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**ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED**

SOILS AND GEOLOGY STUDY

**Treasured Acres
El Paso County, Colorado**

PREPARED FOR:

**Jerry Lomax
11750 Green Acres Lane
Colorado Springs, CO 80908**

JOB NO. 177644

July 27, 2021

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

**Reviewed by,
RMG – Rocky Mountain Group**

A handwritten signature in blue ink that reads "Kelli Zigler".

**Kelli Zigler
Project Geologist**



**Geoff Webster, P.E.
Sr. Geotechnical Project Engineer**

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Wastewater Study, 11750 Green Acres Lane, EPC 5215000035, El Paso County, Colorado,
prepared by RMG – Rocky Mountain Group, Job No. 177644, last dated July 27, 2021.

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the NE¼ of the SE¼ of Section 15, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located less than one mile east of the southeast corner of the intersection of Vollmer Road and Burgess Road. 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 site, as recorded on the El Paso County (EPC) Assessors website, is 15.0 acres, however the Final Plat for the Minor Subdivision reflects 15.18 acres. The proposed site development is to consist of subdividing the 15.18-acre parcel into three lots. Lot 1 is to consist of 5.06 acres, Lots 2 and 3 are to consist of 5.06 acres each. The 15.0-acre parcel is currently identified as:

- EPC Schedule No. 5215000035, currently addressed as 11750 Green Acres Lane and is zoned “RR-5” *Residential Rural*.

The site as referenced in this report refers to the entire 15.0-acre parcel. It is our understanding the proposed development is to consist of one single-family residence with a well and an on-site wastewater treatment system on Lots 2 and 3. The existing residence, well and onsite water treatment system is to remain on Lot 1 and be addressed as 11750 Green Acres Lane. Lots 2 and 3 currently has not received a new address. The subdivision is to be referred to as the Treasured Acres subdivision. Lots 2 and 3 are to be accessed through an easement created along the eastern boundary of Lot 1. The Proposed Lot Layout, Figure 2, outlines the proposed subdivision and the general boundaries of our investigation.

This report presents the results of our geologic evaluation for the proposed subdivision. A separate Wastewater Study for individual on-site wastewater treatment systems is included in Appendix B.

2.0 QUALIFICATIONS OF PREPARERS

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

The principle investigators for this study are Kelli Zigler, P.G. and Geoff Webster, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 20 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.

Geoff Webster, P.E. is a licensed Professional Engineer with 35 years of experience in the structural and geotechnical engineering fields. Mr. Webster holds a Master's degree from the University of Central Florida. Mr. Webster has supervised and performed numerous geological and geotechnical field investigation programs in Colorado and other states.

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 development of single-family residences within the referenced site. 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.

3.1 Scope and Objective

The scope of this study included a physical reconnaissance of the site and a review of pertinent, publically available documents including (but not limited to) previous geologic and geotechnical reports, overhead and remote sensing imagery, published geology and/or hazard maps, design documents, etc. 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
- Available aerial photographs
- Profile pit logs by RMG
- Geologic research and analysis

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 available for our review and are listed below.

1. *Site Plan, Treasured Acres*, provided by Joseph Alessi, via email dated July 11, 2021. *Wastewater Study, 11750 Green Acres Lane, EPC 5215000035, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 177644, last dated July 27, 2021.

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 site contains one single-family residence with four miscellaneous sheds/outbuildings. The existing structures are located near the southwestern corner of the property. Topographically the site is gently rolling terrain and contains slopes less than 10 percent across the property. The overall slope is downward from the northwest to the southeast, with an elevation difference of approximately 28 to 30 feet across the site. The entire site consists of low lying native grasses and weeds. Deciduous trees are denser on Lot 1 and less dense on Lots 2 and 3.

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. Prior to 1952 the entire site was native undisturbed forest. The existing single family residence was reportedly constructed in 1955 per the El Paso County Assessors data. Indications of the residence are not present until 1960. Outbuildings appear to have been constructed between 1975 to 1980. Prior to 2005, the site underwent a major clearing of the forest trees on the northern portion of the site and on proposed Lots 2 and 3. Since 2005, the site has remained generally undisturbed.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

It is our understanding the existing residence, outbuildings, well and septic on Lot 1 is to remain. The location of the new single family residences on Lot 2 and 3 are not yet determined.

5.1 Profile Pit Excavations

RMG observed two 8-foot deep profile pits on site. One profile pit was performed on each Lot 2 and Lot 3. The profile pits were excavated and observed to explore the subsurface soils underlying the proposed Onsite Wastewater Treatment Systems. The number of test pits is in accordance with Regulations of the El Paso County Board of Health, Chapter 8, Onsite Wastewater Treatment Systems (OWTS) as required by 8.5.D.3.a.

Additional information is provided in Section 9.0, On-site Disposal of Wastewater, and within the full Wastewater Study, included in Appendix B.

5.2 OWTS Visual and Tactile Evaluation

A visual and tactile evaluation performed by RMG was used in conjunction with this investigation. The soils were evaluated to determine the soils types and structure. Bedrock and restrictive layers were not encountered in the profile pits. Evidence of seasonal high groundwater was also not observed in the profile pits.

5.3 Groundwater

Groundwater was not encountered in the profile pits observed on July 17, 2021. Groundwater levels are not anticipated to have significant bearing on the proposed foundations or the OWTS placement and designs.

It should be noted that in the sand materials on site, some surficial water and/or perched groundwater conditions may be encountered due to the variability in the soil profiles. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels. Builder and planner should be cognizant of the potential occurrence of such subsurface water features during the construction on-site and deal with each individual problem as necessary (if any) at the time of construction.

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 11 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 Holocene and late Pleistocene Age. The residual soils are produced by the in-situ action of weathering of the underlying bedrock onsite.

6.2 Subsurface Soil Conditions

The subsurface soils encountered in the profile pits performed by RMG were classified using the United States Department of Agriculture (USDA), revealed the onsite soils classified as sand and sandy clay. The sand was encountered with grain sizes ranging from less than 35% to more than 50% of the samples greater than 2mm.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Profile Pit Logs, Figure 2 in the Wastewater Study, presented in Appendix B. The descriptions shown on the logs are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the profile pit logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

6.3 Bedrock Conditions

Bedrock (as defined by USDA Soil Structure and Grade) was not encountered in the profile pit excavations used for this investigation. In general, bedrock (as defined by Colorado Geologic Survey) beneath the site is considered to be part of the Dawson Formation – facies unit five which consists of silty sandstone with interbedded layers of claystone. The Dawson formation is thick-bedded to massive, generally light colored arkose, pebbly, and pebble conglomerate. The sandstones are poorly sorted with high clay contents. The sandstone is generally permeable, well drained, and has good foundation characteristics. The Dawson sandstone is generally considered a restrictive layer for OWTS. The Dawson sandstone is also easily excavated using standard construction equipment for excavations.

6.4 U.S. Soil Conservation Service

The U.S. Soil Conservation Service along with USDA has identified the soils on the property as:

- 41 – Kettle gravelly loamy sand, 8 to 40 percent slopes. Slopes on this site do not exceed 10 percent. The Kettle gravelly loamy sand encompasses 100 percent of the site. Properties of the Kettle gravelly loamy sand, include, poorly-drained soil, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be medium, frequency of flooding is none to frequent and ponding is none. Landforms include hills. The hydrologic soil group is B.

6.5 General Geologic Conditions

Based on our field observations and review of relevant geologic maps, a geologic map was prepared which identifies the geologic conditions affecting the development. The geologic units present on the site are presented in the Engineering and Geology Map, Figure 3.

The site generally consists of silty to clayey sand 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 is considered less permeable, not as well drained and generally suitable for foundations. Three geologic units are mapped at the site as:

- *Tkda₅* – Dawson Formation, facies 5 (early to middle(?) Eocene) – the facies is generally thick-bedded to massive and consists of poorly sorted friable sandstone with high clay content. Contains thin- to very thin interbedded claystone. Total thickness of the formation is 2,000 feet. The Dawson formation is generally resistant to erosion and foundation stability of the sandstone is good. The interbedded claystone is generally not suitable for direct bearing of shallow foundations. Bedrock was not encountered in the profile pits performed by RMG.
- *Da* – disturbed areas – areas that are no longer in their native state, soils have been removed and/or replaced for the existing driveway, existing residence, existing outbuildings, existing OWTS, and utility easements.
- *ss* – steep slopes – steep slopes greater than 30% exist on Lot 1. New construction is currently not proposed on Lot 1.

6.6 Structural Features

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

6.8 Drainage of Water and Groundwater

The overall topography of the site is fairly level, with a gentle slope from the northwest to the southeast. Groundwater was not encountered in the profile pits observed. Both the profile pits were located in near the same elevation. Groundwater water depths are anticipated to fluctuate throughout the year, and basement feasibility should be determined at the time of the site-specific subsurface soil investigations that will be required for each new residence. At this time it is

unknown what type of foundation (e.g. slab, crawlspace or basement) is proposed for the new single family residences on Lots 2 and 3.

6.9 Engineering Geology

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

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

The engineering geology is presented in the Engineering and Geology Map, Figure 3.

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 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 property.

6.11 Flooding and Surface Drainage

Based on our review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0320G the online ArcGIS Pikes Peak Regional Floodplain Map, the entire site lies outside of areas mapped as either 100-year or 500-year floodplains.

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 not identified to be a resource and 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 are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flow-Fans/Mudslides
- Floodplains
- Ground Subsidence
- Landslides
- Loose and Compressible Soils
- Rockfall
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, accelerated erosion along creek banks and drainageways
- Springs and High Groundwater

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

8.1 Expansive Soils and Bedrock

Expansive soils (USDA sandy clay, Soil Type 3A and 4A), were encountered in the test pits excavated on-site. Expansive claystone was not observed in the test pits but is commonly encountered within the Dawson Formation. These occurrences are typically sporadic, therefore none are indicated on the Engineering and Geology Map, Figure 3. The expansive soils and bedrock (if encountered) below the bottom of foundation components, can cause differential movement in the foundation structure. These occurrences should be identified and mitigated on an individual basis.

Mitigation

If expansive soils or bedrock are encountered below the bottom of foundation components, mitigation will be required. Mitigation of expansive soils may require a special foundation design. If overexcavation and replacement with non-expansive soils are required, the non-expansive soils should be placed and compacted to a minimum of 95% of the maximum Modified Proctor Dry Density, ASTM D-1557. Overexcavation and replacement is generally a suitable mitigation for expansive soils/bedrock and is considered common for the area. Drilled piers or other forms of a deep foundation are not anticipated. Floor slabs on expansive soils are expected to experience some movement. Overexcavation and replacement has been successful in minimizing slab movement. Final recommendations should be determined in an additional site specific subsurface soil investigation for each building site.

8.2 Steep Slopes

Steep slope, ranging over 30 percent, exist near the southeastern corner of Lot 1.

Mitigation

Mitigation of the slope is not anticipated at this time. Slopes greater than 30% are generally designated as "no-build" zones. The slope falls within Lot 1, and no new construction is currently proposed within Lot 1. Furthermore, the slopes are comprised of the Dawson Formation, which is generally considered stable. If future construction is proposed near the steep slope, slope stability analysis are not anticipated.

8.3 Faults and Seismicity

Based on review of the Earthquake and Late Cenozoic Fault and Fold Map Server provided by CGS located at <http://dnrwebmapgdev.state.co.us/CGSOnline/> and 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 0.192g 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.

8.4 Radon

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

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. Black Forest is located in a high risk area of the country. *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 is 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 no additional OWTS is proposed for Lot 1. An On-site Wastewater Treatment Systems (OWTS), well and single-family residence is proposed on Lots 2 and 3. The site was previously evaluated by RMG. Two profile pits were performed within or near the probable future OWTS locations to obtain a general understanding of the soil and bedrock conditions. The Profile Pit Logs, Figure 2 are presented in the Wastewater Study included in Appendix B.

9.1 Subsurface Materials

The subsurface materials encountered in the profile pit excavations were classified using Table 10-1 Soil Treatment Area Long-term Acceptance Rates from the El Paso County Department of Health and Environment (EPCDHE) Chapter 8, OWTS Regulations and the USDA Soil Structure Shape and Grade. The materials were grouped into the following general categories:

- Sand:
USDA Soil Texture: Sand
USDA Soil Type: 1 to R0 with > 50% rock
USDA Structure Shape and Grade: Single Grain
Non-cemented

- Sandy Clay:
USDA Soil Texture: Sandy Clay
USDA Soil Type: 4A
USDA Structure Shape and Grade: Blocky, Massive
Non-cemented

- Sandy Clay Loam:
USDA Soil Texture: Sandy Clay Loam
USDA Soil Type: 3A

USDA Structure Shape and Grade: Granular, Massive
Non-cemented

The soils on the proposed two new lots were identified as sand, sandy clay and sandy clay loam. According to our observations, limiting layers were not encountered in the profile pits. The long term acceptance rates (LTAR) associated with the most restrictive soils observed in the profile pits was 0.15 gallons per day per square foot (gpd/sf) for the sandy clay (Soil Type 4A). Groundwater and indications of seasonally shallow groundwater were not observed in the profile pit excavations at the time of their field observation.

9.2 Bedrock Conditions

Bedrock (as defined by USDA Soil Structure and Grade) was not encountered in the profile pit excavations. In general, the bedrock (as defined by Colorado Geologic Survey) beneath the site is considered to be part of the Dawson. The Dawson sandstone is generally considered a restrictive layer for OWTS.

9.3 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, most recently 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 (EPCHDE);
- 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 EPCHDE;
- Treatment areas must also be located a minimum 50 feet from any drainages, floodplains, or ponded areas, and 25 feet from dry gulches.
- The two new lots (Lots 2 and 3), shall be laid out to insure that a minimum of 2 sites are appropriate for an OWTS and do not fall within any restricted areas, (e.g. utility easements, right of ways). Based on the profile pit observations, the two new lots have a minimum of two locations for the OWTS as presented on the Septic Suitability Map, Figure 5 within the Wastewater Study included in Appendix B.

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 both new lots (Lots 2 and 3) have suitable areas for future individual on-site wastewater treatment systems within the cited limitations. However, if indications of seasonally shallow groundwater or perched water conditions are observed at the time of the site specific OWTS evaluation, the type of system that can be installed may be restricted to compensate

for the water conditions. It should be noted that the LTAR values stated above are for the profile pit locations performed for this report only.

This does not constitute an OWTS design. An OWTS exists on Lot 1 and an additional OWTS is not currently proposed. A separate individual OWTS evaluation and design for each Lot 2 and 3 should be completed once each lot has a buyer. The OWTS evaluation and design are unique to each OWTS location and will require the owner to know what type of residence they are constructing and how many bedrooms the residence will have. The information presented above and within the Wastewater Study, included in Appendix B are to be used for the approval of the subdivision and as preliminary information for any potential buyers.

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 radon, and faults/seismicity. Geologic constraints (also as described in section 8.0 of this report) such as: potentially expansive soils/bedrock were found on the site. 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 pits, preliminary results, conclusions and recommendations presented in this report are not intended for use for design and construction of the single-family residences or the OWTS. At this time, construction is not proposed for Lot 1.

A site-specific Subsurface Soil Investigation, Profile Pit Evaluation and OWTS Design will need to be completed for Lots 2 and 3. All recommendations presented in a site-specific Subsurface Soil Investigation, Profile Pit Evaluation and OWTS Design are to be followed for the future single family residences and the onsite wastewater systems for Lots 2 and 3.

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 foundation and floor slabs of the structure should be designed using the recommendations provided in the lot-specific subsurface soil investigation performed for Lots 2 and 3. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.

We believe the surficial sand soils will classify as Type C materials and the clay soils will classify as Type B as defined by OSHA in 29CFR Part 1926, date January 2, 1990. OSHA requires temporary slopes made in Type C materials be laid back at ratios no steeper than 1.5:1 (horizontal to vertical) and slopes made in Type B materials be laid back at ratios no steeper than 1:1 (horizontal to vertical) unless the excavation is shored or braced.

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

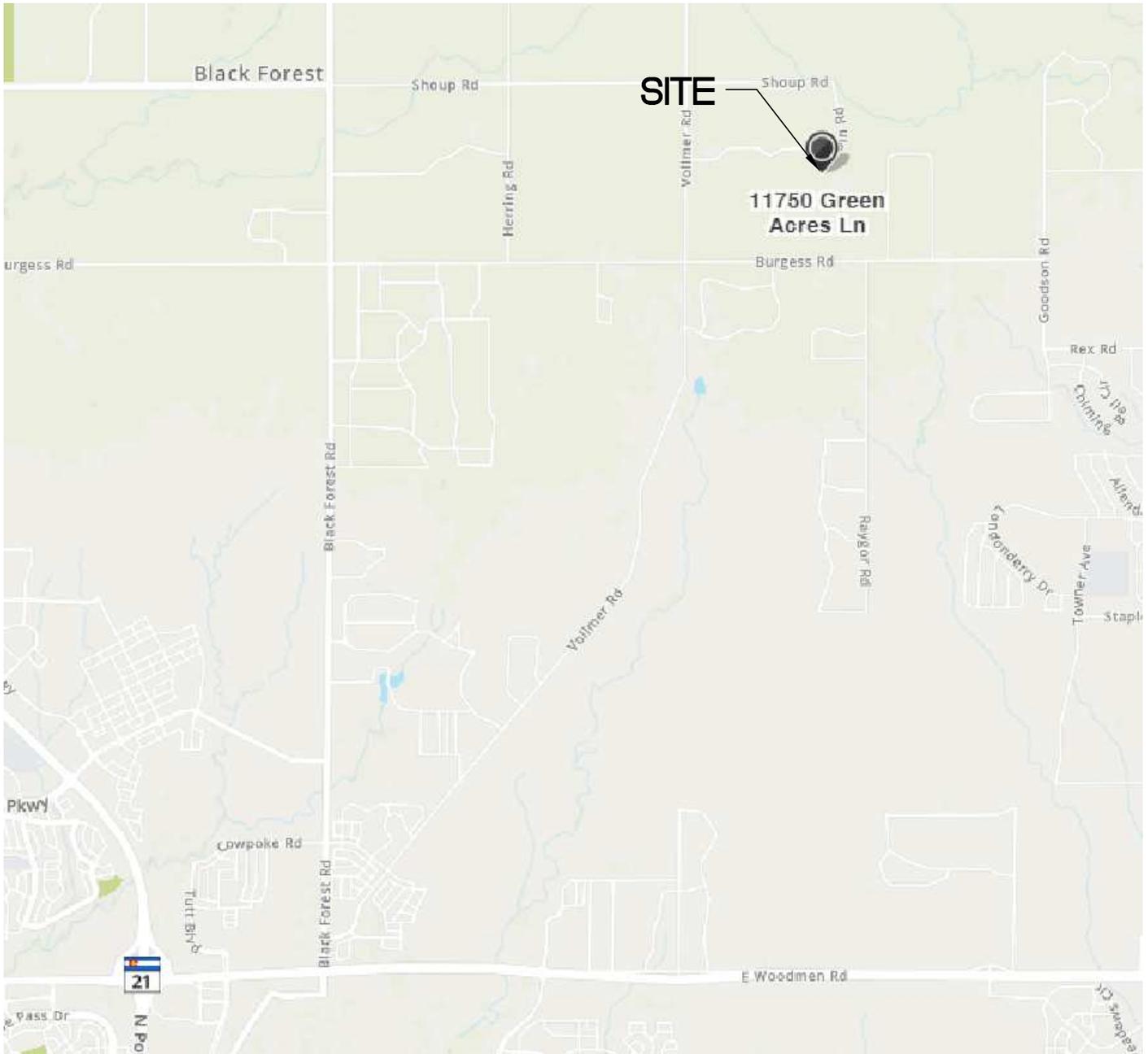
This report has been prepared for **Jerry Lomax** in accordance with generally accepted geotechnical engineering and engineering geology practices. The conclusions and recommendations in this report are based in part upon data obtained from review of available topographic and geologic maps, review of available reports of previous studies conducted in the site vicinity, a site reconnaissance, and research of available published information, soil test borings, soil laboratory testing, and engineering analyses. The nature and extent of variations may

not become evident until construction activities begin. If variations then become evident, RMG should be retained to re-evaluate the recommendations of this report, if necessary.

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

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



ROCKY MOUNTAIN GROUP

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Northern Office:
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SITE VICINITY MAP

TREASURED ACRES
 EL PASO COUNTY, CO
 JERRY LOMAX

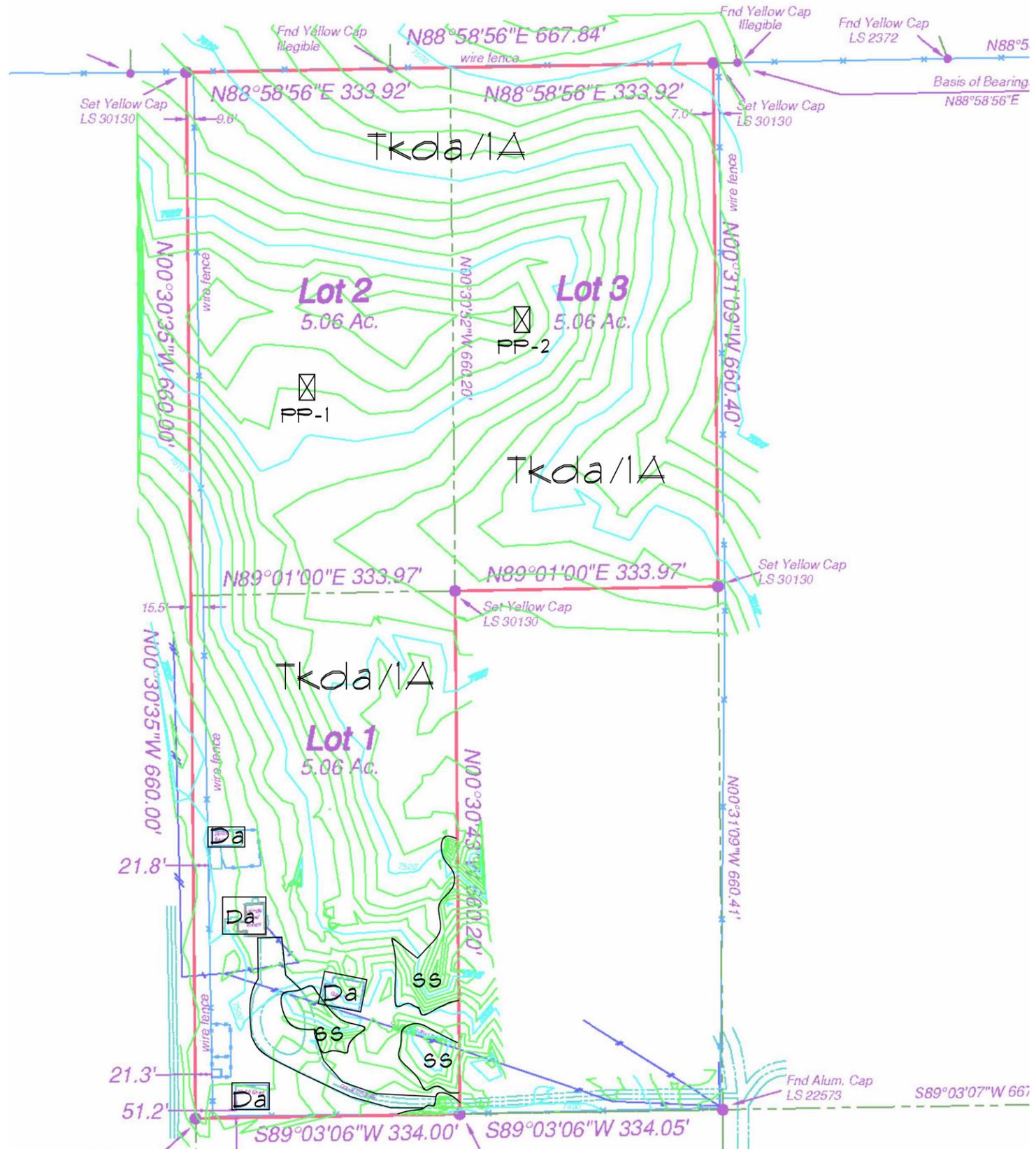
JOB No. 177644

FIG No. 1

DATE 7-27-2020



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 2910 Austin Bluffs Parkway
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 Fax (719) 548-0223
Central Office:
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Northern Office:
 (970) 330-1071
Woodland Park Office:
 (719) 687-6077
Monument Office:
 (719) 488-2145
Pueblo Office:
 (719) 544-7750



NOT TO SCALE
 BASE MAP PROVIDED BY:
 ALESSI and ASSOCIATES, Inc.

General Geology

- *Tkda₅* - Dawson Formation, facies 5 (early to middle(?) Eocene) - the facies is generally thick-bedded to massive and consists of poorly sorted friable sandstone with high clay content. Contains thin- to very thin interbedded claystone. Total thickness of the formation is 2,000 feet. The Dawson formation is generally resistant to erosion and foundation stability of the sandstone is good. The interbedded claystone is generally not suitable for direct bearing of shallow foundations. Bedrock was not encountered in the profile pits performed by RMG.
- *Da* - disturbed areas - areas that are no longer in their native state, soils have been removed and/or replaced for the existing driveway, existing residence, existing outbuildings, existing OWTS, and utility easements.
- *ss* - steep slopes - steep slopes greater than 30% exist on Lot 1. New construction is currently not proposed on Lot 1.

Engineering Geology

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

DENOTES APPROXIMATE LOCATION OF RMG TEST PITS

TREASURED ACRES
 EL PASO COUNTY, CO
 JERRY LOMAZX

ENGINEER:	GGW
DRAWN BY:	KZ
CHECKED BY:	GGI
ISSUED:	1-21-2020
REVISION:	DATE:
	JOB #:

ENGINEERING AND
 GEOLOGY

SHEET No.
FIG-3

APPENDIX A

Additional Reference Documents

1. *Treasured Acres*, prepared by Alessi and Associates, Inc., Job No. 191279, last dated July 30, 2019.
2. *Wastewater Study, 11750 Green Acres Lane, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 177644, last dated July 27, 2021.
3. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0320G*, Federal Emergency Management Agency (FEMA), effective December 7, 2018.
4. *Geologic Map of the Black Forest Quadrangle, El Paso County, Colorado*, By Jon P. Thorson, 2003. Colorado Geological Survey Open-File Map 03-6.
5. *Black Forest, Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
6. *Black Forest Quadrangles, Map of Potential Geologic Hazards and Surficial Deposits*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
7. *Pikes Peak Regional Building Department*: <https://www.pprbd.org/>.
8. <https://property.spatalest.com/co/elpaso/#/property/5215000035>
Schedule No.: 5215000035.
9. *Colorado Geological Survey, USGS Geologic Map Viewer*:
<http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/>.
10. *Historical Aerials*: <https://www.historicaerials.com/viewer>, Images dated 1947, 1952, 1955, 1960, 1969, 1983, 1999, 2005, 2009, 2011, 2013, 2015 and 2017.
11. *USGS Historical Topographic Map Explorer*: <http://historicalmaps.arcgis.com/usgs/>
Colorado Springs Quadrangles dated 1894, 1913, 1944, 1975, and 1983.
12. *Google Earth Pro*, Imagery dated 1999, 2004, 2005, 2006, 2011, 2013, 2015, 2017, 2019 and 2021.

APPENDIX B

Wastewater Study

Architecture
Structural
Geotechnical



Materials Testing
Forensic
Civil/Planning

**ROCKY MOUNTAIN GROUP
EMPLOYEE OWNED**

Job No. 177644

July 31, 2020
Revised July 27, 2021

Jerry Lomax
11750 Green Acres Lane
Colorado Springs, CO 80908

Re: Wastewater Study
11750 Green Acres Ln
EPC 5215000035
El Paso County, Colorado

Dear Jerry Lomax:

Ref: Land Survey Plat, prepared by Alessi and Associates, Inc., Job No. 191279, dated July 30, 2019

Dear Jerry Lomax:

As requested, personnel of RMG – Rocky Mountain Group has performed a preliminary investigation and site reconnaissance at the above referenced property. It is our understanding the approximately 15-acre parcel is to be subdivided into three smaller parcels. Per the Land Survey Plat, referenced above, each of the three new lots are to consist of 5.06 acres.

The parcel is currently partially developed. An existing single-family residence with well and septic are currently reside on the proposed new Lot 1. It is our understanding that these are to remain. Future construction on proposed new Lots 2 and 3 is anticipated to consist of single-family residences, each with a well and septic. As such, this letter is to provide preliminary 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 investigations for this site were not available for our review. However, it is our understanding that a soils and geology study is to be completed by Groundwater Investigations, LLC.

SITE CONDITIONS

Personnel of RMG performed a site reconnaissance visit on July 17, 2020. 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. Two 8-foot deep profile pits, one each on Lot 2 and Lot 3, were observed. A Profile Pit Location Plan is presented in Figure 1.

The site surface characteristics were observed to consist of dense deciduous trees, low lying grasses and weeds across the entire site.

The following conditions were observed with regard to the 15-acre parcel:

- A well currently **does** exist on Lot 1 of the existing 15-acre site, near the existing single-family residence. It is our understanding that the well is to remain;
- No runoff or irrigation features anticipated to cause deleterious effects to treatment systems on the site were observed. However, a pond with a man-made dam is located more than 200 feet north and east of the southeast property corner of Lot 3. A low lying area (seasonal drainageway) appears to extend from the pond at an angle across the southern portion of Lot 3.
- Black Squirrel Creek is located approximately 0.33 miles to the north of the northern property line. The entire site lies outside the designated floodway or floodplain;
- Slopes greater than 20 percent **do not** exist; and
- Significant man-made cuts **do not** exist.

Treatment areas are to be located a minimum distance of 100 feet from any well location. Treatment areas are also to be located a minimum of 50 feet from any spring, lake, water course, irrigation ditch, stream or wetland. Other setbacks for the treatment area include, but are not limited to, a minimum 10 feet from property lines, dry gulches, cut banks and fill areas (from the crest).

DOCUMENT REVIEW

RMG has reviewed the above referenced Land Survey Plat, identified the soil conditions anticipated to be encountered during construction of the proposed OWTS for Lots 2 and 3, and included a review of documented Natural Resource Conservation Service - NRCS data downloaded electronically from websoilsurvey.nrcs.usda.gov. The Soil Survey Descriptions are presented below. A review of FEMA Map No. 08041C0320G, effective December 7, 2018 indicates that the proposed treatment areas are not located within an identified flood plain.

SOIL EVALUATION

Personnel of RMG performed a soil evaluation to include two 8-foot deep profile pits, one each on Lot 2 and Lot 3, on July 17, 2020 (Profile Pit PP-1 and PP-2), utilizing the visual and tactile method for the evaluation of the site soils. The profile pits were excavated in area that appeared most likely to be used for residential wastewater treatment areas. The Profile Pit Logs are presented in Figure 2.

The soil conditions as indicated by the NRCS data are anticipated to consist of Kettle gravelly loamy sand with 8 to 40 percent slopes. The Kettle gravelly loamy sand was mapped by the USDA to encompass the majority of the property. Properties of the loamy sand include, somewhat excessively drained soils, depth of the water table is anticipated to be greater than 80 inches, runoff is anticipated to be medium, frequency of flooding and/or ponding is none, and landforms include hills. The USDA Soil Map and full Map Unit Descriptions are presented in Figures 3 and 4, respectively.

Groundwater, seasonal and/or saturated conditions or bedrock were not encountered in the profile pits performed by RMG.

Redoximorphic features indicating the fluctuation of groundwater or higher ground water levels were not observed in the profile pits.

CONCLUSIONS

In summary, it is our opinion that there are no foreseeable or stated construction related issues or land use changes proposed at this time. Lots 2 and 3 each are suitable for an individual OWTS. 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.

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 profile pit excavations. Therefore, depth to limiting or restrictive conditions, bedrock, and groundwater may be different from the results reported in this letter.

Individual wastewater treatment systems are proposed for Lots 2 and 3. Additional OWTS site evaluations for each lot will need to be performed in accordance with the applicable health department codes prior to construction. This report may require additional profile pits in the vicinity of the proposed treatment field. A minimum separation of 4 feet (or 3 feet, if an unlined sand filter is used) shall be maintained from groundwater and bedrock to the infiltrative surface.

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

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

**Reviewed by,
RMG – Rocky Mountain Group**

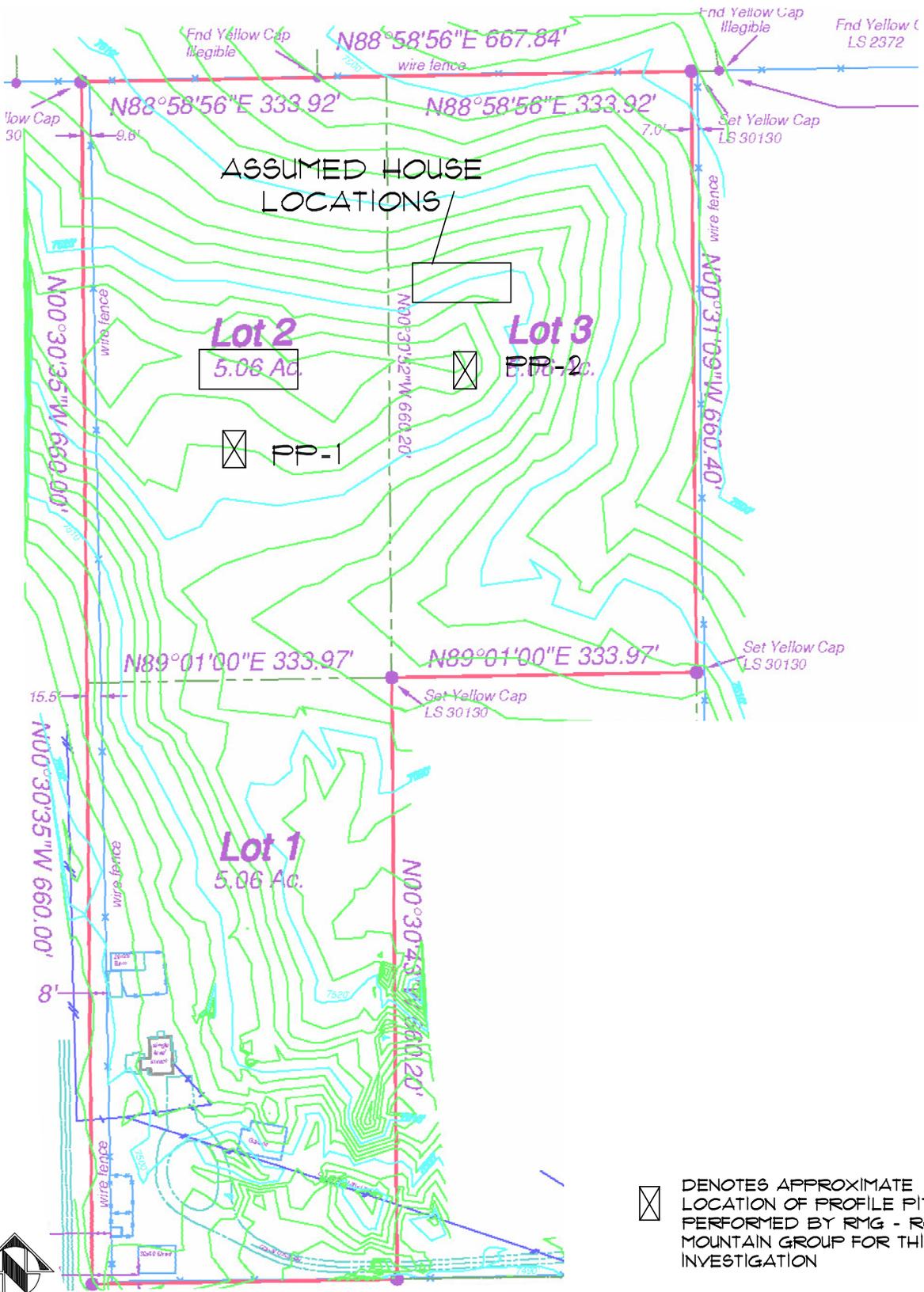


**Kelli Zigler
Project Geologist**



**Tony Munger, P.E.
Geotechnical Project Manager**

APPENDIX A
Profile Pit Location Plan



⊗ DENOTES APPROXIMATE LOCATION OF PROFILE PITS PERFORMED BY RMG - ROCKY MOUNTAIN GROUP FOR THIS INVESTIGATION

NOT TO SCALE



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**PROFILE PIT
LOCATION PLAN**
GREEN ACRES LANE
EPC SHCHEDULE NO. 5215000035
EL PASO COUNTY, CO
JERRY LOMAX

JOB No. 177644

FIG No. 1

DATE 7-24-2020

TEST PIT TP-1			
DATE OBSERVED: 07/17/20			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 1.0 FT SAND			1
1 - 4.0 FT SAND (51% > 35%)	2ft		R-0
4.0 FT - 5.0 FT SANDY CLAY	4ft		4A
5.0 FT - 8.0 FT SANDY CLAY LOAM (50% > 35%)	6ft		1
	8ft		

TEST PIT TP-2			
DATE OBSERVED: 07/17/20			
SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 2.0 FT SAND			1
2.0 FT - 8.0 FT SANDY CLAY	2ft		4A
	4ft		
	6ft		
	8ft		

SOIL DESCRIPTIONS



SAND



SAND (51% > 35%)



SANDY CLAY



SANDY CLAY
LOAM



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PROFILE PIT LOGS

11750 GREEN ACRES LANE
EPC 5215000035
JERRY LOMAX

JOB No. 177644

FIGURE No. 2

DATE 07/24/2020

APPENDIX C
USDA Soil Map and Map Unit Descriptions



- 41 - Kettle gravelly loamy sand



NOT TO SCALE
BASE MAP PROVIDED BY: USDA



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USDA SOIL MAP

GREEN ACRES LANE
EPC SHCEDULE NO. 5215000035
EL PASO COUNTY, CO
JERRY LOMAX

JOB No. 177644

FIG No. 3

DATE 7-24-2020

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

Map Unit Setting

National map unit symbol: 368h

Elevation: 7,000 to 7,700 feet

Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent

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

Description of Kettle

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand

Bt - 16 to 40 inches: gravelly sandy loam

C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes



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USDA MAP UNIT DESCRIPTIONS

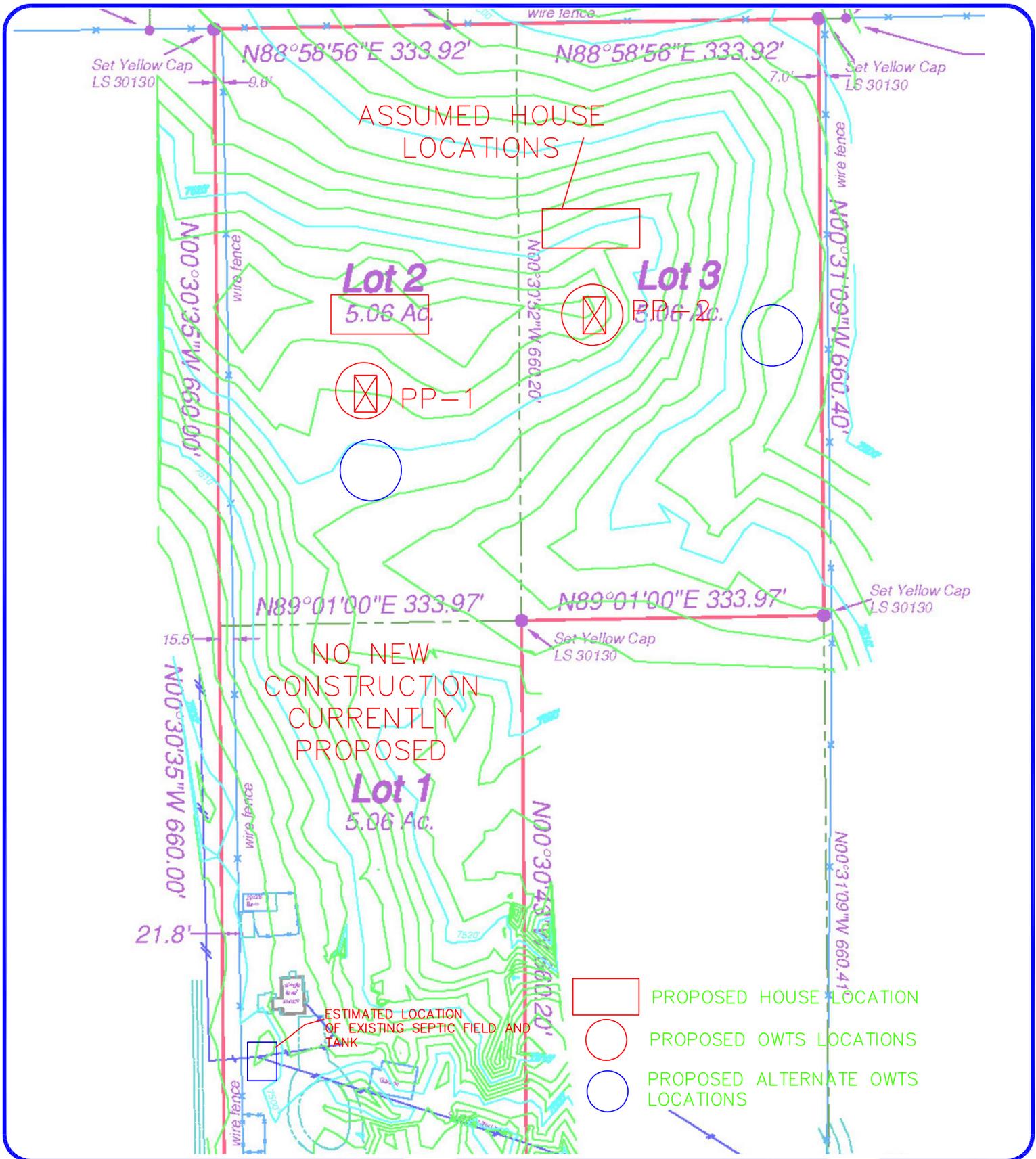
GREEN ACRES LANE
EPC SHCEDULE NO. 5215000035
EL PASO COUNTY, CO
JERRY LOMAX

JOB No. 177644

FIG No. 4

DATE 7-24-2020

APPENDIX D
Septic Suitability Map



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SEPTIC SUITABILITY MAP

TREASURED ACRES
 EL PASO COUNTY, CO
 JERRY LOMAX

JOB No. 177644

FIG No. 5

DATE 7-27-2020
 REV 10-13-2021