system.

Additionally, dependent upon the rate of groundwater flow into the excavation, a geosynthetic vertical drain and an overexcavation drain may be required around the lower portions of the excavation to allow for installation of the layered geogrid and structural fill system.

Builders and planners should be cognizant of the potential for the occurrence of subsurface water conditions, in order to evaluate and mitigate each individual problem as necessary. Fluctuations in groundwater and subsurface moisture conditions will occur due to variations in rainfall, irrigation, changes in surface drainage patterns, and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels.

8.4 Unstable or Potentially Unstable Slopes - *hazard*

Lots 1-11 and portions of Lots 20-44 contain slopes near the southern half of each lot that are near or slightly greater than 30%. Slopes greater than 30% are generally designated as "No-Build" zones. The remainder of the site does not contain steep slopes.

Localized, isolated slopes encountered on the lots can either be avoided or regraded, and are not anticipated to impact the proposed construction. The majority of the remaining slopes across the site are comprised of sandstone bedrock. The sandstone of the Dawson formation is generally considered stable up to a 1:1 (horizontal to vertical) cut. Interbedded claystone seams may be present within the sandstone, but are generally encountered in 1- to 2-foot layers within the sandstone and are not expected to substantially affect the overall slope stability. The sandstone bedrock is generally considered stable for steep slopes. It is the rocks and boulders on these steep slopes that create the instability.

Mitigation

Without additional slope stability analyses or rockfall studies, it is recommended the residences and detached structures **maintain a minimum setback of 30 feet from the top and bottom of slopes exceeding 30 percent**. The 30-foot setback represents a 3:1 setback from the average slope across the ridge. Additionally, the foundation should be designed with additional rigidity to help reduce the effect of potential lateral movement of subsurface soils. This may include (but is not limited to) the use of tie beams, counterforts, and added reinforcing to help the foundation move as a unit. This approach should reduce potential cracking and damage resulting from differential movement within the foundation system and super structure. Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of slopes is not considered to pose a risk to the proposed structures.

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).

8.5 Rockfall - *hazard*

Lots 1–3, 5, and 6 have been identified as containing rockfall hazard zones along the southern portion of the lots. These areas are characterized by exposed sandstone cliffs and boulders**,** with talus deposits composed of boulders and cobbles observed downslope of the outcrops. The rockfall hazard is primarily confined to areas immediately below the source zones. At present, no residences are located within the impacted area downslope of these rockfall sources. Notably, the majority of the identified rockfall source areas lie within land that is proposed to remain as designated Open Space for wildlife conservation. Should future development be proposed within the Lakeview Heights subdivision**,** located below these lots, site-specific rockfall mitigation measures will be necessary to ensure public safety and compliance with geologic hazard regulations. Existing rockfall source zones are shown on the Engineering and Geology Map, Figure 19.

Mitigation

Mitigation techniques on the steeper slopes and cliffs should include those mitigation types discussed for the rockfall source area (sections **8.5.1** and **8.5.2**, below), such as rock stabilization. Another option is the use of structures designed to stop rocks before they reach the proposed development to the south, if approved. These structures generally consist of walls, fences, or berms that are specifically designed by a qualified professional engineer or geologist to absorb the impact of moving boulders or debris and stop them. Drainage should be directed around structures to avoid areas of ponding water and sediment

buildup. These type of structures do require periodic maintenance to prevent debris from building up behind the catchment structues and maintaining effectiveness. A Rockfall Analysis may need to be conducted to determine the rockfall characteristics and the effectivness of catchment structures on the site, as needed. Another option, would be to maintain a minimum distance of 30 feet from the top of the cliffs to prevent rockfall down the slopes. Use of specialized heavy equipment to facilitate rock removal and breakup is not anticipated, but could be necessary if substantial sandstone is to be removed. RMG recommends **blasting should be prohibited on the site due to the close proximity of the rock outcroppings.**

Furthermore, drainage will be imperative to maintain the integrity of the parent rock. At no point should surface water overtop the crest of the slope. All surface drainage for the new construction is to be redirected towards the north, away from the southern and eastern slopes. It is highly recommended that all construction equipment maintain as much separation from the slope as feasibly possible and work the materials back away from the slope. At no point shall demolition debris be allowed to topple down the slope.

8.5.1 Rockfall Source Area

The sandstone outcroppings along the ridge, which delineate the identified rockfall source area, form steep, exposed cliffs located along the southern portion of the site. The cliff coincides with a zone of increased slope gradient where naturally fractured and weathered sandstone is exposed at the surface. These cliffs are located along the southern portion of the site along the steep slopes. During our initial site observations, only a limited number of potentially unstable rocks were identified that may warrant scaling or removal. Most of the outcrops appear stable under current conditions.

Mitigation

If the 30-foot setback can be maintained from the top of the slopes and cliff, rockfall mitigation should not be required. However, if this setback cannot be maintained, then additional rockfall analysis will be required. Stabilization of the areas can include removal of loose blocks of rocks and boulders, often referred to as scaling. Any scaling should be performed under existing conditions prior to any earthwork that would remove existing vegetation and change soil characteristics that could alter where the rocks tumble and roll. Periodic monitoring is recommended to assess ongoing weathering, freeze-thaw activity, or vegetation disturbance that could influence future rockfall potential. Temporary barriers should be used to protect existing buildings and roadways during the scaling operations.

Other techniques include stabilization of loose blocks mechanically and may involve pinning the loose rocks to the face of the small cliffs to prevent future dislodgement. This could be accomplished with Portland cement grout, gunite, or a combination of mechanical rock bolts and/or cable lashing.

8.5.2 Rockfall Runout Zone

The area beneath the rockfall source areas is generally referred to as the "runout zone". This area is typically littered with rock fragments in a state of marginal instability. The detached rock fragments present in this zone may also serve as a source of rockfall to the slopes below. The upper portions immediately below the source areas or the steeper slopes on the site below, outside the property boundaries, will need to be evaluated prior to future development. Some of the rocks may

reach lower areas of the site to the south where future development could be proposed. The rocks in this area are lying flat along the sloping surface and with vegetation and no disturbance, appear stable. However, if the surrounding area was to be disturbed from the current native state, the stability of these rocks could change.

Mitigation

Mitigation techniques on the steeper slopes should include those discussed for the rockfall source area (sections **8.5.1** and **8.5.2**, below), such as rock stabilization. Another option is the use of structures designed to stop rocks before they reach proposed building areas. These structures could include walls, fences, or berms that are specifically designed by a qualified engineer or geologist to absorb the impact of moving boulders or debris to stop them. Drainage should be directed around structures to avoid areas of ponding water or sediment buildup. These types of structures do require periodic maintenance to prevent debris from building up behind the catchment structure and reducing its effectiveness. A Rockfall Analysis was not completed for **Lots 1-3, 5, and 6**. It is uncertain where the residences are to be placed, but it is our opinion if the residences can maintain a 30-foot setback from the top of the slopes, a rockfall analysis is not needed. If this setback cannot be maintained, we recommend additional Rockfall Analysis be completed prior to construction of the residences demolition.

8.6 Surface Drainage - *constraint*

Since portions of the southern property contain rock cliffs and steep slopes, the surface drainage should be taken into consideration when selecting the placement of any future structures, particularly on the lots containing the southern steep slope.

Mitigation

Mitigating surface drainage atop steep rocky slopes is critical to reducing erosion, preventing rockfall initiation, and protecting downslope structures, if proposed in the future. Even in the rocky terrain with minimal soil, concentrated runoff and freeze-thaw cycles can exploit joints and bedding planes, leading to progressive destabilization. Below are practical and effective mitigation strategies generally used for rocky, steep-slope environments.

- **Maintain a 30-foot lateral distance** from the top of the slope to avoid additional mitigation. If a 30-foot separation cannot be maintained, additional slope analyses will likely be considered.
- **Diversion Swales and Berms** shall be placed along the top of the cliff to intercept sheet flow, particularly during construction when vegetation is limited and/or completely removed. The swale or berm should be constructed with low-permeability material (compacted clay, treated soil) or lined with concrete or riprap. They should grade gently (1–5%) to carry water laterally to a stable outlet.
- **Grouted Rock or Concrete V-ditches** – generally installed along access paths or slope benches. Durable in rocky, high-flow environments. Must be securely anchored to rock and include energy dissipation features.
- **Riprap Aprons or Drop Structures** – to be installed at drainage outlet points to reduce erosive energy. Sized based on expected peak flow and slope.
- **Check Dams (Rock or Concrete)** - slows water within steep swales or ditches. Prevents formation of rills and gullies on the slope.
- **Concrete or Shotcrete Channels** that are lined with concrete or shotcrete to prevent erosion.
- **Vegetated Mats or Erosion Control Blankets** are not ideal on bare rock, but can be useful on thin

colluvial veneers or jointed rock with soil pockets.

8.7 Faults and Seismicity - *hazard*

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 time 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 in the vicinity of the Ute Pass Fault, which is greater than 15 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 0.183g 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.

8.8 Radon - *hazard*

Radon is a gas that can move freely within the soil and air but can become trapped in structures constructed on the soil. Radon is a byproduct of the natural decay of uranium and radium. Trace amounts of radioactive nuclides are common in the soils and bedrock that underlie this region and site.

***"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.*

El Paso County has an EPA assigned Radon Zone of 1. A radon zone of 1 predicts an average indoor radon screening level greater than 4 pCi/L, which is above the recommended levels assigned by the EPA. *The EPA recommends you take corrective measures to reduce your exposure to radon gas.*

Most of Colorado is generally considered to have the potential of high levels of radon gas, based on the information provided at: http://county-radon.info/CO/El_Paso.html. There are not believed to be unusually hazardous levels of radon from naturally occurring sources 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.

Measures that can be taken after the residence is enclosed 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 it is enclosed and commonly utilized techniques are in place to minimize the risk.

9.0 ON-SITE DISPOSAL OF WASTEWATER

It is our understanding that On-site Wastewater Treatment Systems (OWTS) are proposed for each lot. The site was evaluated by observing 15 profile test pits across the entire site, to obtain a general understanding of the soil and bedrock conditions. The Test Pit Logs are presented in the Wastewater Study included in Appendix B.

9.1 Subsurface Materials

The subsurface materials encountered in the test pit excavations were classified using Table 10-1: Soil Treatment Area Long-term Acceptance Rates from the EPCDHE Chapter 8, OWTS Regulations and the USDA Soil Structure Shape and Grade. The materials were grouped into a variety of soil types to include the following general categories:

- 35% Rock (Soil Type R)
- Sand (Soil Type 1)
- Loamy Sand (Soil Type 1)
- Sandy Clay (Soil Type 4)
- Silty Clay (Soil Type 4)
- Sandy Clay Loam (Soil Type 3A)
- Clay (Soil Type 4)

Limiting layers were encountered in two of the test pits. Bedrock was encountered in TP-3 and groundwater was encountered in TP-7. The long term acceptance rate (LTAR) associated with the most restrictive soils observed in the test pits was 0.40 gallons per day per square foot (gpd/sf) for Soil Type 4. Additional discussions based on our site visit were presented in **5.3 Test Pit Excavations: OWTS Visual and Tactile Evaluation.**

Bedrock (as defined by USDA Soil Structure and Grade) was encountered in five of the test pits observed by RMG. In general, the bedrock (as defined by Colorado Geologic Survey) beneath the site is considered to be part of the Dawson formation. The Dawson formation is generally considered a restrictive layer for OWTS. The shallow depth of this formation and the required separation from the bottom of the OWTS treatment areas may result in limitations on the depth of the treatment areas across the majority of the site. In some cases, mounded systems may be required.

9.2 Treatment Areas

Treatment areas at a minimum must achieve the following:

- The 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*, effective July 7, 2018, amended May 23, 2018;
- Prior to construction of an OWTS, an OWTS design prepared per *the Regulations of the El Paso County Board of Health, Chapter 8, OWTS Regulations* will need to be completed. A scaled site plan and engineered design will also be required prior to obtaining a building permit;
- Comply with any physical setback requirements of Table 7-1 of the El Paso County Department of Health and Environment (EPCDHE);

- Treatment areas are to be located a minimum 100 feet from any well (existing or proposed), including those located on adjacent properties per Table 7-2 per the EPCDHE;
- Treatment areas must also be located a minimum 50 feet from any spring, lake, water course, irrigation ditch, stream or wetland, and 25 feet from dry gulches;
- Other setbacks include the treatment area to be located a minimum 10 feet from property lines, cut banks and fill areas (from the crest);
- The lots are to be laid out to ensure that the proposed OWTS does not fall within any restricted areas (e.g. utility easements, rights-of-way, No Build Areas). Based on the test pit observations, the parcel has a minimum of two locations for the OWTS on each lot.

Contamination of surface and subsurface water resources should not occur provided the OWTS is installed according to the El Paso County Guidelines and property maintained.

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems within the cited limitations. It should be noted that the LTAR values stated above are for preliminary planning only, for the purpose of demonstrating suitability of the proposed systems. The final OWTS systems shall be designed based on an LTAR determined at the time of the OWTS Site Evaluation. This does not constitute an OWTS design. If a future structure and/or OWTS are proposed an individual OWTS will need to be completed prior to construction of the new residence.

10.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in Section 8.0 of this report) that were found to be present at this site include potentially unstable slopes, rockfall, radon, and faults/seismicity. Geologic constraints (also as described in section 8.0 of this report) include expansive and compressible soils/bedrock and seasonally fluctuating subsurface water. It is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering and design contraction practices and avoidance when deemed necessary.

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 borings, laboratory test results, conclusions and recommendations presented in this report are only intended for use in preliminary design and construction.

A site-specific Subsurface Soil Investigation and a site-specific OWTS Site Evaluation and Design will be required for all proposed future structures in the approved development.

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 herein are not considered unusual 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 local construction practices.

In addition to the previously identified mitigation alternatives, surface and subsurface drainage systems should be implemented. Exterior, perimeter foundation drains should be installed around below-grade habitable or storage spaces. Surface water should be efficiently removed from the building area to prevent ponding and infiltration into the subsurface soil.

The foundations and floor slabs of the structures should be designed using the recommendations provided in a lot-specific subsurface soil investigations performed for each lot. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.

Lots 1-3, 5, and 6: Depending on the selected location of the residence a rockfall analysis may be required.
Lots 1-11 and portions of Lots 20-44: maintain a 30-foot setback from the top of the southern slope to provide separation from the top of the slope for slope stability and reduce the potential for rockfall.

Lots 12-17, 49, 50, 53-55, 57-59, 61, 65, 66, and 75-77: Slab on grade foundations are permitted until further year-long groundwater monitoring is completed to determine that a minimum of 6 feet of separation can be maintained from bottom of crawlspace or basement foundation to seasonally fluctuating groundwater.

In our opinion, the native soils should generally be considered a Type "B" soil when applying the OSHA guidelines. For these soil conditions, OSHA recommends a temporary slope inclination of 1H:1V or flatter for excavations 20 feet or less in depth. Some surface sloughing may occur on the slope face at these angles. Steeper cut slopes may be utilized for excavations less than 4 feet deep depending on the strength, moisture content, and homogeneity of the soils as observed in the field. Appropriate slope inclinations should be evaluated in the field by an OSHA-qualified "Competent Person" based on the actual conditions encountered.

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 these properties to read and understand this report, as well as the previous reports referenced above, and to carefully to 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.

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 wildfire hazards, environmental assessment of the site, or identification of

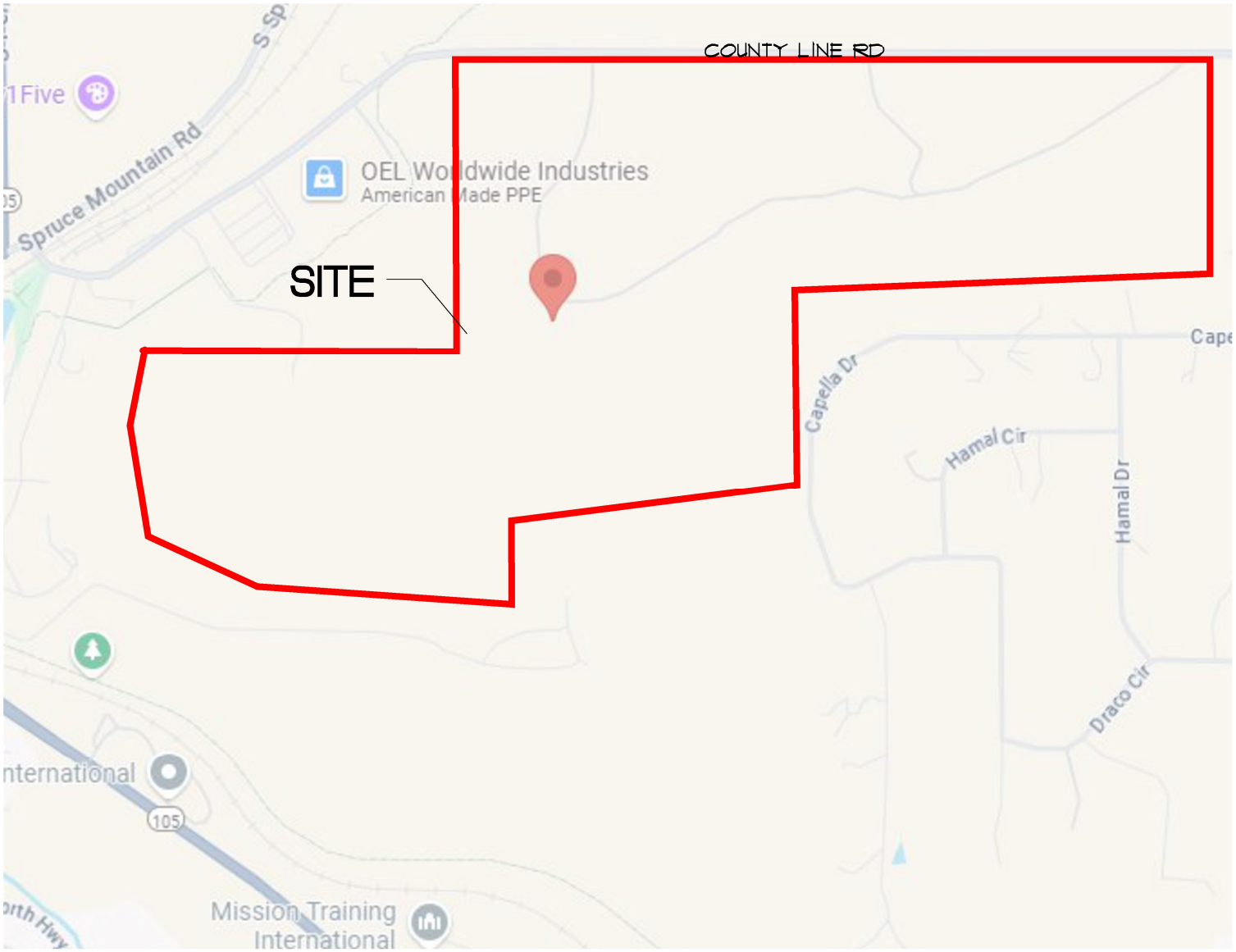
contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to, biological or toxicological issues, are beyond the scope of this report. If the owner is concerned about the potential for such contamination or conditions, other studies should be undertaken.

This report has been prepared for **Roger and Mary Sung** 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 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.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point of view, please feel free to contact us.

FIGURES



NOT TO SCALE

Architecture
Structural
Geotechnical

RMG

Materials Testing
Forensics
Civil / Planning

Engineers / Architects
SOUTHERN COLORADO OFFICE
2910 AUSTIN BLUFFS PKWY, SUITE 100,
COLORADO SPRINGS, CO 80918
(719) 548-0600 ~ WWW.RMGENGINEERS.COM
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

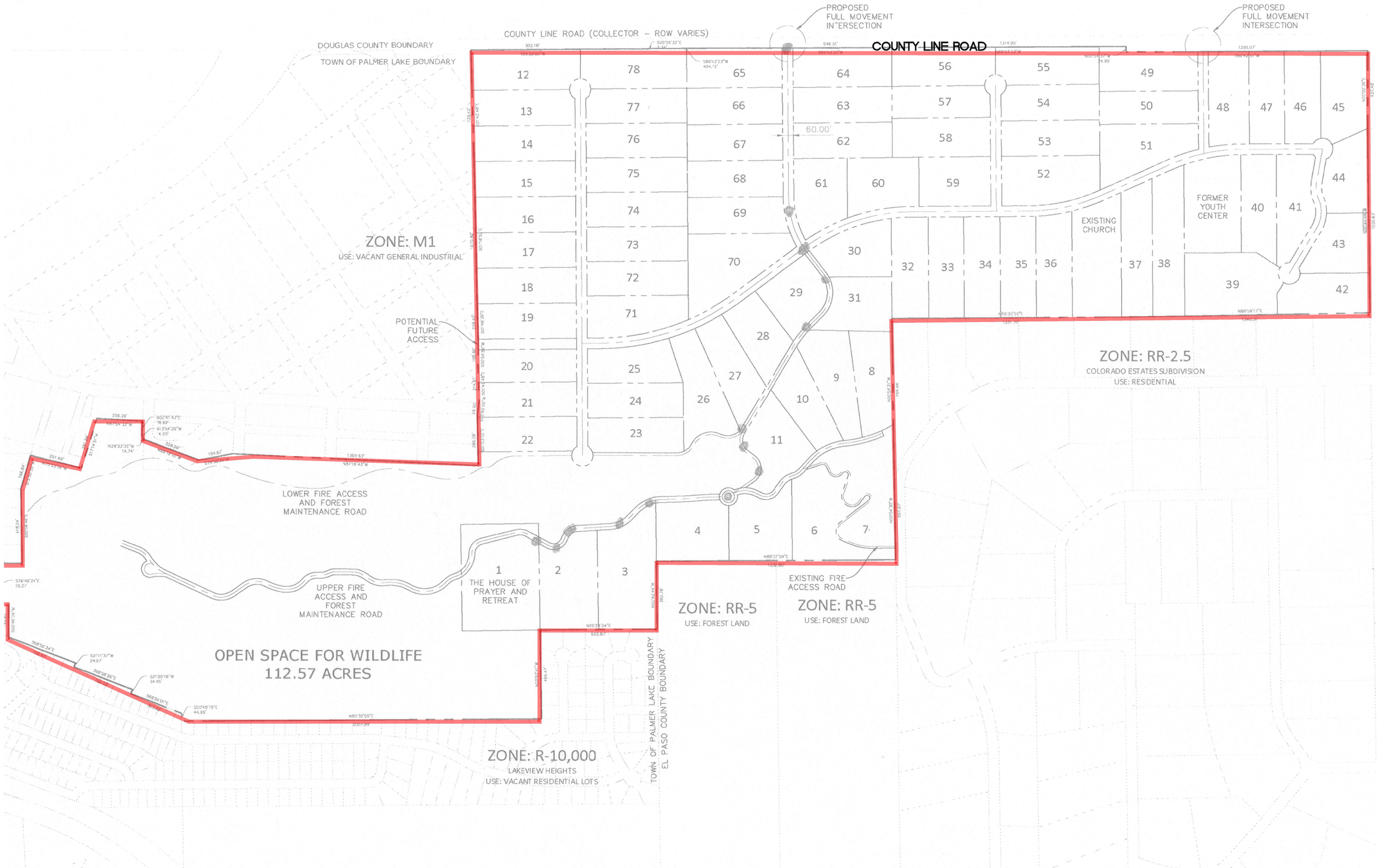
SITE VICINITY MAP

PROPOSED SUBDIVISION
COUNTY LINE ROAD
EL PASO COUNTY, CO
ROGER AND MARY SUNG

JOB No. 199069

FIG No. 1

DATE 7-1-2025



REFERENCE
NOT TO SCALE

JOB No. 199069

RMG
Materials Testing
Forensics
Civil / Planning
Architecture
Structural
Geotechnical
Engineers / Architects
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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

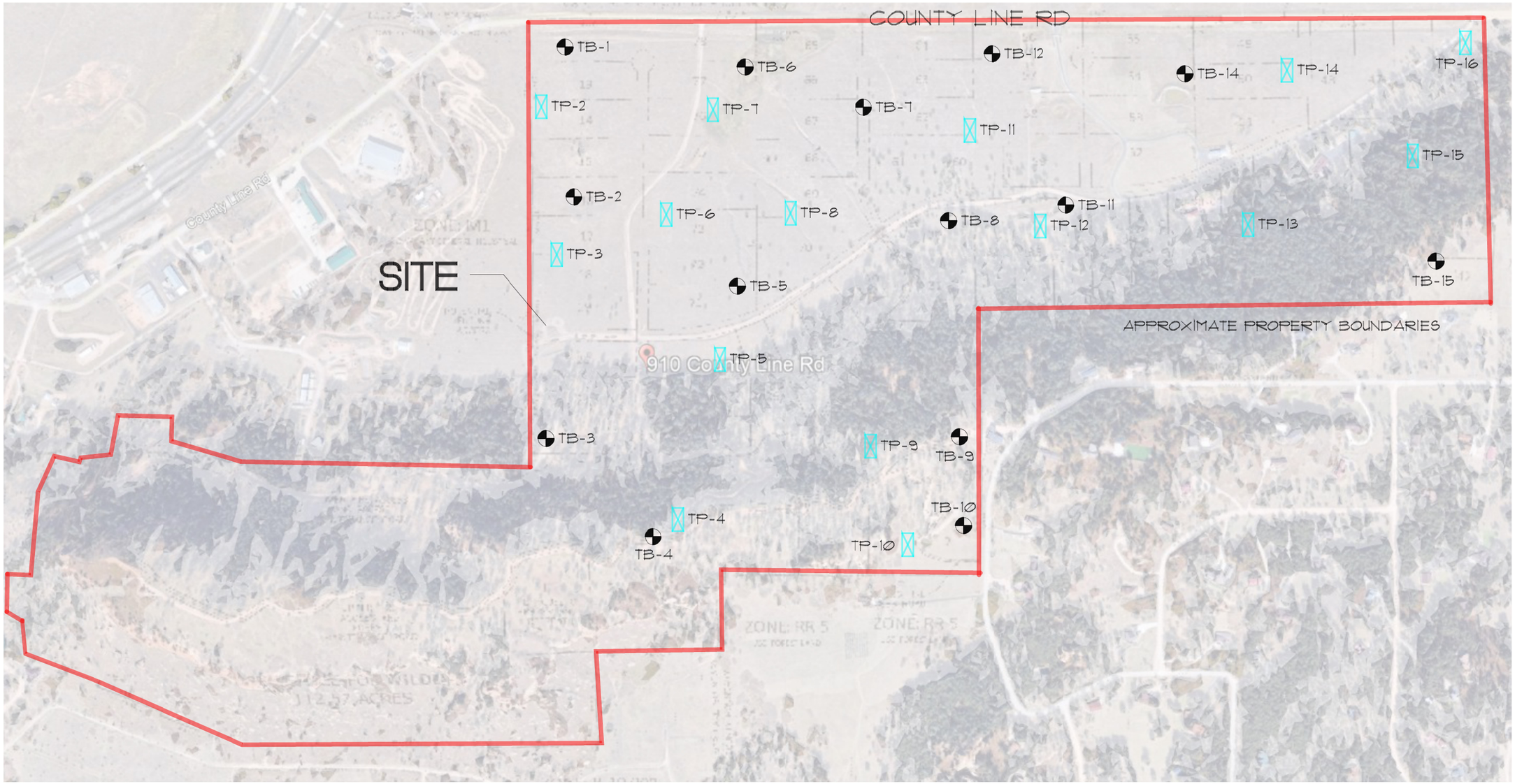
PROPOSED SUBDIVISION
COUNTY LINE ROAD

EL PASO COUNTY, COLORADO
ROGER AND MARY SUNG

ENGINEER:	TPM
DRAWN BY:	KMZ
CHECKED BY:	TPM
ISSUED:	7-1-2025

PROPOSED
LOT LAYOUT

SHEET No.
FIG-2



DENOTES APPROXIMATE LOCATION OF TEST BORINGS

DENOTES APPROXIMATE LOCATION OF TEST PITS

REFERENCE
NOT TO SCALE

JOB No. 199069

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Forensics
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Architecture
Structural
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PROPOSED SUBDIVISION
COUNTY LINE ROAD
EL PASO COUNTY, COLORADO
ROGER AND MARY SUNG

ENGINEER:	TPM
DRAWN BY:	KMZ
CHECKED BY:	TPM
ISSUED:	7-1-2025

TEST PIT/BORING LOCATION PALN

SHEET No.
FIG-3

SOILS DESCRIPTION


CLAYEY SAND


SANDSTONE


SANDY CLAY


SILTY SAND


SILTY TO CLAYEY SAND

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
RMG - ROCKY MOUNTAIN GROUP
5085 LIST DRIVE, SUITE 200
COLORADO SPRINGS, COLORADO

SYMBOLS AND NOTES


XX — STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


XX — UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


FREE WATER TABLE


DEPTH AT WHICH BORING CAVED


BULK — DISTURBED BULK SAMPLE


AUG — AUGER "CUTTINGS"

4.5 — WATER CONTENT (%)

ROCKY MOUNTAIN GROUP

Structural Forensics

RMG

Geotechnical Materials Testing

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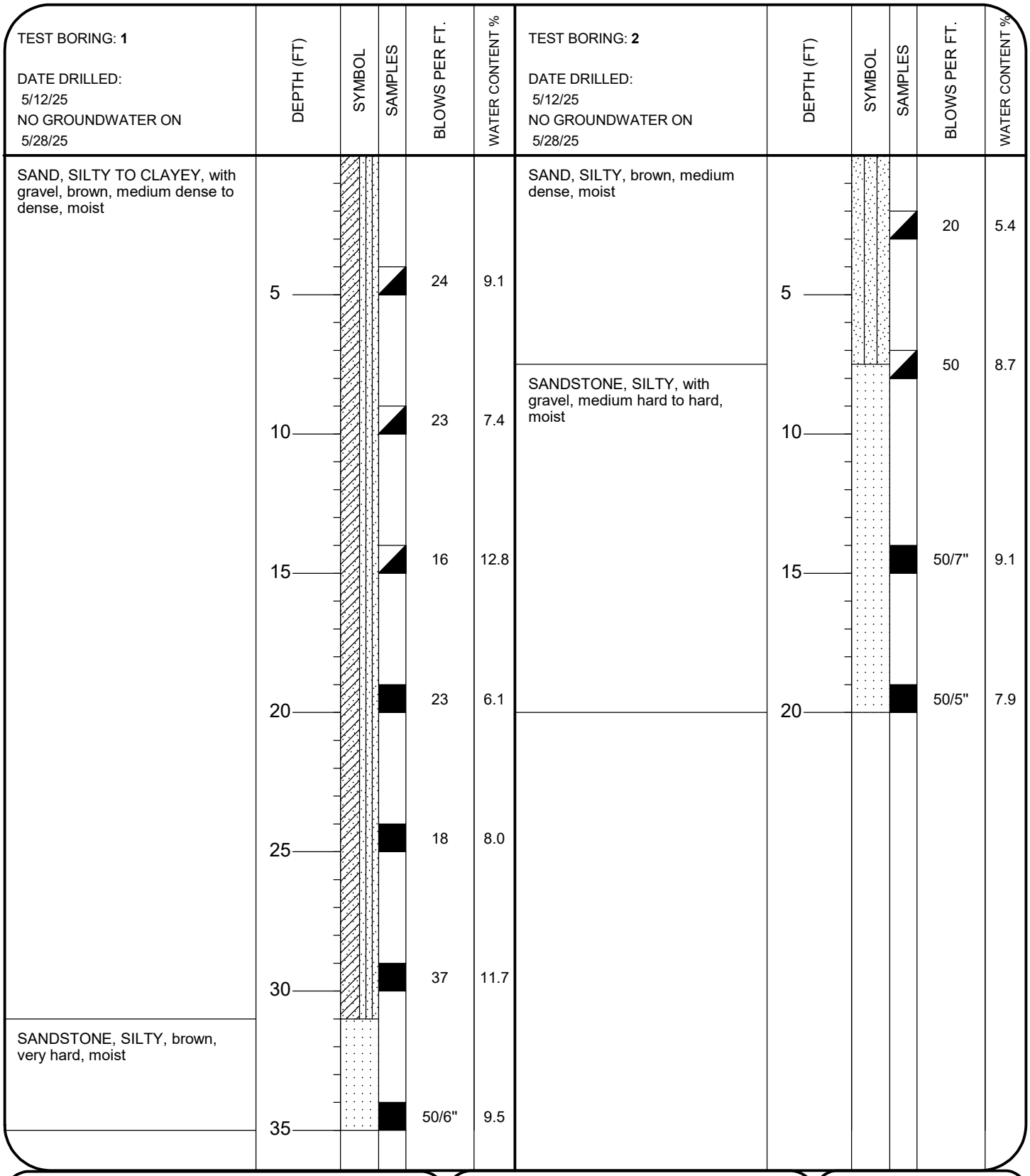
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOGS

JOB No. 199069

FIGURE No. 4

DATE Jul/01/2025



RMG ENGINEERS

Structural Forensics

Geotechnical Materials Testing

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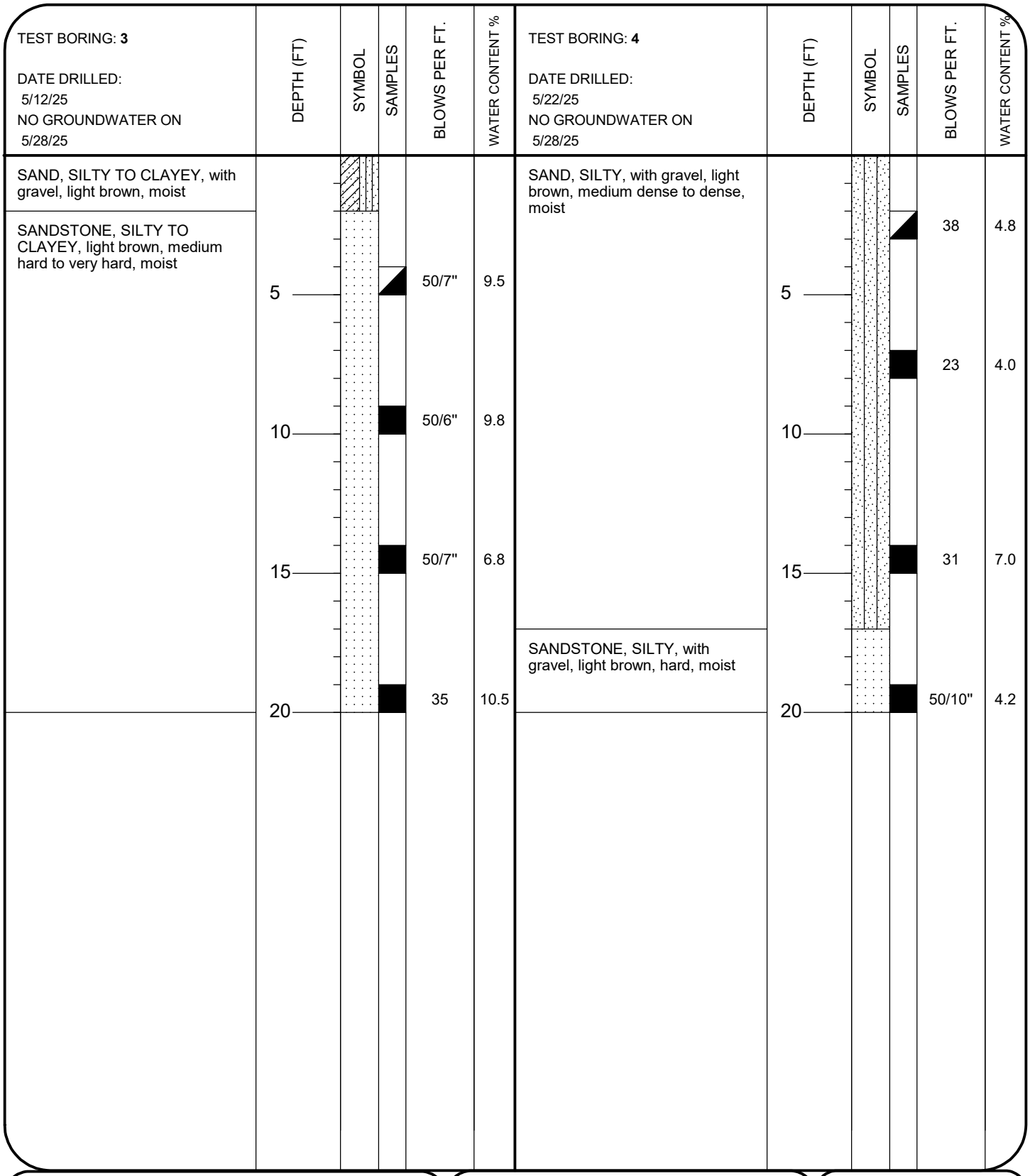
(719) 548-0600
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOG

JOB No. 199069

FIGURE No. 5

DATE Jul/01/2025



RMG ENGINEERS

Structural Forensics

Geotechnical Materials Testing

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Colorado Spings, CO 80918
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SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

TEST BORING LOG

JOB No. 199069

FIGURE No. 6

DATE Jul/01/2025

TEST BORING: **5**

DATE DRILLED:
5/12/25
NO GROUNDWATER ON
5/28/25

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	SAND, SILTY TO CLAYEY, brown, very loose to medium dense, moist		5	14.1
5			12	7.5
10			14	9.9
15			27	8.4
20				

TEST BORING: **6**

DATE DRILLED:
5/12/25
GROUNDWATER @ 2.0 '
5/28/25

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	CLAY, SANDY, olive to brown, medium stiff, moist to wet			
5			8	17.1
	SAND, SILTY TO CLAYEY, brown, medium dense, moist to wet			
10			22	16.3
15			27	11.4
	SANDSTONE, CLAYEY, brown, hard, moist to wet			
20			50/11"	11.6

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TEST BORING LOG

JOB No. 199069

FIGURE No. 7

DATE Jul/01/2025

TEST BORING: **7** DATE DRILLED: 5/12/25 NO GROUNDWATER ON 5/28/25	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, dark brown to light brown, loose to medium dense, moist	5			6	7.1
	10			14	7.2
	15			9	14.4
	20			13	11.4

TEST BORING: **8** DATE DRILLED: 5/12/25 NO GROUNDWATER ON 5/28/25	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, SILTY TO CLAYEY, with gravel, brown, loose to medium dense, moist	5			13	9.4
	10			26	10.6
	15			14	8.7
	20			11	13.0

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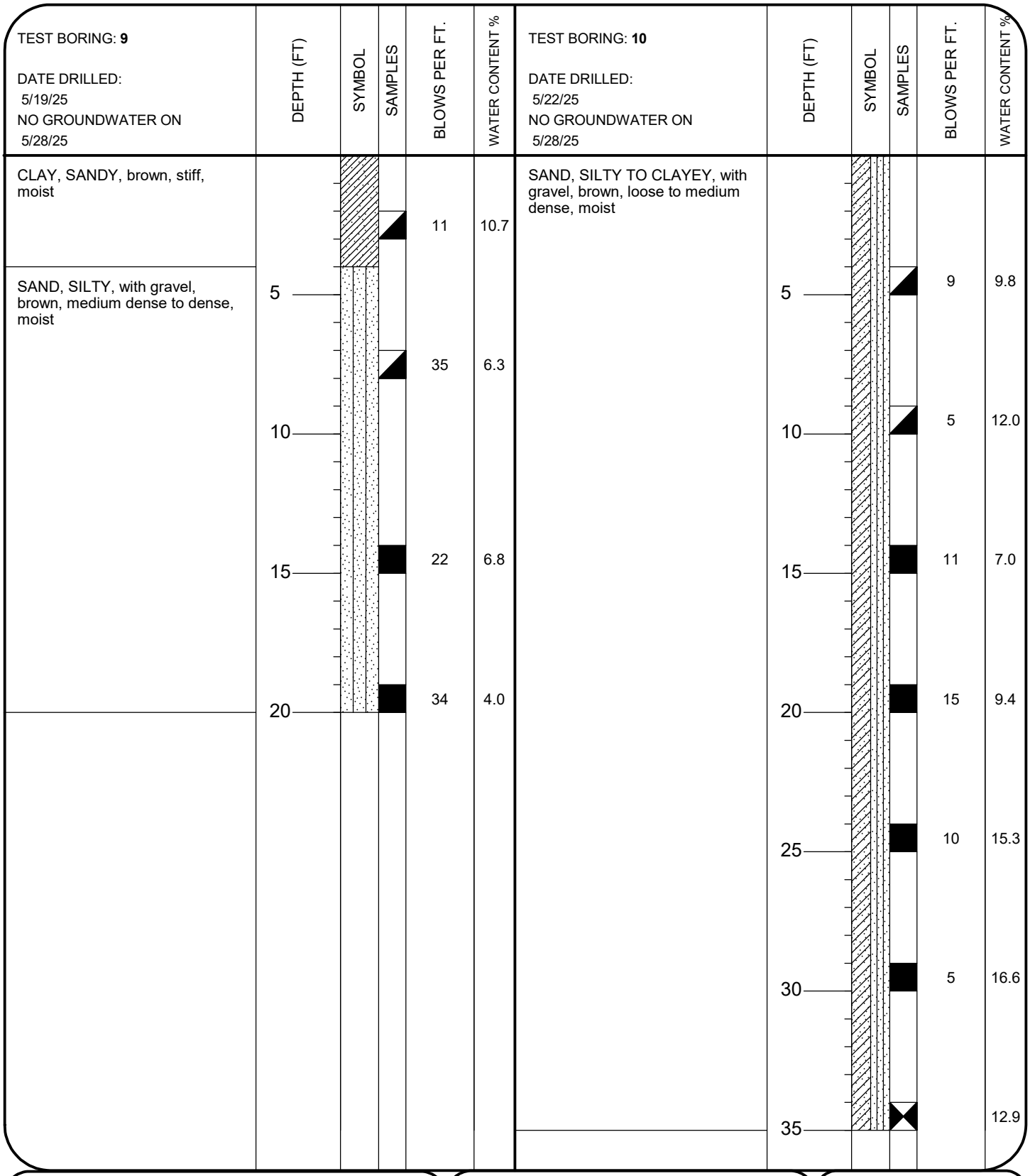
TEST BORING LOG

JOB No. 199069

FIGURE No. 8

DATE Jul/01/2025



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TEST BORING LOG

JOB No. 199069

FIGURE No. 9

DATE Jul/01/2025

TEST BORING: **11**

DATE DRILLED:
5/12/25
NO GROUNDWATER ON
5/28/25

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5			4	2.8
10			19	2.4
15			15	8.0
20			29	8.0

SAND, SILTY, with gravel, brown, very loose to medium dense, moist

TEST BORING: **12**

DATE DRILLED:
5/12/25
GROUNDWATER @ 4.5 '
5/28/25

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
			6	11.0
5 ▽				
			11	14.6
10				
15			13	13.8
20			42	12.0

SAND, SILTY TO CLAYEY, brown, loose to medium dense, moist to wet

SANDSTONE, CLAYEY, gray, medium hard, moist to wet

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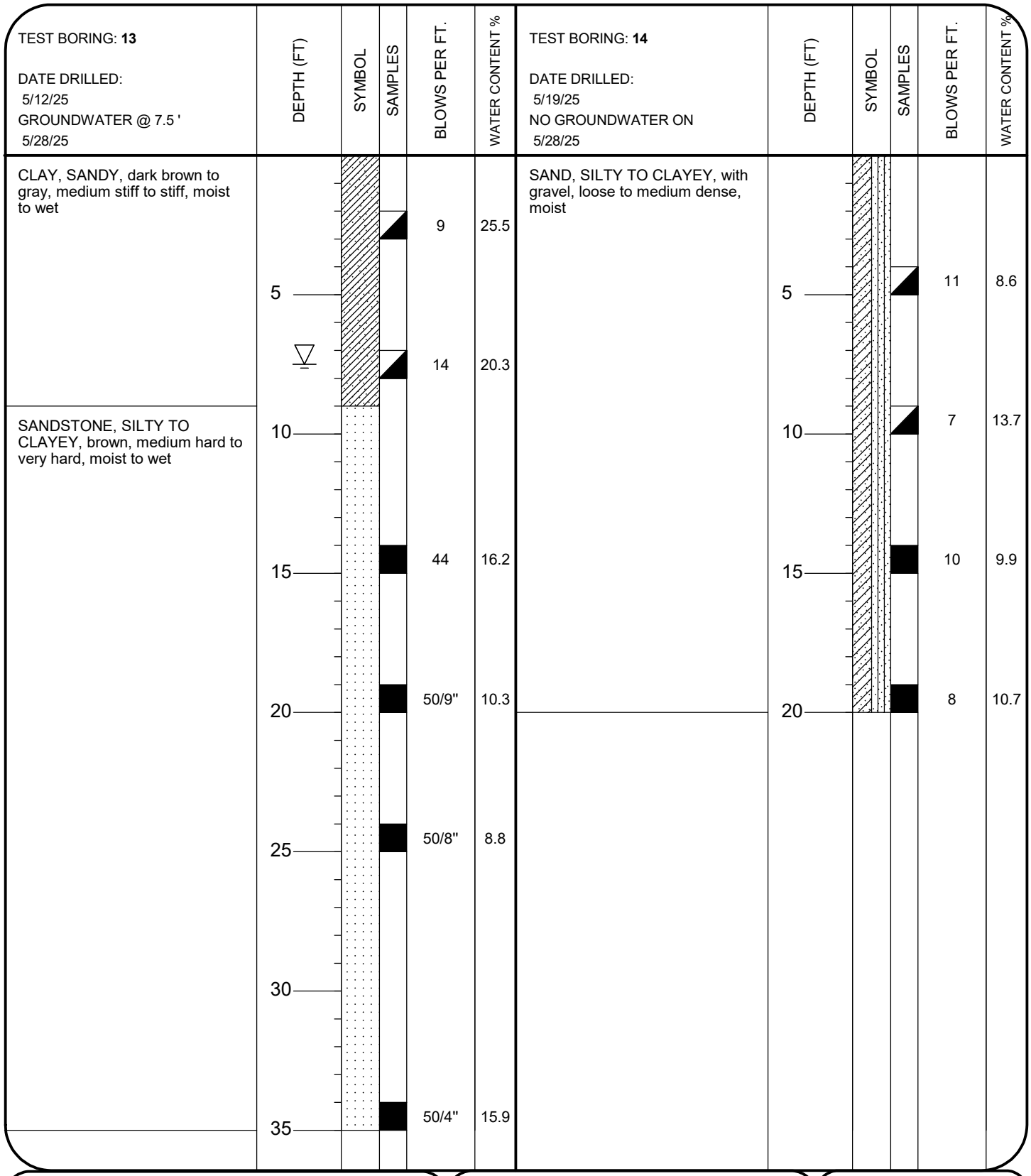
TEST BORING LOG

JOB No. 199069

FIGURE No. 10

DATE Jul/01/2025



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TEST BORING LOG

JOB No. 199069

FIGURE No. 11

DATE Jul/01/2025

TEST BORING: **15**

DATE DRILLED:
5/22/25
NO GROUNDWATER ON
5/28/25

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
SAND, CLAYEY, with gravel, light brown, moist				
SANDSTONE, SILTY TO CLAYEY, light brown, medium hard to very hard, moist				
5			50/9"	10.8
10			50/6"	9.8
15			50/9"	10.0
20			50/6"	11.2

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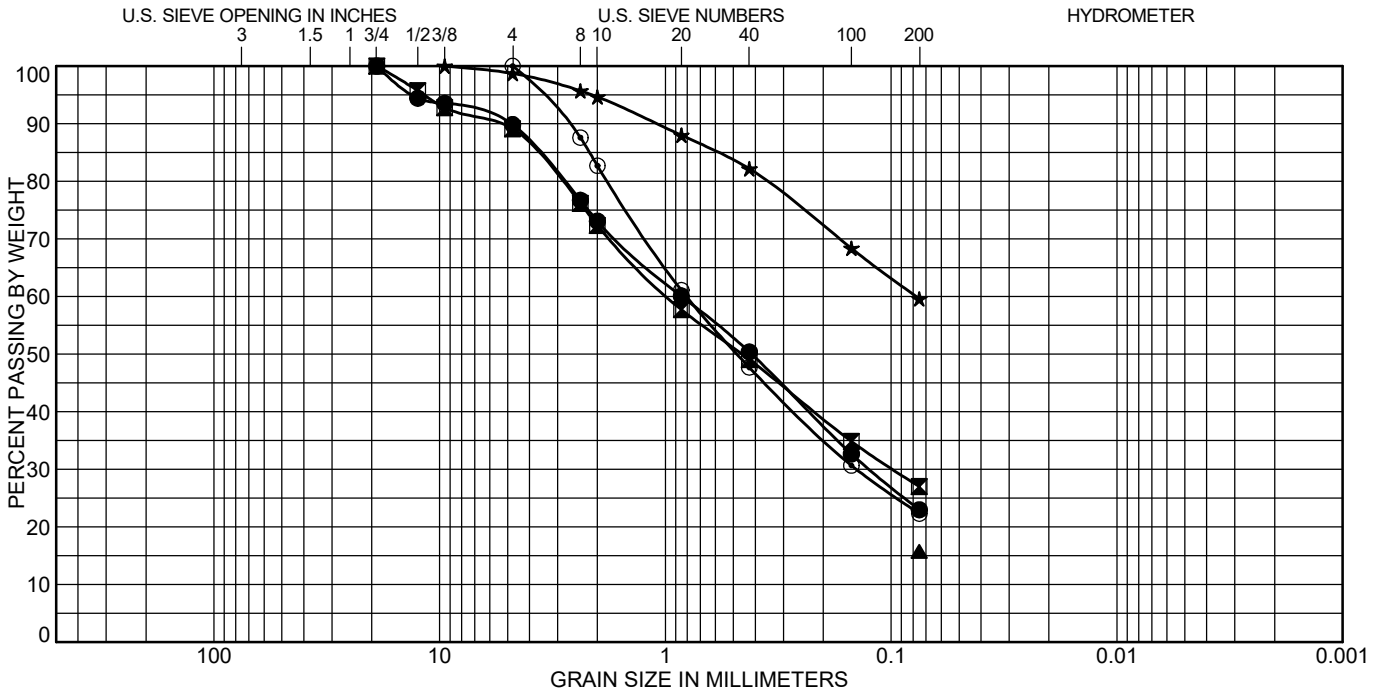
TEST BORING LOG

JOB No. 199069

FIGURE No. 12

DATE Jul/01/2025



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	2	7.0				
⧓	3	4.0	**SILTY SAND(SM)**	**NP**	**NP**	**NP**
▲	5	7.0				
★	7	7.0	**SANDY LEAN CLAY(CL)**	**29**	**15**	**14**
⊙	8	4.0				

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	2	7.0	10.2	66.9	23.0	
⧓	3	4.0	10.9	62.1	27.0	
▲	5	7.0			15.8	
★	7	7.0	1.3	39.1	59.6	
⊙	8	4.0	0.0	77.7	22.3	

ROCKY MOUNTAIN GROUP

Structural Forensics

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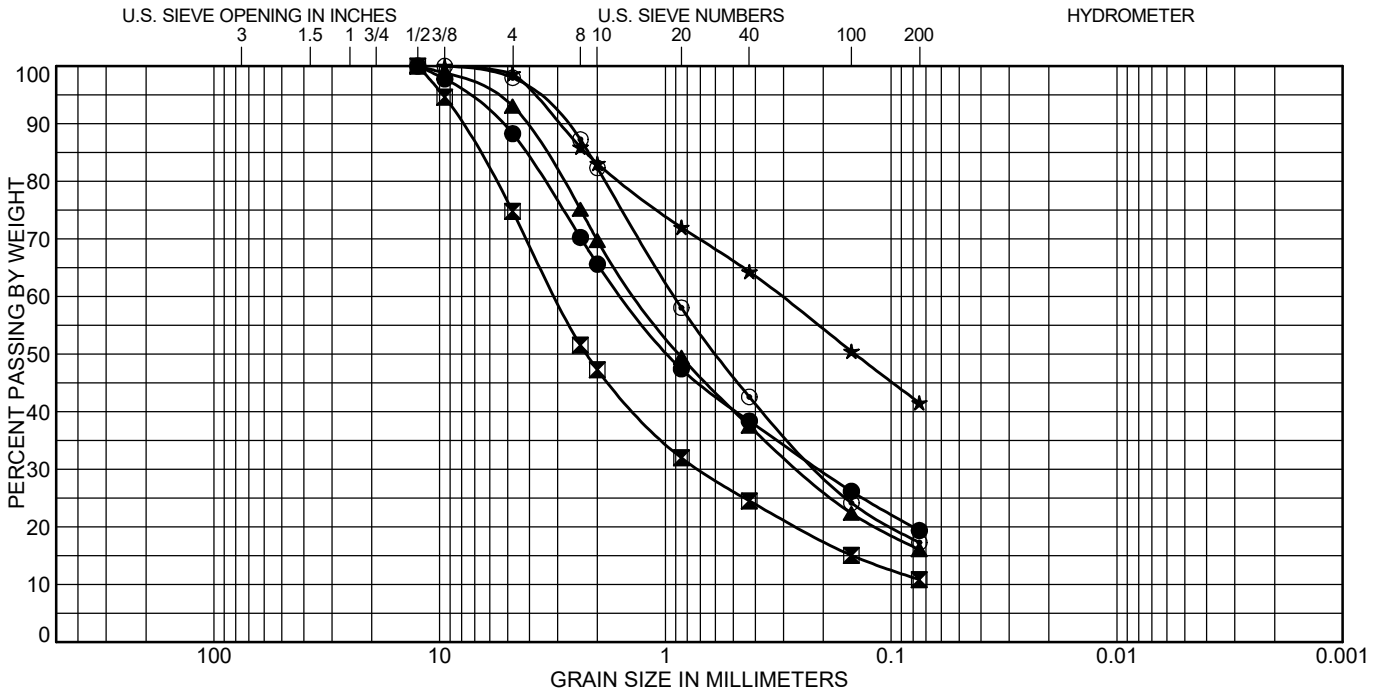
SOIL CLASSIFICATION DATA

JOB No. 199069

FIGURE No. 13

DATE Jul/01/2025



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	10	9.0				
⧓	11	4.0	**WELL-GRADED SAND with SILT and GRAVEL(SW-SM)**	**NP**	**NP**	**NP**
▲	12	7.0				
★	13	29.0				
⊙	14	9.0	**CLAYEY SAND(SC)**	**24**	**14**	**10**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	10	9.0	11.7	68.9	19.4	
⧓	11	4.0	25.2	63.9	10.8	
▲	12	7.0	6.9	77.0	16.1	
★	13	29.0	1.3	57.1	41.5	
⊙	14	9.0	2.0	80.7	17.3	

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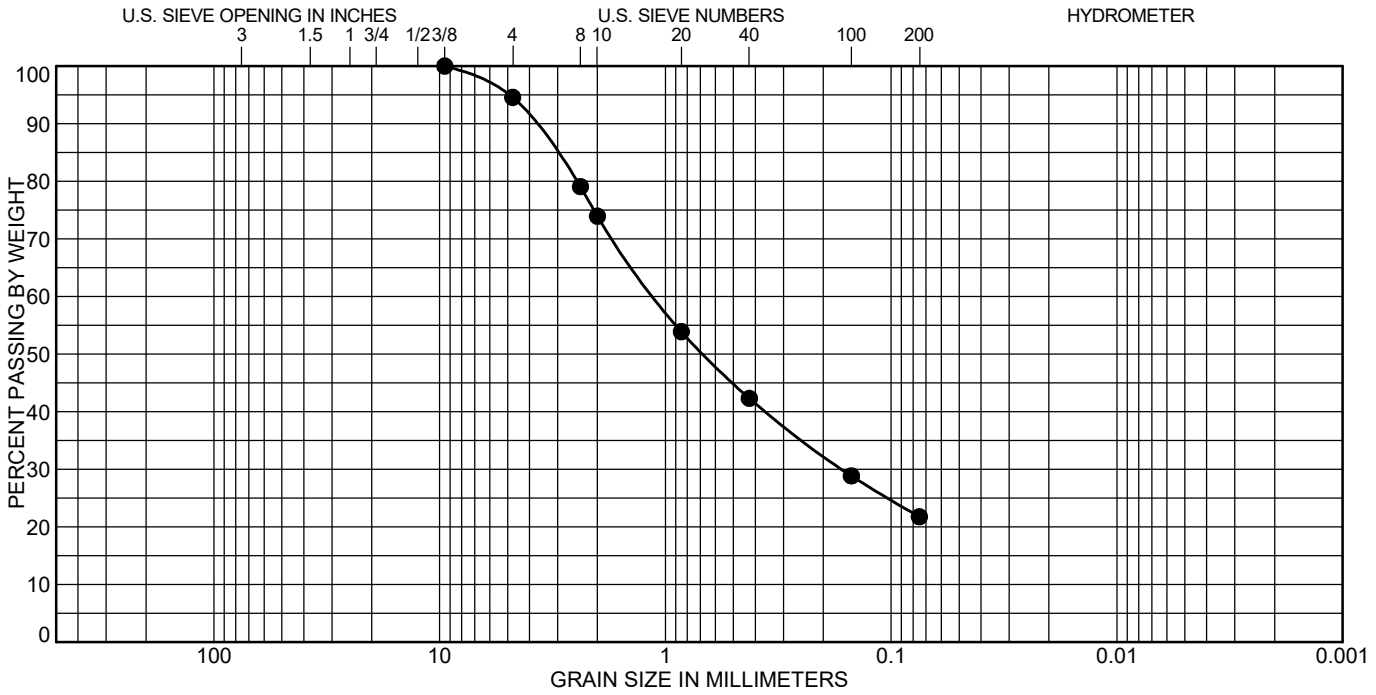
SOIL CLASSIFICATION DATA

JOB No. 199069

FIGURE No. 14

DATE Jul/01/2025



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**15**	**14.0**				

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**15**	**14.0**	**5.4**	**72.8**	**21.8**	

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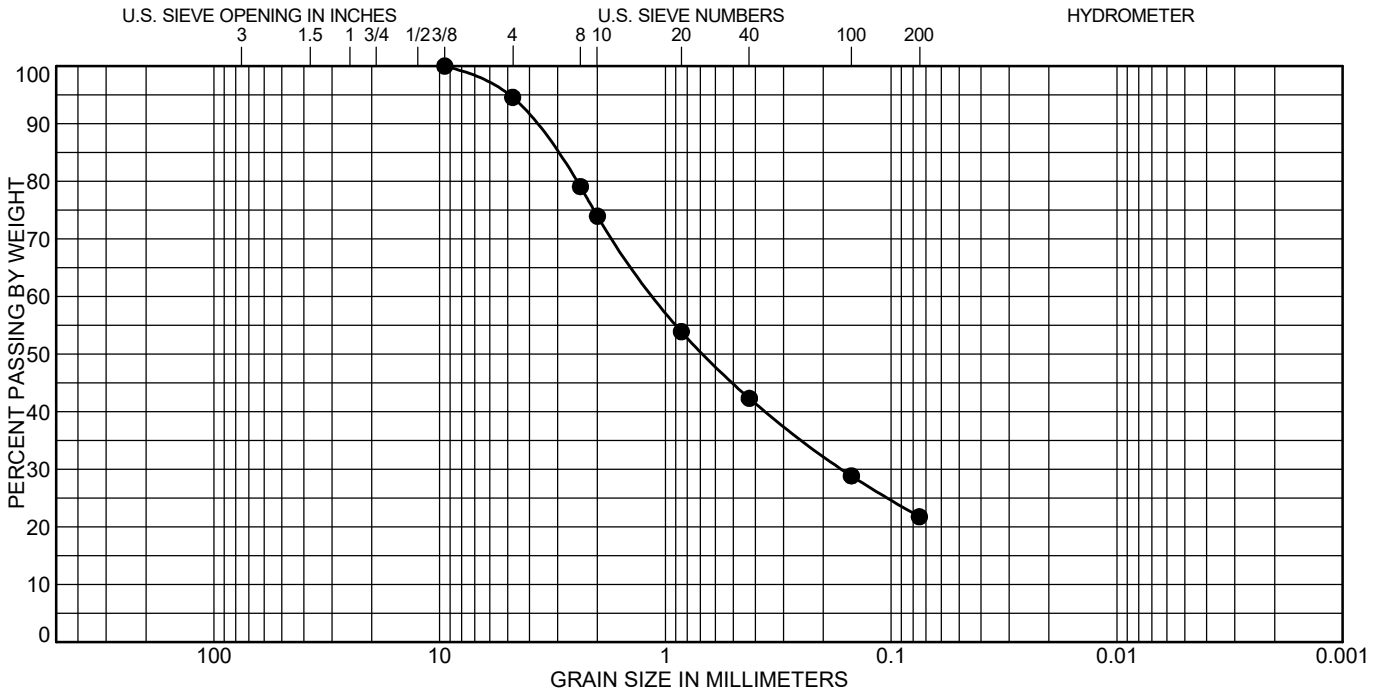
SOIL CLASSIFICATION DATA

JOB No. 199069

FIGURE No. 15

DATE Jul/01/2025



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**15**	**14.0**				

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**15**	**14.0**	**5.4**	**72.8**	**21.8**	

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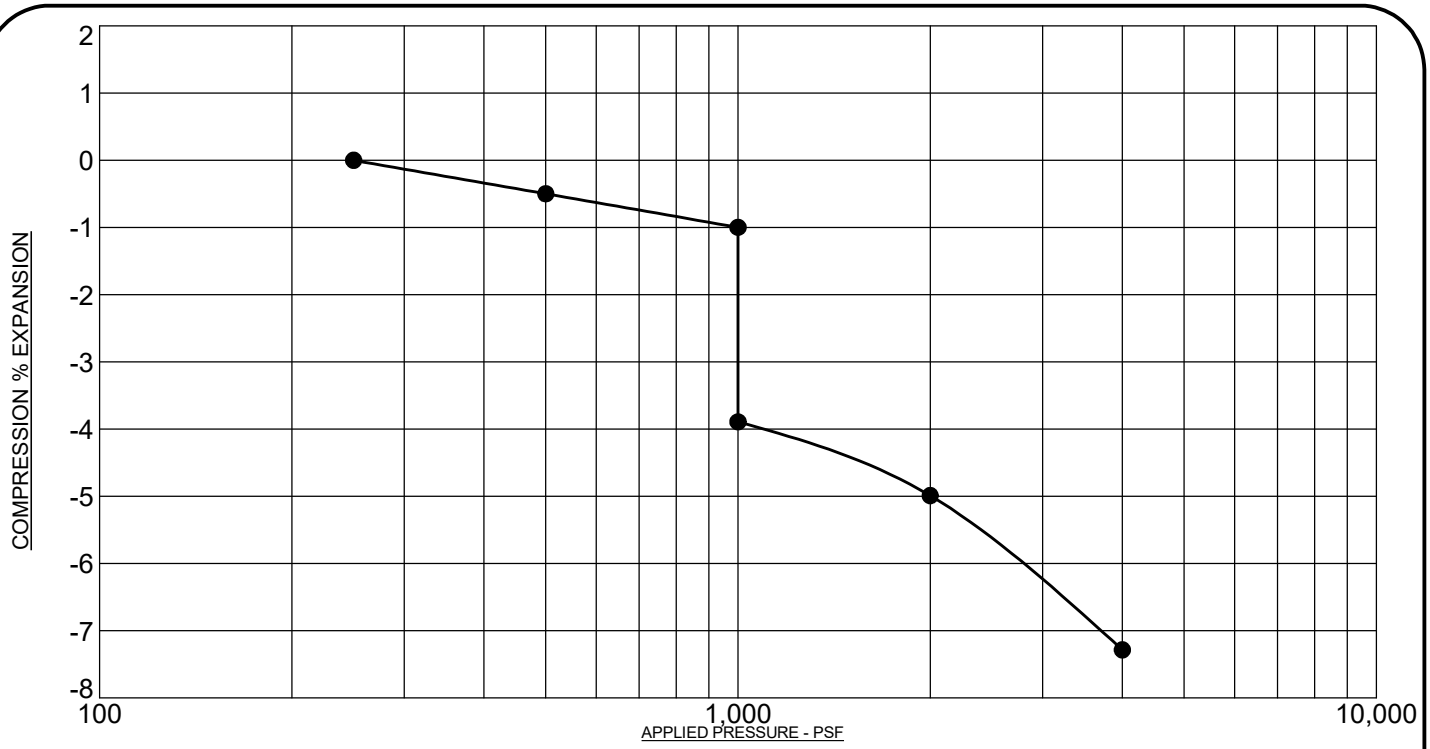
SOIL CLASSIFICATION DATA

JOB No. 199069

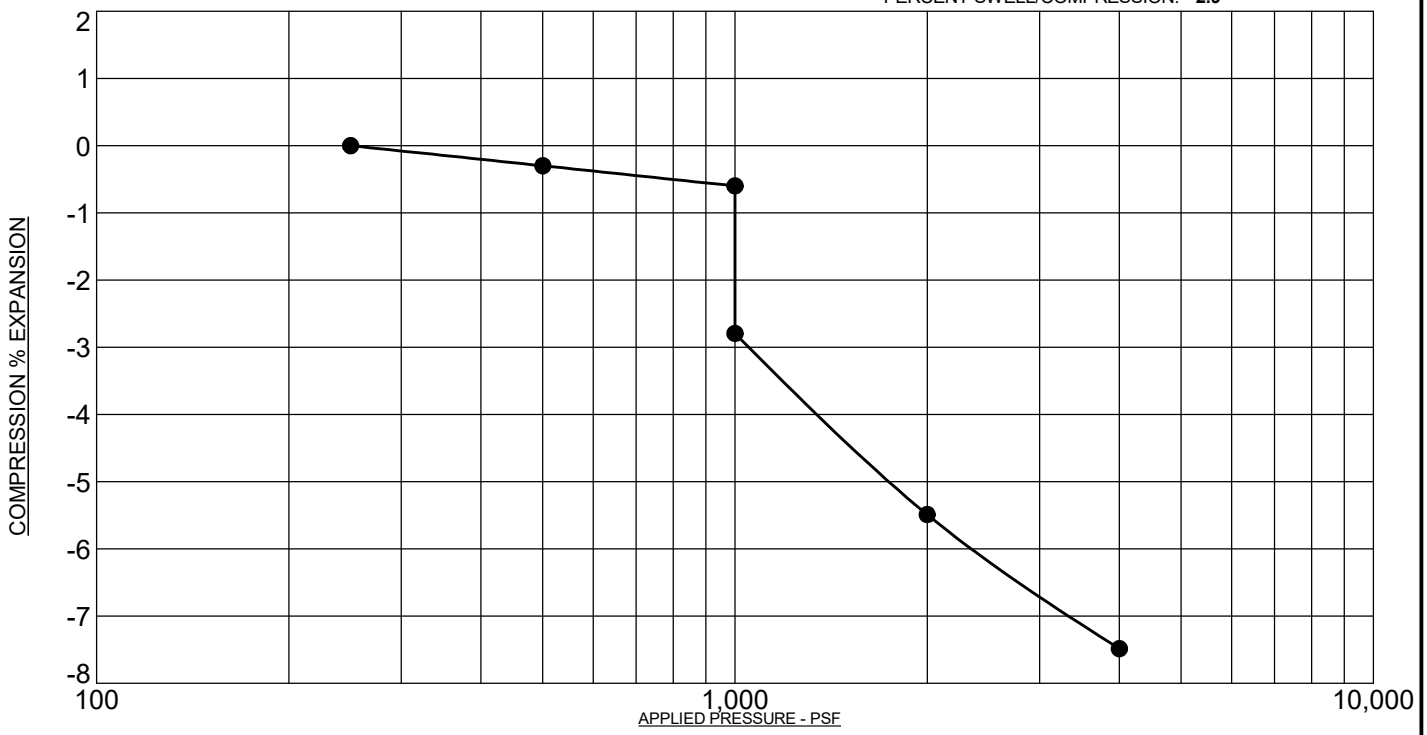
FIGURE No. 16

DATE Jul/01/2025



PROJECT: **County Line Road, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, SILTY TO CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **1 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **117.8 PCF**
NATURAL MOISTURE CONTENT: **7.4%**
PERCENT SWELL/COMPRESSION: **- 2.9**



PROJECT: **County Line Road, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, SILTY TO CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **4 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **PCF**
NATURAL MOISTURE CONTENT: **4.8%**
PERCENT SWELL/COMPRESSION: **- 2.2**

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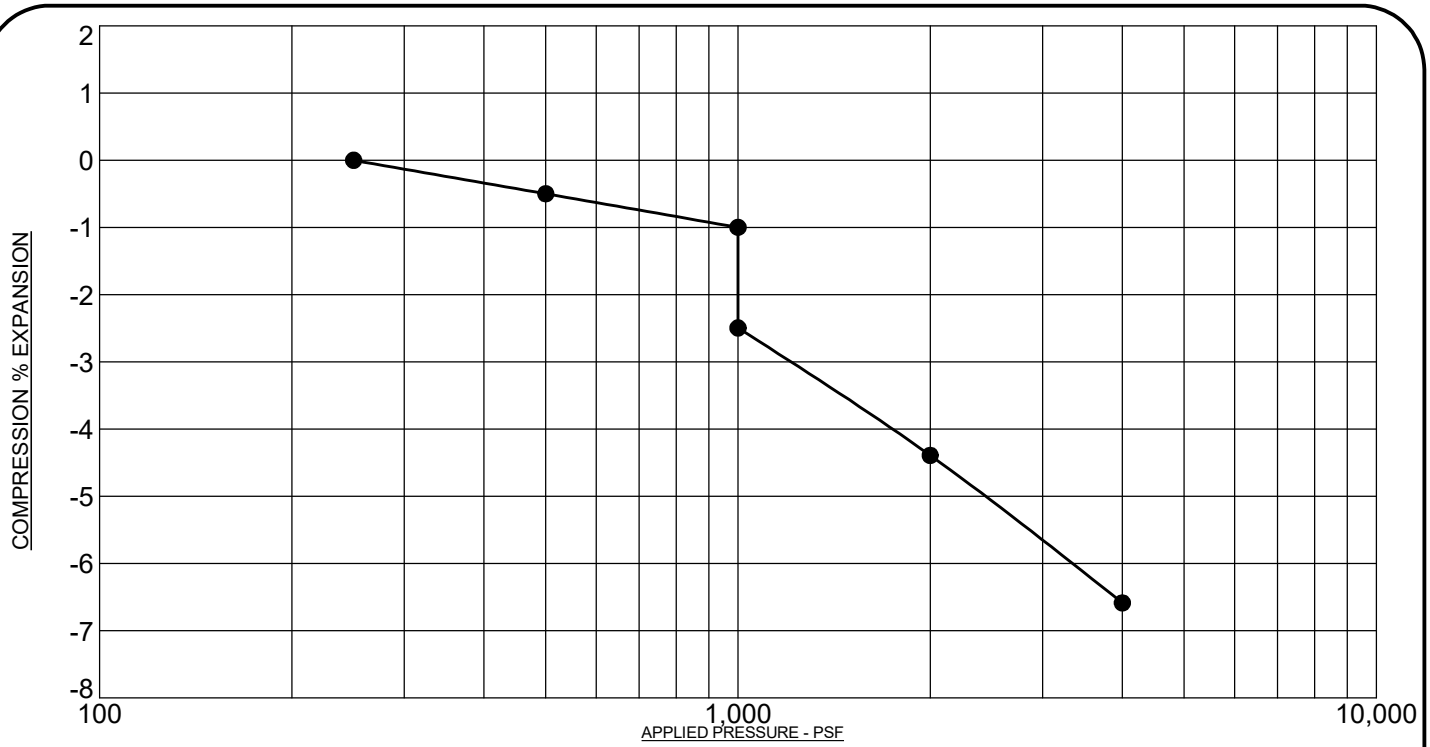
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 199069

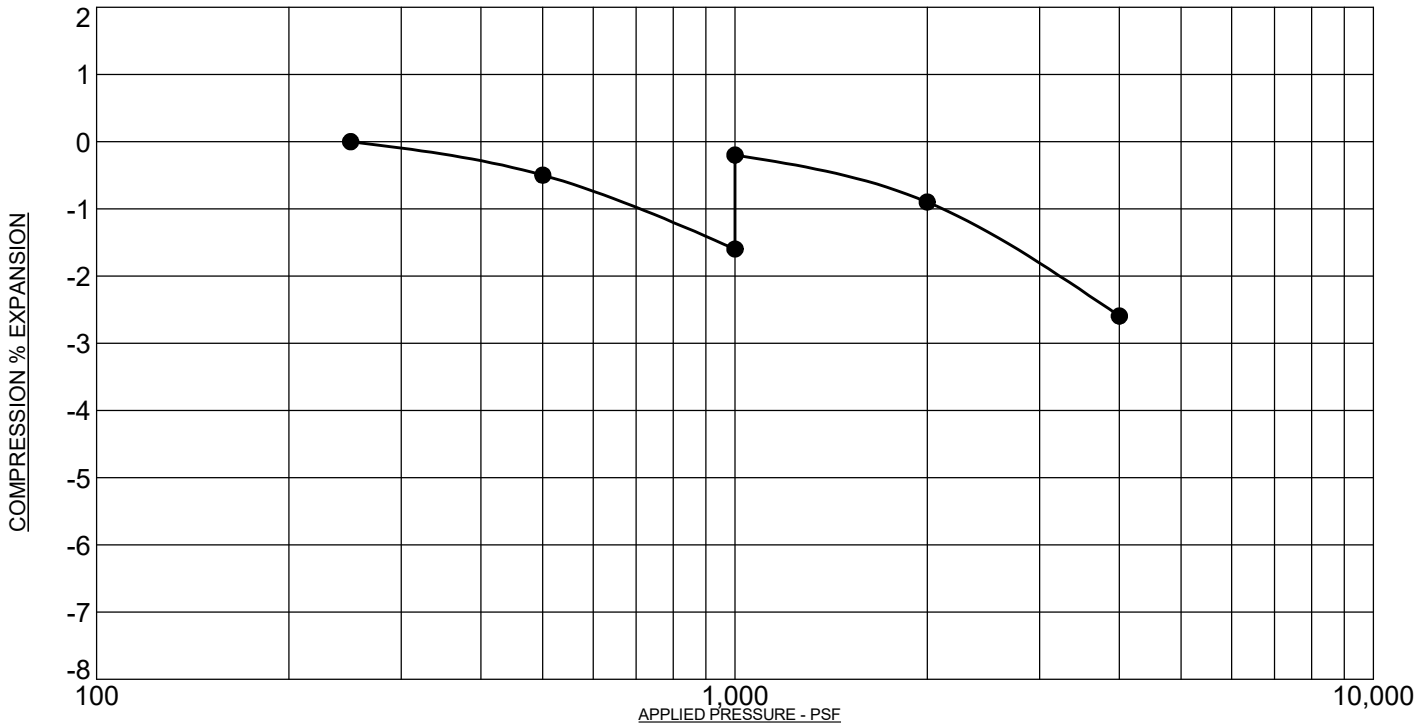
FIGURE No. 17

DATE Jul/01/2025



PROJECT: **County Line Road, El Paso County, Colorado**
SAMPLE DESCRIPTION: **SAND, SILTY TO CLAYEY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **8 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **PCF**
NATURAL MOISTURE CONTENT: **9.4%**
PERCENT SWELL/COMPRESSION: **- 1.5**



PROJECT: **County Line Road, El Paso County, Colorado**
SAMPLE DESCRIPTION: **CLAY, SANDY**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1,000 PSF

SAMPLE LOCATION: **13 @ 2 FT**
NATURAL DRY UNIT WEIGHT: **PCF**
NATURAL MOISTURE CONTENT: **25.2%**
PERCENT SWELL/COMPRESSION: **1.4**

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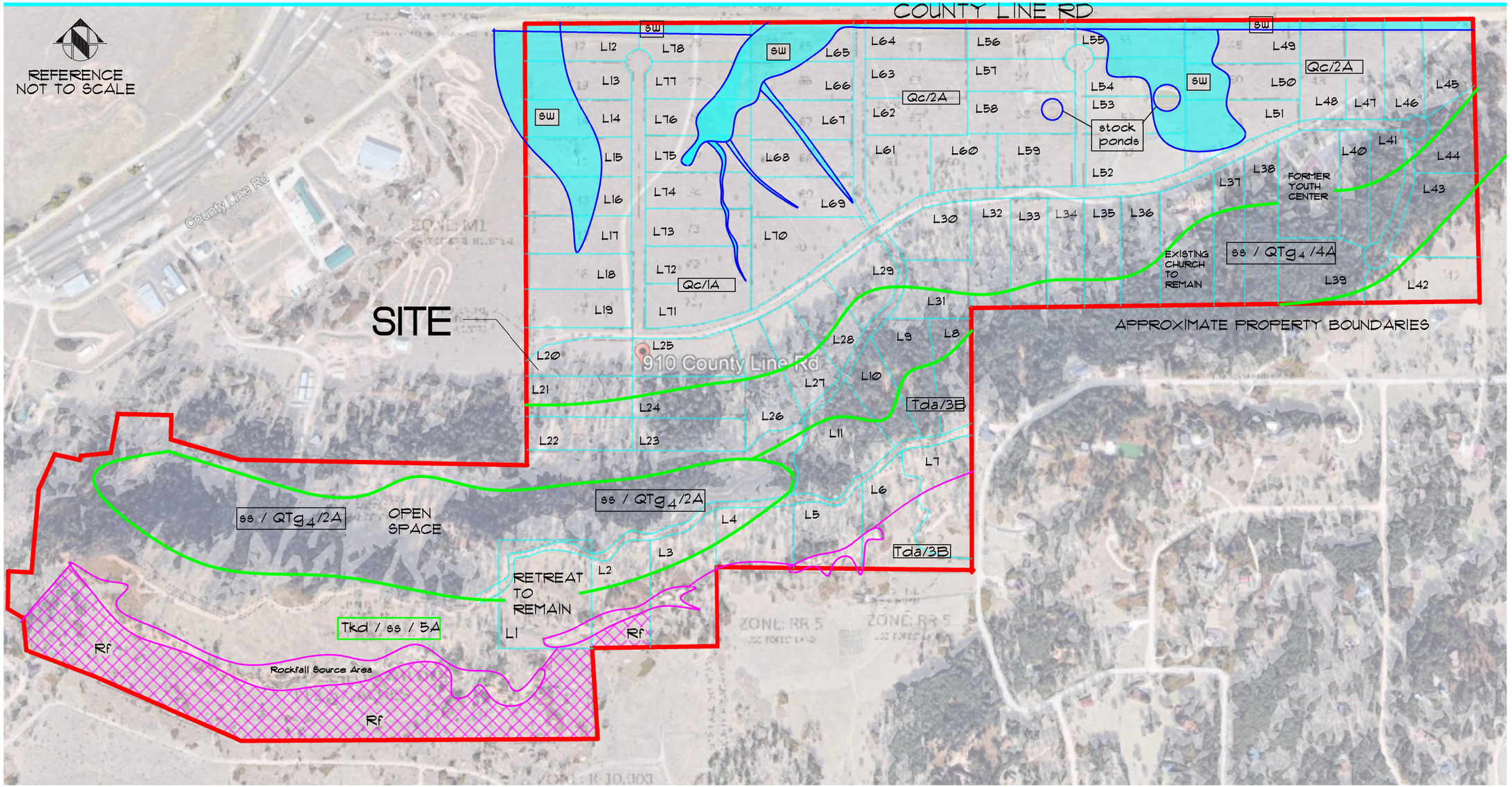
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 199069

FIGURE No. 18

DATE Jul/01/2025



Geologic

- ***Qc - Colluvium deposits, undivided (Holocene to late Pleistocene)*** - loose, unconsolidated accumulation of **soil, rock fragments, and sediment** that has moved **downslope** primarily by **gravity-driven processes** (i.e., mass wasting), often in combination with minor water transport.
- ***QTg_4 - Gravel deposit (early Pleistocene or late Eocene?)*** - refers to an **older, high-standing gravel deposit** of uncertain age.
- ***Qcs - Colluvium and sheetwash alluvium deposits, undivided (Holocene and late Pleistocene)*** - represents an **ancient gravel deposit** preserved as isolated high benches in the Monument Quadrangle. While its exact age is uncertain, its stratigraphic position suggests deposition by ancestral high-energy streams.
- ***Tkda - Dawson Formation, (Upper Cretaceous and Paleocene)*** - the unit is generally drab colored; which includes shades of grey, yellow and brown. Pebbles are mostly granitic, quarts, feldspar, with pebbles ranging up to 2 inches in diameter.
- ***Rf - Rockfall*** - areas that are prone to rockfall.
- ***sw - seasonally wet areas*** - low lying areas that may contain surface water during heavy precipitation events (rain, snow melt).
- ***ss - steep slopes*** - slopes along the exposed outcrops / cliffs along the southern portion of the site could be potentially unstable. These cliffs should not be disturbed by the proposed development. It is recommended a **50-foot setback** be maintained from the top of the cliff banks unless detailed rockfall and slope stability analyses are performed to demonstrate adequate factors of safety. This setback area is to be designated as a "No Build Area".

Engineering

- **1A - Stable alluvium, colluvium and bedrock on flat to gentle slopes (0-5%)**
- **2A - Stable alluvium, colluvium and bedrock on flat to gentle to moderate slopes (5-12%)**
- **3B - Expansive and potentially expansive soil and bedrock on flat to moderate slopes (0-12%)**
- **4A - Potentially unstable colluvium and bedrock on moderate to steep slopes (12-24%)**
- **5A - Rockfall and potential rockfall hazard and talus deposits**

JOB No. 199069

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Forensics
Civil / Planning
Architecture
Structural
Geotechnical
Engineers / Architects
SOUTHERN COLORADO OFFICE
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COLORADO SPRINGS, CO 80918
(719) 548-0600 ~ WWW.RMGENGINEERS.COM
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

PROPOSED SUBDIVISION
COUNTY LINE ROAD
EL PASO COUNTY, COLORADO
ROGER AND MARY SUNG

ENGINEER:	TPM
DRAWN BY:	KMZ
CHECKED BY:	TPM
ISSUED:	7-1-2025
REVISED:	12-26-2024
REVISED: Include 'No Build Zone'	5-19-2025
REVISED: Updated Site Plan	5-19-2025

ENGINEERING AND GEOLOGY MAP

SHEET No.
FIG-19

APPENDIX B

Wastewater Study, prepared by RMG

Job No. 199069

June 27, 2025

Roger & Mary Sung
3195 County Line Rd.
Monument, CO 80132

Re: Wastewater Study
Proposed Subdivsion
County Line Rd
El Paso County, Colorado

Dear Mr. and Mrs. Sung:

As requested, personnel of RMG Engineers (RMG) has performed a preliminary investigation and site reconnaissance at the above referenced address. The total calculated area of the included parcels, as recorded on the El Paso County (EPC) Assessors website, is currently 331.36 acres. The proposed site development is to consist of rezoning and subdividing the parcels into 78 lot ranging between 2.5 and 5.0 acres per lot. The approximate location of the site is shown on the Site Vicinity Map, Figure 1. The included parcels are as follows:

- **El Paso County Parcel Number 7105424044** – the site is currently labeled as Star View Circle, is currently classified as forest land and is undeveloped vacant land which consists of 14.4 acres.
- **El Paso County Parcel Number 7104200012** – the site is currently addressed as 910 County Line Rd, is currently not zoned, currently is classified as forest land and is undeveloped vacant land which consists of 141.93 acres.
- **El Paso County Parcel Number 7104000002** – the site is currently labeled as County Line Rd, is currently zoned RR-5 – Residential Rural, is undeveloped vacant land, and consists of 34.29 acres.
- **El Paso County Parcel Number 7104000001** – the site is currently addressed as 20040 Capella Dr, is currently zoned RR-5 Residential Rural, is undeveloped vacant land, and consists of 49.84 acres.
- **El Paso County Parcel Number 7104001010** – the site is currently addressed as 3275 County Line Rd, is currently zoned RR-5 Residential Rural, and contains an existing church, which has an associated well and septic system, and consists of 46.62 acres.
- **El Paso County Parcel Number 7103000028** – the site is currently addressed as 3195 County Line Rd, is currently zoned RR-5 Residential Rural, and contains a former youth center, which has an associated well and septic system, and consists of 44.28 acres.

It is our understanding that the parcels are to be subdivided into 78 lots ranging between 2.5 and 5.0 acres each. Of the 331.36 acres, approximately 112.57 acres are to remain as open space. The subdivision is to be accessed along the northern property boundary, from two locations County

Line Road, east of Spruce Mountain. One additional potential future access is proposed along the western property boundary. Each lot is to be serviced by an individual wastewater treatment system and a well. Preliminary grading plans were still in process at the time of this study, but it is our understanding that grading is anticipated to be minor, with construction occurring near the existing grades. The Proposed Lot Layout, Figure 2, outlines the proposed subdivision and the general boundaries of our investigation.

The majority of the property is undeveloped but there are two existing structures on the property. The existing church and former youth center structures are to remain, and are not included in the overall total of lots. Additionally, the House of Prayer and Retreat is to remain on proposed Lot 1. Two stock ponds are located near the northern portion of the site, on proposed lots 50 and 58. The ponds will likely be emptied and filled in with soil. The parcels addressed as 3195 and 3275 County Line Road have associated septic fields and wells. It is uncertain at this time if the septic fields and wells will remain.

This letter is to provide information for the on-site wastewater report per the On-Site Wastewater Treatment Systems (OWTS) Regulations of the El Paso County Board of Health pursuant to Chapter 8.

The following are also excluded from the scope of this report including (but not limited to) foundation recommendations, site grading/surface drainage recommendations, subsurface drainage recommendations, geologic, natural and environmental hazards such as landslides, unstable slopes, seismicity, snow avalanches, water flooding, corrosive soils, erosion, radon, wild fire protection, hazardous waste and natural resources.

Previous Studies and Field Investigation

Reports of previous geotechnical engineering/geologic investigations for this site were available for our review and are listed below:

1. *Soil and Geology Study, Proposed Subdivision, County Line Road, El Paso County, Colorado,* prepared by RMG Engineers, dated June 20, 2025.
2. *Soil and Geology Study, Red Rock Acres, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 189879, dated February 22, 2023.
3. *Wastewater Study, Red Rock Acres, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 189879, dated February 22, 2023.
4. *Soils and Geology Study, Elephant Rock Villas, Lot 2, Rancho Iraceme Sub., Filing No. 2. Town of Palmer Lake, El Paso County, Colorado,* prepared by RMG – Rocky Mountain Group, Job No. 190736, last amended January 4, 2023.

The findings, conclusions and recommendations contained in these reports were considered during the preparation of this report.

SITE CONDITIONS

Personnel of RMG performed a reconnaissance visit on May 21, 2025. The purpose of the reconnaissance visit was to evaluate the site surface characteristics including landscape position, topography, vegetation, natural and cultural features, and current and historic land uses. Fifteen (15) 8-foot deep test pits were performed on across the site during our reconnaissance visit. A Test Pit Location Plan is presented in Figure 3.

Topographically, the site consists of undulating to gently rolling hills that generally slope down to the north. Steeper slopes, heavily vegetated terrain, and rock outcrops are located along the southern property boundary.

Vegetation across the northern portion of the site consists of low lying grasses, weeds, yuccas, and scattered trees. The vegetation and trees are much denser on the southern portion of the site. The lots along the ridge are heavily vegetated and dense with trees.

The following conditions were observed with regard to the 331.36-acre parcel:

- Approximately 10 wells currently **do** exist on the existing 331.36-acre site;
- **No** runoff or irrigation features anticipated to cause deleterious effects to treatment systems on the site were observed;
- **No** major waterways exist on the property. The entire site lies outside the designated floodway or floodplain;
- Slopes greater than 20 percent **do** exist on the southern portion of the site; and
- Significant man-made cuts **do not** exist on the site.

Treatment Areas

Treatment areas at a minimum must achieve the following:

- The 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*, effective July 7, 2018;
- Prior to construction of an OWTS, an OWTS design prepared per *the Regulations of the El Paso County Board of Health, Chapter 8, OWTS Regulations* will need to be completed. A scaled site plan and engineered design will also be required prior to obtaining a building permit;
- Comply with any physical setback requirements of Table 7-1 of the El Paso County Department of Health and Environment (EPCDHE);
- Treatment areas are to be located a minimum 100 feet from any well (existing or proposed), including those located on adjacent properties per Table 7-2 per the EPCDHE;
- Treatment areas must also be located a minimum 50 feet from any spring, lake, water course, irrigation ditch, stream or wetland, and 25 feet from dry gulches;
- Other setbacks include the treatment area to be located a minimum 10 feet from property lines, cut banks and fill areas (from the crest);
- The new lots shall be laid out to ensure that the proposed OWTS does not fall within any restricted areas, (e.g. utility easements, right of ways). Based on the test pit observations, the parcel has a minimum of two locations for the OWTS.

- The existing systems do not lie on the new proposed lots.

Contamination of surface and subsurface water resources should not occur if the treatment areas are evaluated and installed according to El Paso County Health Department and State Guidelines in conjunction with proper maintenance.

DOCUMENT REVIEW

RMG has reviewed the above referenced site plan. We have identified the soil conditions anticipated to be encountered during construction of the proposed OWTS for each proposed lot. Our review included a review of documented Natural Resource Conservation Service (NRCS) data provided by websoilsurvey.nrcs.usda.gov. The Soil Survey Descriptions are presented below. A review of FEMA Map No. 08041C0044G, effective December 7, 2018 indicates that the proposed treatment areas are not located within an identified floodplain.

SOIL EVALUATION

Personnel of RMG performed a soil evaluation to include fifteen (15) 8-foot deep test pits, on March 21, 2025, utilizing the visual and tactile method for the evaluation of the site soils. The test pits were excavated in areas that appeared most likely to be used for residential construction. The Test Pit Logs are presented in Figure 3 through 11. A Septic Suitability map is presented in Figure 12.

The U.S. Soil Conservation Service along with USDA has identified the soils on the property from two different maps, the Castle Rock Area and the El Paso County Area. The following are from the Castle Rock Area, the northern portion of the site.

- **CrE – Crowfoot-Tomah sandy loams,** *5 to 25 percent slopes*. The Crowfoot-Tomah sandy loams were mapped by the USDA to be located along County Line Road. Properties of the Crowfoot-Tomah sandy loams include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be none too low, frequency of flooding and ponding is none. Landforms for the Crowfoot setting include ridges, hills, and alluvial fans. Landforms for the Tomah setting include alluvial fans, hills, and ridges.
- **KfF – Kettle-Falcon complex,** *9 to 65 percent slopes.* The Kettle-Falcon complex was also mapped by the USDA to be located along County Line Road. Properties of the Kettle-Falcon complex include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be low for the Kettle setting and very high for the Falcon setting, frequency of flooding and ponding is none. Landforms for the Kettle setting include ridges and hills. Landforms for the Falcon setting include cliffs.
- **PeD – Peyton sandy loam,** *3 to 9 percent slopes*. The Peyton sandy loam was also mapped by the USDA to be located along County Line Road. Properties of the Peyton sandy loam include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and ponding is none. Landforms include valley sides, plateaus, and mesas.
- **PvE – Pring and Kippen gravelly sandy loams,** *1 to 25 percent slopes*. The Pring and Kippen gravelly sandy loams was also mapped by the USDA to be located along County

Line Road. Properties of the Pring and Kippen gravelly sandy loams include, well-drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and ponding is none. Landforms include valley sides, plateaus, and mesas.

- **71 – Pring coarse sandy loam**, *3 to 8 percent slopes*. The Pring coarse sandy loam encompasses the majority of the property. Properties of the Pring coarse sandy loam include, well-drained soil, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be low to moderate, frequency of flooding is none and ponding is none. Landforms for both the Pring and Kippen setting include valley sides.

The following are from the El Paso County Area, the majority of the site.

- **41 – Kettle gravelly loamy sand**, *8 to 40 percent slopes*. The Kettle gravelly loamy sand was mapped by the USDA to be located along the southern portion of the property. The Kettle gravelly loamy sand encompasses approximately 10.5 acres for a total of 27.9 percent of the property. Properties of the Kettle gravelly loamy sand include, somewhat excessively drained soil, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms are depressions.
- **42 – Kettle-Rock outcrop complex**, Properties of the Kettle-Rock outcrop complex include, well-drained soils, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms include hills.
- **69 – Peyton-Pring complex**, *8 to 15 percent slopes.* Properties of the Peyton-Pring complex include, well-drained soils, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be medium, frequency of flooding and ponding is none, and landforms include hills.
- **71 – Pring coarse sandy loam**, *3 to 8 percent slopes*. The Pring coarse sandy loam encompasses approximately of the property 1.8 percent of the property. Properties of the Pring coarse sandy loam include, well-drained soil, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be low, frequency of flooding is none and ponding is none. Landforms include hills.
- **93 – Tomah-Crowfoot complex**, *8 to 15 percent slopes.* The Tomah-Crowfoot complex was mapped by the USDA to encompass the northwest corner of the property. Properties of the Tomah-Crowfoot complex 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 below.

Groundwater was encountered in TP-3 and bedrock was encountered in TP-3 as observed by RMG.

An OWTS is proposed for each lot and should conform to the recommendations of a future OWTS site evaluation, performed in accordance with the applicable health department codes prior to construction. This report may require additional test pits in the vicinity of the proposed treatment field. A minimum separation of 4 feet shall be maintained from groundwater and bedrock to the infiltrative surface.

Redoximorphic features indicating the fluctuation of groundwater or higher ground water levels were observed in TP-7.

CONCLUSIONS

In summary, it is our opinion the site is suitable for individual on-site wastewater treatment systems within the cited limitations. There are no foreseeable or stated construction related issues or land use changes proposed at this time.

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 (soil types 3A to 5) or greater than 0.80 (soil type 0) is encountered at the time of the site specific OWTS evaluation, an "engineered system" will be required.

Additionally, based on the depth of the limiting layer (groundwater in TP-7) encountered at a depth of 5 feet below the existing ground surface, the maximum depth of the OWTS components may be limited to 2 feet below the existing ground surface or mound systems (above finished ground surface) may be required.

LIMITATIONS

The information provided in this report is based upon the subsurface conditions observed in the profile pit excavations and accepted engineering procedures. The subsurface conditions encountered in the excavation for the treatment area may vary from those encountered in the test pit excavations. Therefore, depth to limiting or restrictive conditions, bedrock, and groundwater may be different from the results reported in this letter.

An OWTS site evaluation will need to be performed on each lot in accordance with the applicable health department codes prior to construction.

I hope this provides the information you have requested. Should you have questions, please feel free to contact our office.

Cordially,

RMG Engineers

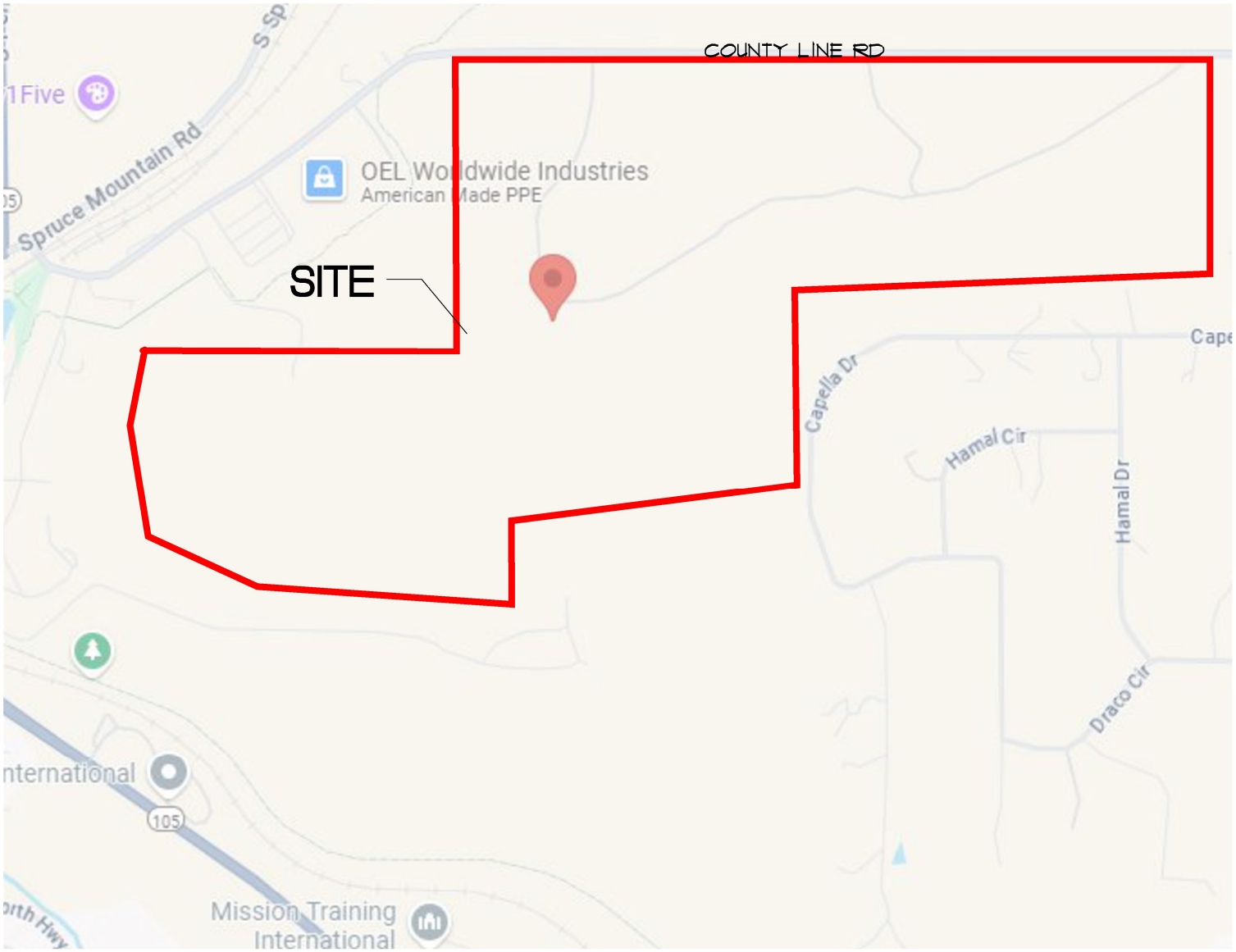
Kelli Zigler

Kelli Zigler
Geotechnical Group Director

Reviewed by,

RMG Engineers

Tony Munger, P.E.
Sr.Geotechnical Project Manager | COO



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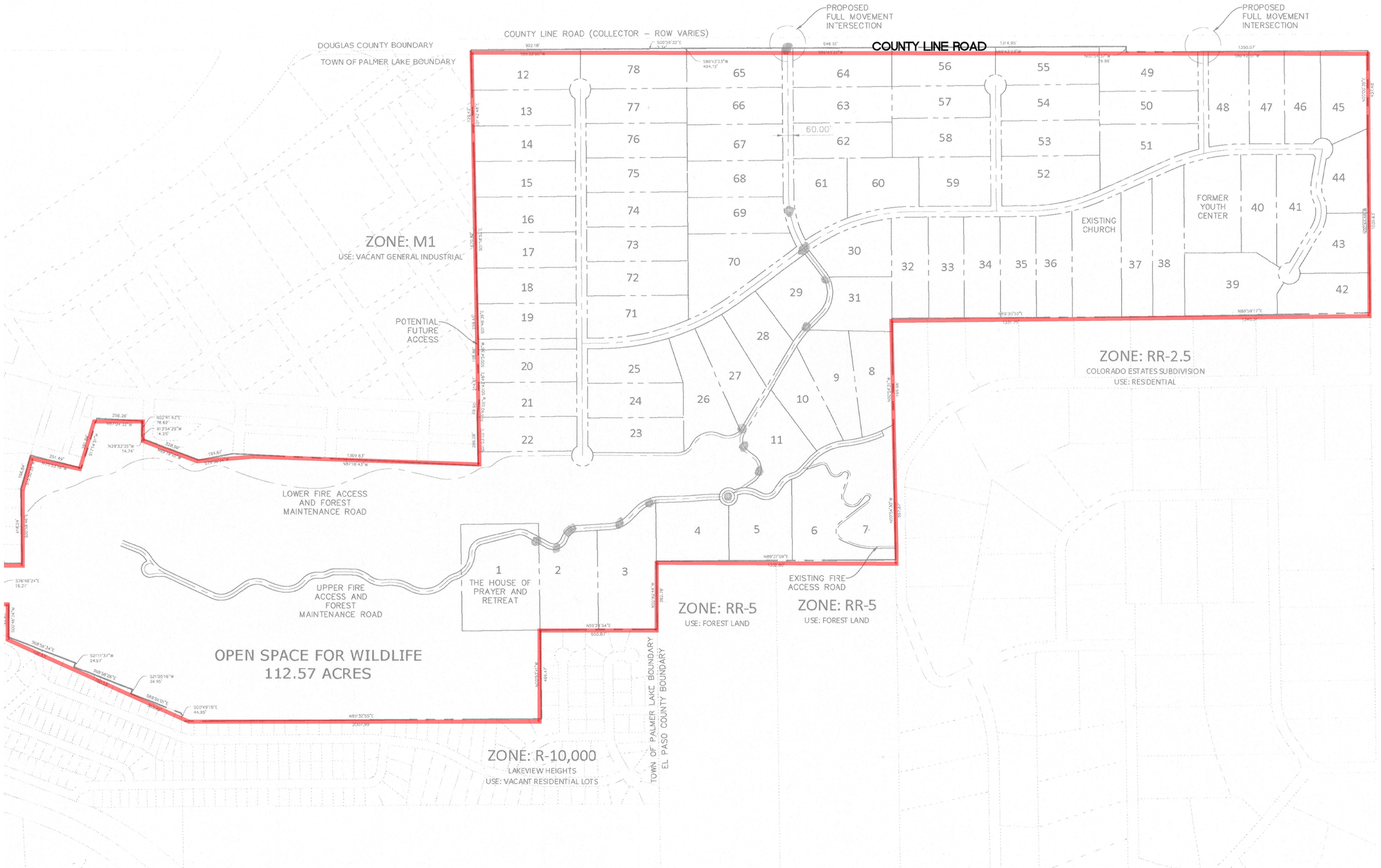
SITE VICINITY MAP

PROPOSED SUBDIVISION
COUNTY LINE ROAD
EL PASO COUNTY, CO
ROGER AND MARY SUNG

JOB No. 199069

FIG No. 1

DATE 7-1-2025



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PROPOSED SUBDIVISION
COUNTY LINE ROAD

EL PASO COUNTY, COLORADO
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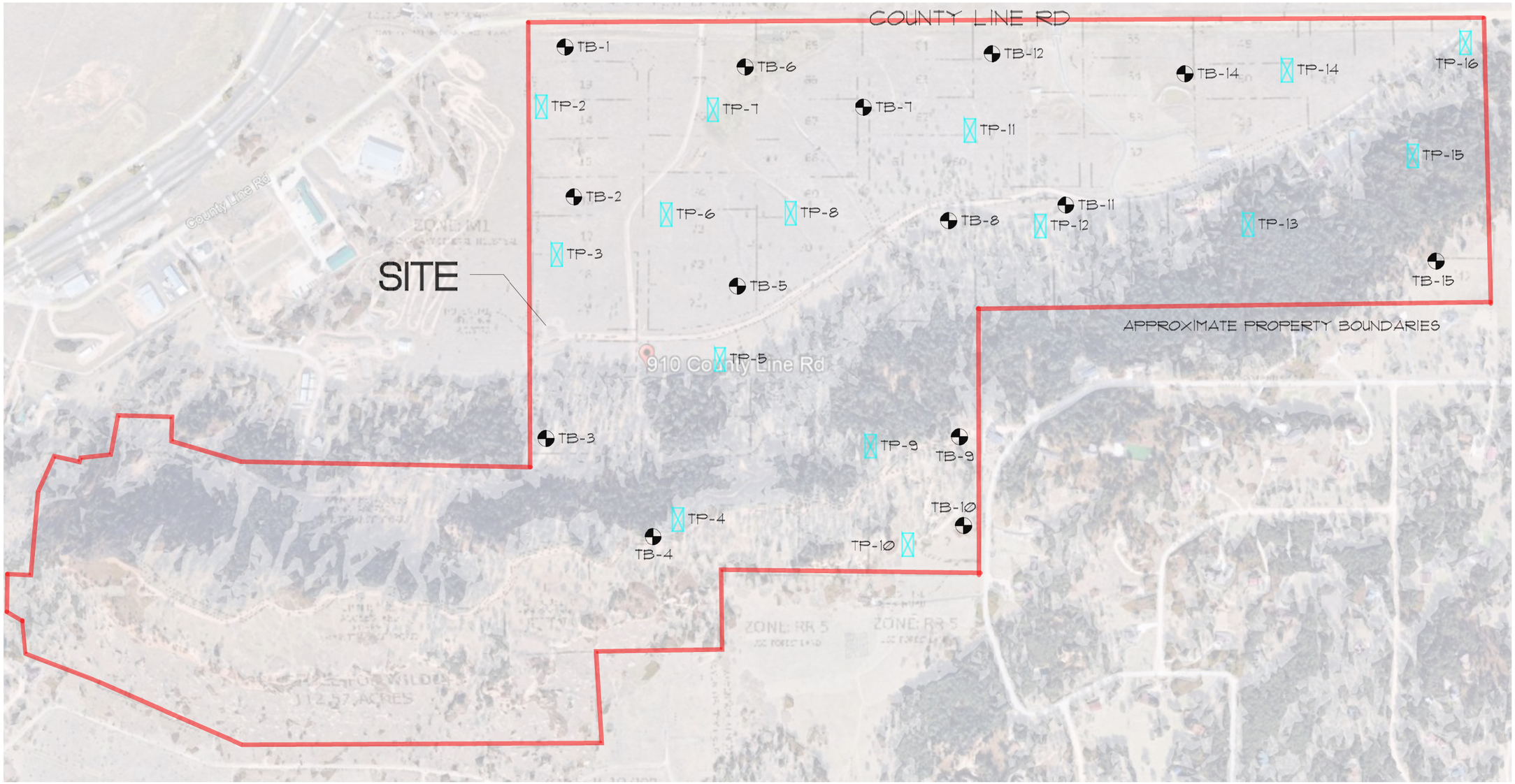
ENGINEER:	TPM
DRAWN BY:	KMZ
CHECKED BY:	TPM
ISSUED:	7-1-2025

PROPOSED
LOT LAYOUT

SHEET No.
FIG-2



DENOTES APPROXIMATE LOCATION OF TEST BORINGS

DENOTES APPROXIMATE LOCATION OF TEST PITS

REFERENCE
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ISSUED:	7-1-2025

TEST PIT/BORING LOCATION PALN

SHEET No.
FIG-3

TEST PIT TP-1

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 3.0 FT SANDY CLAY LOAM (GRANULAR, STRONG)	2ft		3
3.0 TO 7.0 FT SAND (SINGLE-GRAIN, STRUCTURELESS)	4ft 6ft		1
7.0 - 8.0 FT SILTY CLAY (BLOCKY, MODERATE)	8ft		4

TEST PIT TP-2

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 4.0 FT SAND (SINGLE-GRAIN, STRUCTURELESS)	2ft		1
4.0 - 8.0 FT SILTY CLAY (BLOCKY, MODERATE)	4ft 6ft		4
	8ft		

SOIL DESCRIPTIONS

SANDY CLAY LOAM

SAND

SILTY CLAY

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TEST PIT LOGS

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COUNTY LINE ROAD
EL PASO COUNTY, CO
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JOB No. 199069

FIG No. 4

DATE 7-1-2025

TEST PIT TP-3

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 5.0 FT SANDY, CLAY (GRANULAR, STRONG)	2ft 4ft		4
5.0 - 8.0 FT SANDY CLAY (GRANULAR, STRONG) *HARD TO EXCAVATE DUE TO BEDROCK CONDITIONS	6ft 8ft		4/R-1

TEST PIT TP-4

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 2.0 FT CLAY (BLOCKY, MODERATE)	2ft		2
2.0 - 3.0 FT SANDY CLAY (GRANULAR, STRONG)			4
3.0 - 8.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS) MORE THAN 35% > 2mm	4ft 6ft 8ft		R-O

SOIL DESCRIPTIONS

SANDY CLAY

CLAY

LOAMY SAND

Architecture
Structural
Geotechnical

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TEST PIT LOGS

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JOB No. 199069

FIG No. 5

DATE 7-1-2025

TEST PIT TP-5

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 2.0 FT SANDY CLAY LOAM (GRANULAR, MODERATE) MORE THAN 35% > 2mm	2ft		3/R-1
2.0 - 6.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS) MORE THAN 35% > 2mm	4ft		R-O
6.0 - 8.0 FT SILTY CLAY (BLOCKY, MODERATE)	6ft 8ft		4

TEST PIT TP-6

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 3.0 FT SAND (SINGLE-GRAIN, STRUCTURELESS)	2ft		1
3.0 TO 6.0 FT SILTY CLAY LOAM (BLOCKY, STRONG)	4ft		3
6.0 - 8.0 FT SILTY CLAY (BLOCKY, MODERATE)	6ft 8ft		4

SOIL DESCRIPTIONS

- SANDY CLAY LOAM
- SAND
- SILTY CLAY
- LOAMY SAND
- SILTY CLAY LOAM

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Structural
Geotechnical

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TEST PIT LOGS

PROPOSED SUBDIVISON
COUNTY LINE ROAD
EL PASO COUNTY, CO
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JOB No. 199069

FIG No. 6

DATE 7-1-2025

TEST PIT TP-7

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 4.0 FT SANDY CLAY (BLOCKY, STRONG)	2ft 4ft		4
4.0 - 6.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS)	6ft		R-O
6.0 - 8.0 FT SILTY CLAY LOAM (BLOCKY, STRONG)			3
RESTRICTIVE LAYER GROUNDWATER AT 5 FT	8ft		

TEST PIT TP-8

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 4.0 FT SANDY CLAY LOAM (GRANULAR, STRONG)	2ft 4ft		3
4.0 - 8.0 FT SAND (SINGLE-GRAIN, STRUCTURELESS)	6ft		1
	8ft		

SOIL DESCRIPTIONS

- SANDY CLAY LOAM
- SAND
- LOAMY SAND
- SANDY CLAY

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TEST PIT LOGS

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JOB No. 199069

FIG No. 7

DATE 7-1-2025

TEST PIT TP-9

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 4.0 FT SANDY CLAY (GRANULAR, STRONG) MORE THAN 35% > 2mm	2ft		4/R-1
4.0 - 5.0 FT SANDY CLAY (GRANULAR, STRONG)	4ft		4
5.0 - 8.0 FT SANDY CLAY LOAM (GRANULAR, STRONG) MORE THAN 35% > 2mm	6ft		4/R-1
	8ft		

TEST PIT TP-10

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 3.0 FT SAND CLAY LOAM (GRANULAR, MODERATE) MORE THAN 35% > 2mm	2ft		3/R-1
3.0 - 6.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS) MORE THAN 35% > 2mm	4ft		R-O
6.0 - 8.0 FT SANDY CLAY (GRANULAR, STRONG) MORE THAN 35% > 2mm	6ft		4/R-1
	8ft		

SOIL DESCRIPTIONS

SANDY CLAY LOAM

SANDY CLAY

LOAMY SAND

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FIG No. 8

DATE 7-1-2025

TEST PIT TP-11

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 6.0 FT SANDY CLAY LOAM (GRANULAR, STRONG)	2ft 4ft 6ft		3
6.0 - 8.0 FT SAND (SINGLE-GRAIN, STRUCTURELESS)	8ft		1

TEST PIT TP-12

DATE OBSERVED: 5/21/25

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 6.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS)	2ft 4ft 6ft		3
6.0 - 8.0 FT SANDY CLAY (GRANULAR, STRONG)	8ft		4A

SOIL DESCRIPTIONS

- SAND
- LOAMY SAND
- SANDY CLAY LOAM
- SANDY CLAY

Architecture
Structural
Geotechnical

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TEST PIT LOGS

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FIG No. 9

DATE 7-1-2025

TEST PIT TP-13			
DATE OBSERVED: 5/21/25			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 4.5 FT LOAMY SAND (SINGLE-GRAIN, STUCTURELESS)	2ft 4ft		1
4.5 - 8.0 FT SANDY CLAY (GRANULAR, STRONG)	6ft 8ft		4

TEST PIT TP-14			
DATE OBSERVED: 5/21/25			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 1.5 FT SANDY CLAY LOAM (GRANULAR, STRONG)			3
1.5 - 8.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS) MORE THAN 35% > 2mm	2ft 4ft 6ft 8ft		R-O

SOIL DESCRIPTIONS

LOAMY SAND

SANDY CLAY
LOAM

SANDY CLAY

Architecture
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TEST PIT LOGS

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FIG No. 10

DATE 7-1-2025

TEST PIT TP-15			
DATE OBSERVED: 5/21/25			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 4.0 FT LOAMY SAND (SINGLE-GRAIN, STRUCTURELESS)	2ft 4ft		1
0 - 4.0 FT SANDY CLAY (GRANULAR, STRONG) MORE THAN 35% > 2mm	6ft 8ft		4/R-1

SOIL DESCRIPTIONS

LOAMY SAND

SANDY CLAY

Architecture
Structural
Geotechnical

RMG

Materials Testing
Forensics
Civil / Planning

Engineers / Architects

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TEST PIT LOGS

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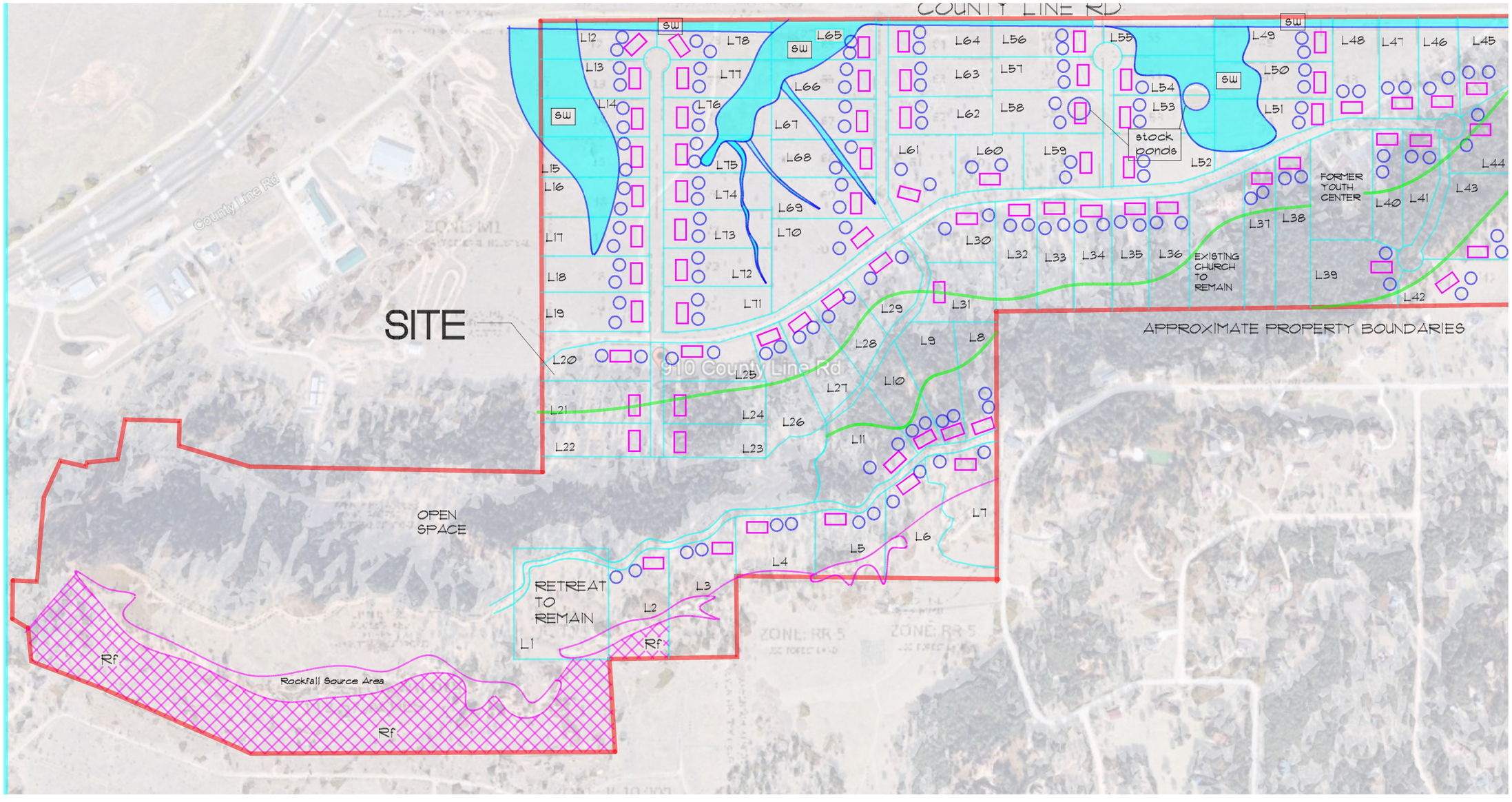
FIG No. 11

DATE 7-1-2025



NOTE: THE SELECTED OWTS LOCATIONS ARE FOR ILLUSTRATION ONLY. IF THE EL PASO COUNTY HEALTH DEPARTMENT PHYSICAL SETBACK REQUIREMENTS ARE MET AND THE OWTS DOES NOT FALL WITHIN THE NO BUILD ZONE THERE ARE NOT ADDITIONAL RESTRICTIONS ON THE PLACEMENT OF THE OWTS FOR EACH LOT

THE SELECTED RESIDENCE LOCATIONS ARE FOR ILLUSTRATION ONLY. IF THE EL PASO COUNTY HEALTH DEPARTMENT PHYSICAL SETBACK REQUIREMENTS ARE MET AND THE RESIDENCE DOES NOT FALL WITHIN THE NO BUILD ZONE THERE ARE NOT ADDITIONAL RESTRICTIONS ON THE PLACEMENT OF THE OWTS FOR EACH LOT

Rf - Rockfall - areas that are prone to rockfall.

sw - seasonally wet areas - low lying areas that may contain surface water during heavy precipitation events (rain, snow melt).

REFERENCE
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PROPOSED SUBDIVISION
COUNTY LINE ROAD

EL PASO COUNTY, COLORADO
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ENGINEER:	TPM
DRAWN BY:	KMZ
CHECKED BY:	TPM
ISSUED:	7-1-2025

SEPTIC SUITABILITY MAP

SHEET No.
FIG-12