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SOILS AND GEOLOGY STUDY

Please add "PCD File No. SP217"

Peerless Farms
El Paso County, Colorado

PREPARED FOR:

Robert Williams
4075 Golf Club Drive
Colorado Springs, CO 80922

JOB NO. 180213

April 14, 2021
Revised June 29, 2023

Respectfully Submitted,
RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,
RMG – Rocky Mountain Group

COLORADO REGISTERED
ANTHONY P. MUNGER
7/5/23
39818
PROFESSIONAL ENGINEER

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

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1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the NW¼ of the NW¼ of Section 13, Township 13 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 2 miles east of the intersection of Curtis Road and Falcon Highway. 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 40.01 acres. The proposed site development is to consist of subdividing the 40.1-acre parcel into seven lots. The 40.01-acre parcel is currently identified as:

- EPC Schedule No. 4313000001, currently addressed as 16975 Falcon Highway and is zoned "RR-5" *Residential Rural.*

It is our understanding the existing two residences with a well and on-site wastewater treatment system is to remain on Lot 3 and contain 6.266 acres, the address is to remain 16975 Falcon Highway. The barn is to remain on Lot 4. The remainder of the lots range from 5.023 to 6.303. Each lot is to consist of one single-family residence with water provided by Sage Waters Users Association. The subdivision is to be referred to as the Peerless Farm subdivision. Access to the subdivision it to be provided by a new cul-de-sac extending approximately 680 feet south of Falcon Highway. Two 50' private access roads are to extend west from the new cul-de-sac, the northern private access road may be used for Lots 1, 2, and 4. The southern private access road is to be used for Lots 3, 5, 6, and 7. The Proposed Lot Layout, Figure 2, outlines the proposed subdivision and the general boundaries of our investigation.

This report presents the summary of the geologic hazards and constraints for the proposed subdivision.

2.0 QUALIFICATIONS OF PREPARERS

This Geology and Soils report was prepared by a professional geologist as defined by Colorado Revised Statures 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.

Tony Munger is a licensed professional engineer with over 21 years of experience in the construction engineering (residential) field. Mr. Munger and 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 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
- Exploratory soil test borings by RMG
- Profile pit logs by JDM Consulting, LLC
- Laboratory testing of representative site soil and rock samples by RMG
- 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.

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 two single family residences located near the center of the property and a detached barn approximately 500 feet to the east of the residences. Topographically the site is fairly flat to gently rolling terrain, with overall slopes less than 9 percent across the property. The overall slope is downward from the north to the south, southwest, with an elevation difference of approximately 28 to 30 feet across the site.

An unnamed intermittent creek traverses the site along the western portion the property. Trees only exist around the residence. Three small ponds are located east of the intermittent creek. It is uncertain at this time if the ponds are to remain or to be filled in prior to future construction. The entire site consists of low lying native grasses and weeds.

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. According to the EPC County Assessors the existing residence was constructed in 1932. Since 1947, the site has remained generally undisturbed and consistent with the present layout.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

5.1 Drilling

The subsurface conditions within the property were explored by drilling a total of three (3) exploratory borings and observing (3) test pits. The three test borings were drilled on March 4, 2021 and the three test pits were observed on February 26, 2021. The approximate location of the test borings and test pits are presented on the Test Boring and Test Pit Location Plan, Figure 3.

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 utilizing a 2-inch O.D. Split Barrel Sampler. An Explanation of Test Boring/Pit Logs is presented in Figure 4. The test boring and test pit logs are presented in Figure 5 through 7.

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

5.2 Laboratory Testing

Soil laboratory testing was performed as part of this investigation. The laboratory tests included moisture content, dry density, grain-size analyses and Atterberg Limits. Swell/Consolidation tests were not performed on the onsite non-expansive silty sand. A Summary of Laboratory Test Results is presented in Figure 8. Soils Classification Data is presented in Figure 9.

5.3 OWTS Visual and Tactile Evaluation

A visual and tactile evaluation for the proposed OWTS's was performed in conjunction with this investigation. The soils were evaluated to determine the soils types and structure. Bedrock was not encountered in the test pits (or test borings). Evidence of seasonal high groundwater was observed in the test pits. Groundwater was encountered in one of the test pits (TP-2) at a depth of 6 feet. The soil descriptions of the test pits are presented in the Wastewater Study included in Appendix B.

5.4 Groundwater

Groundwater was encountered in all three test borings at depths ranging between 11.0 feet to 18.0 feet below the existing ground surface at the time of drilling. When checked approximately five days subsequent to drilling, groundwater was encountered at depths ranging between 3.5 feet and

18.5 feet. Groundwater levels are anticipated to have sufficient separation from the bottom of proposed crawlspace foundation components on all lots and from basement foundation components on Lots 2, 4, and 7. Due to the shallow groundwater conditions encountered near the unnamed intermittent creek, the use of basements on Lots 1, 5, and 6 may be limited. New construction is not currently proposed on lot 3. If basement construction is proposed on lot 3 in the future, we recommend that those structures be subject to the same feasibility evaluations as recommended above for lots 1, 5, and 6. Groundwater conditions should be considered in the site specific soil investigations and OWTS designs.

The presence of creeks, streams, holding ponds, or other waterways (particularly those that only intermittently contain water) are not necessarily indicative of a shallow groundwater condition. Such waterways can be fed solely from "upstream" precipitation, irrigation, and other surface sources. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

6.1 Geologic Conditions

The site physiographically lies in the western portion of the Great Plains Physiographic Province south of the Palmer Divide. Approximately 20 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 bedrock onsite.

6.2 Subsurface Soil Conditions

The subsurface soils encountered in the test borings were classified using the Unified Soil Classification System (USCS). The laboratory testing performed revealed the on-site soils classified as silty sand (SM) and poorly graded sand with silt (SP-SM).

The subsurface soils encountered in the test pit excavations were classified using the United States Department of Agriculture (USDA). The test pits revealed the onsite soils classified as sand, sandy clay and sandy clay loam.

6.3 Bedrock Conditions

Bedrock (as defined by USDA Soil Structure and Grade) was not encountered in the test borings or test pit excavations used for this investigation. In general, the bedrock (as defined by Colorado Geologic Survey) beneath the site is considered to be part of the Dawson Formation 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 not anticipated to be encountered in the foundation excavations for the residences or within the treatment areas.

6.4 U.S. Soil Conservation Service

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

- 8 – *Blakeland loamy sand, (1 to 9 percent slopes)*, the Blakeland loamy sand was mapped by the USDA to encompass the north central portion of the site. The Blakeland loamy sand encompasses approximately less than 20 percent of the property. Properties of the Blakeland loamy sand include, somewhat excessively drained soil, depth of the water table is anticipated to be more than 80 inches, runoff is anticipated to be low, frequency of flooding and ponding is none. Landforms include hills and flats. The Blakeland loamy sand is anticipated in the area of Lot 2.

- 9 – *Blakeland Fluvaquentic Haplaquolis* - *Blakeland Fluvaquentic Haplaquolis* was mapped by the USDA to encompass approximately 40 percent of the property. Properties of the Blakeland Fluvaquentic Haplaquolis include, somewhat excessively drained soils, depth of the water table is anticipated to be greater than 80 inches, frequency of flooding and ponding is none, and landforms include hills and flats.

- 9 – *Truckton loamy sand, 1 to 9 percent slopes*. Truckton loamy sand was mapped by the USDA to encompass approximately 40 percent of the property. Properties of the Truckton loamy sand include, well-drained soils, depth of the water table is anticipated to be greater than 80 inches, frequency of flooding and ponding is none, and landforms include hills and flats.

The USDA Soil Survey Map is presented in Figure 10.

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 11.

The site consists of eolian (windblown) silty sand. The silty sand is generally permeable, well drained, and has good foundation characteristics, as the clay content increases the permeability and foundation characteristics decline. Four geologic units were mapped at the site as:

- *Qes – eolian sand (Holocene to upper Pleistocene)* – as mapped on the Falcon Quadrangle, the sand is generally yellowish-brown to tan, fine to course grained, frosted sand and silt deposited by wind. Typically, this unit is faintly stratified and noncohesive; dune forms are not present. The unit is likely deposited as a sandsheet by winds capable of moving very find gravel-sized clasts. Eolian sand is moderately compacted, easily excavated, and drains well. Eolian sand was encountered in all three test borings to depths of approximately 20 feet.

- *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 OWTS, and utility easements.

- *Rf – Regulatory Floodplain* – intermittent creek, drainageway that exists along the western portion of the site. This area lies within a designated floodway zoned AE.

- *Sw – Seasonally wet areas,* in these areas we would anticipate the potential for periodically high surface moisture conditions. These areas lie outside the defined regulatory floodway and can likely be avoided by the proposed development.

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.

6.8 Drainage of Water and Groundwater

The overall topography of the site is fairly flat, with a gentle slope from the north to the south, southwest. Groundwater was encountered in all three of the test borings and one of the test pits observed. All the test borings and test pits were located at relatively the same elevation. Groundwater water depths are anticipated to fluctuate throughout the year and will likely affect basement foundation construction on Lots 1 and 5.

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 11.

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. 08041C0567G the online ArcGIS Pikes Peak Regional Floodplain Map, the western portion of the site lies within an areas mapped as AE. Per FEMA, AE indicates areas that have at least a 1% annual-chance of being flooded, but where wave heights are less than 3 feet. The Floodway is mapped with designated Base Flood Elevations (BFE). The BFE for the western portion of the subdivision ranges between 6559.7 to 6530.0 feet. The proposed residences on Lot 1 and 5 and any future structures proposed for lot 3 will need to consider the BFE at the time of construction. The FEMA Map is presented in Figure 12.

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 floodplain deposits comprised of sand and gravel with minor amounts of silt and clay deposited by water along present stream courses. Extraction of the sand and gravel resources are 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 outside the Denver Basin Coal Region. The area has not been mapped as a coal resource and 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 are not anticipated to pose a significant risk to the proposed development:

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

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

8.1 Loose and Compressible Soils

Loose soils were encountered in the test borings; eolian deposits are known to have low density. Any loose or compressible soils encountered beneath foundations or floor slabs will require mitigation.

Mitigation
Loose soils may require additional compaction to achieve the allowable bearing pressure indicated in the site-specific soil investigation. Fluctuations in material density may occur. In some cases, removal and recompaction of up to 2 feet of soil may be required. The removal and recompaction shall extend a minimum of 2 feet beyond the building perimeter, and at least that same distance beyond the perimeter of counterfort and "T" wall footings. 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.

8.2 Surface Drainage and Shallow Groundwater

The property partially lies within a designated floodway of an unnamed creek and its drainageway should be taken into consideration when considering the placement of the residences and OWTS treatment areas on Lots 1 and 5.

Mitigation
Due to the size of the lots within the proposed development, the drainage areas should and can be avoided by construction. Structures should not block the drainageways. Any site grading should be done in a manner to avoid ponding of water around the structures and treatment areas. Treatment areas are not to be located in the drainageways due to the potential for seasonally wet conditions.

All construction should remain outside the floodway. It is recommended the unnamed drainageway be identified as a “No Build Area” unless additional studies are performed, in conjunction with the drainage engineer, prior to any new construction. The drainageway is fairly shallow and does not contain banks that would scour and eroded away. This area is shown on the Engineering and Geology Map, Figure 11.

Per the latest approved edition of the Pikes Peak Regional Building Code, the lowest finished floor elevation (including basement together with attendant utility and sanitary facilities) shall be elevated one-foot or more above the BFE. Provided that the recommendations presented herein, as well as any requirements stipulated by the governing regulatory agencies, are followed, the presence of the floodplain is not anticipated to preclude current or proposed development on the lots included in the proposed development. However, due to the shallow groundwater conditions encountered on the site, basement construction should be limited in some areas of the site. Our recommendations for evaluation of basement feasibility are as follows:

Proposed Lots 1, 5, and 6:

If basements are proposed on lots 1, 5, and/or 6, basement construction should be restricted on lots 1, 5, and 6 *except* where one of the following conditions apply:

- A year-long groundwater monitoring study is undertaken, and the results indicate that groundwater is sufficiently deep to allow basement construction;
- The proposed construction will result in at least 15 feet of separation between the proposed ground surface and the groundwater elevation. Where groundwater encroaches shallower than 15 feet, the ground surface may be modified (raised) to increase the separation to meet these criteria.

If groundwater is encountered at the time of the site-specific subsurface soil investigations within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should also be considered in additional to the perimeter drain. It must be understood that subsurface drains are designed to intercept some types of subsurface moisture and not others. Therefore, the drain(s) could operate properly and not mitigate all moisture problems relating to foundation performance or moisture intrusion into the basement area.

Proposed Lots 2, 4, and 7:

Based on the currently proposed building locations on lots 2, 4, and 7, it is our opinion that the proposed structures will have adequate separation from groundwater. We do not recommend that a basement feasibility study be required on lots 2, 4, or 7 provided that the future structures are located in the eastern 1/2 of lots 2 and 4 or the eastern 2/3 of lot 7. If basement construction is proposed on the western portions of these three lots in the future, we recommend that those structures be subject to the same feasibility evaluations as recommended above for lots 1, 5, and 6.

Proposed Lot 3:

New construction is not currently proposed on lot 3. If basement construction is proposed on lot 3 in the future, we recommend that those structures be subject to the same feasibility evaluations as recommended above for lots 1, 5, and 6.

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 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 20 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 0.177g for a short period (S_s) and 0.054g 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. Peyton 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.

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: loose soils, surface drainage and shallow groundwater 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 borings, laboratory test results, conclusions and recommendations presented in this report are intended for use for design and construction.

A site-specific Subsurface Soil Investigation and OWTS Evaluation and Design will be required for all proposed single family residences.

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 each lot. In addition, appropriate surface drainage should be established during construction and maintained by the homeowner.
A subsurface perimeter drain is recommended around portions of the structure which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas but not the walkout trench, if applicable. Shallow groundwater conditions were encountered

in the test borings at the time of field exploration. Depending on the conditions observed at the time of the Open Excavation Observation, an underslab drainage layer may also be recommended to help intercept groundwater before it enters the slab area should the groundwater levels rise. In general, if groundwater was encountered within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should be anticipated. 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.

All construction should remain outside the unnamed creek drainageway. It is recommended the unnamed creek drainageway be identified as a "No Build Area" unless additional studies are performed, in conjunction with the drainage engineer, prior to any new construction. This area is shown on the Engineering and Geology Map, Figure 11.

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 **Robert Williams** 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

APPENDIX A
Additional Reference Documents

1. *Preliminary Plan, Peerless Farms*, 16975 Falcon Highway, Peyton, CO, prepared by Kimley Horn, not dated.
2. *Loy Layout*, received via email from Client, February 9, 2020.
3. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0567G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
4. *Geologic Map of the Falcon Quadrangle, El Paso County, Colorado*, by Matthew L. Morgan and Jonathan L. White, Colorado Geological Survey, 2012.
5. *Falcon Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
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APPENDIX B

Wastewater Study – prepared by RMG

It appears the report is missing figures and appendix. Please resubmit in the next submittal.