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SOIL AND GEOLOGY STUDY

Greaves Subdivision, Filing No. 1
Replat of Lot 13, Wildwood Ranch Estates, Filing No. 7
El Paso County, Colorado

PREPARED FOR:

BR & C, Inc
3880 Inspiration Drive
Colorado Springs, CO 80917

JOB NO. 196053

April 9, 2024

Respectfully Submitted,

RMG – Rocky Mountain Group

Kelli Zigler

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Project Geologist

Reviewed by,

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TABLE OF CONTENTS

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the NW¼ of Section 5, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is generally located north and west of the intersection of Meridian Road and Goshawk Road. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing Land Use

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

- Schedule No. 5205209004, currently addressed as 7030 Snow Mass Dr, zoned RR-5, consists of approximately 10.34 acres of vacant land.

The site is currently accessed by a driveway from the south. Access to the new lots may utilize the same driveway.

1.3 Project Description

It is our understanding the parcel is to be subdivided into two lots. According to the proposed Greaves Subdivision, Filing No.1 Final Plat, prepared by Polaris Surveying, Inc., last dated December 27, 2023, Lot 1 is to be the southern lot and consist of 5.348 acres and Lot 2 is to be the northern lot and consist of 5.015 acres. Each new lot is to eventually contain a single-family residence, a well, and an On-site Wastewater Treatment System (OWTS). The Proposed Lot Layout is presented in Figure 2. The previous structure was damaged in a fire in 2013, debris from the previous structure is to be removed and properly disposed of at an off-site location.

1.4 Previous Investigations

A *Soils Report* was performed by others prior to this study and is listed below:

1. *Soils Report, Lot #13, Filing No. 17, Wildwood Ranch Estates Subdivision, 7030 Snow Mass Drive, El Paso County, Colorado,* prepared by A Better Soil Solution, dated February 6, 2024.

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

2.0 QUALIFICATIONS OF PREPARERS

This Soil and Geology Study 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 Tony Munger, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 23 years of experience in

the geological and geotechnical engineering field. Ms. Kelli Zigler holds a B.S. in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Tony Munger, P.E. is a licensed professional engineer with over 23 years of experience in the construction engineering (residential) field. Mr. Munger holds a B.S. in Architectural Engineering from the University of Wyoming

3.0 STUDY OVERVIEW

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

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

3.1 Scope and Objective

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

The objectives of our study are to:

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

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

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

3.2 Site Evaluation Techniques

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

- Geologic and topographic maps
- Review of selected publicly available, pertinent engineering reports
- Exploratory test borings by others
- Available aerial photographs
- 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 Additional Documents

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

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The site is currently vacant land, bound to the south by Snow Mass Drive and all three other sides by developed 10 to 15 acre parcels. The site is located primarily within the W. Kiowa Creek Drainage. W. Kiowa Creek is located south of the property and trends downward from the west to the east.

4.2 Topography and Vegetation

The site surface characteristics were observed to consist of flat to mildly rolling terrain with low lying grasses, weeds, and dense forest.

4.3 Aerial Photographs and Remote-Sensing Imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1952, Colorado Geological Survey (CGS) surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. The site was originally developed prior to 1999. The site remained relatively unchanged until the Black Forest fire burned the residence and detached garage. Remnants of the structures were demolished and the resultant debris was reportedly removed. Since 2019, the site has been vacant.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

The current subsurface conditions within the property were explored by RMG by drilling four (4) exploratory test borings to depths of 15 feet below the existing ground surface by others. The total number of borings generally meets the minimum criteria as stipulated in the ECM, Section C.3.3.

5.1 Drilling (by others)

Four test borings were reportedly performed by A Better Soil Solution on each new lot to explore the subsurface soil conditions and provide recommendations for design and construction of the proposed foundations. The test borings extended to depths of approximately 15 feet below the existing ground surface. The results of their investigation are presented in the referenced report, attached and included in Appendix B. The approximate locations of the A Better Soil Solution test borings are presented on the Engineering and Geology Map, Figure 3.

5.2 Groundwater

Groundwater was not reported in the tests borings observed by others. Indications of redoximorphic conditions were noted on the Solid Stem Auger (STA) Log TH-1 at a depth of 15 feet and on STA Log TH-2 at 9 feet. Both TH-1 and TH-2 were located on proposed Lot 1. The test holes located on the proposed Lot 2 did not indicate redoximorphic conditions. It should be noted that in granular soils and bedrock, some perched water conditions might be encountered due to the variability of the soil profile. Isolated sand and gravel layers within the soil, even those of limited thickness and width, can carry water in the subsurface. Groundwater may also flow atop the underlying bedrock. Builders and planners should be cognizant of the potential for the occurrence of subsurface water conditions during on-site construction, in order to evaluate and mitigate each individual problem as necessary.

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

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

The site is located within the western portion of the Great Plains Physiographic Province. A major structural feature known as the Rampart Range Fault is located approximately 17 miles west of the site. Rampart Range Fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. In general, the geology at the site consists of alluvium overlying the bedrock of the Upper part of the Dawson Formation. The alluvium generally consists of gravelly loamy sands to extremely gravelly loamy sands. The upper part of the Dawson Formation is generally comprised of the arkosic sandstone, claystone, mudstone, conglomerate, and localized coal beds.

6.1 Subsurface Soil Conditions

The subsurface materials encountered in the test holes, by others, reportedly classified as silty sand (SM) and clayey sand (SC) that extended to the 15-foot termination depth of all four test holes.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Solid Stem Auger (STA) logs within the *Soils Report*, in Appendix B.

6.2 Bedrock Conditions

Bedrock was not reported in the test borings performed for the *Soils Report* by others. Bedrock is not expected to be encountered in the foundation excavations or utility trenches. In general, the bedrock (as

mapped by Colorado Geologic Survey - CGS) is considered part of the Dawson formation and consists of silty sandstone with interbedded layers of claystone. Bedrock is not expected to be encountered in the foundation excavation or the utility trenches. The Dawson formation is thick-bedded to massive, generally light colored arkose, pebbly, and pebble conglomerate. The sandstone is generally poorly sorted with various amounts of clay content. The sandstone is generally permeable, well drained, and has good foundation characteristics. The claystone is generally well sorted with high sand content. The claystone is less permeable than the sandstone and is generally not suitable for direct bearing of shallow foundations. If bedrock were encountered, the Dawson can readily be excavated with standard construction equipment such as a front-end loader, skid loader, and/or (mini) excavator.

6.3 U.S. Soil Conservation Service

The United States Department of Agriculture (USDS) and the Natural Resources Conservation Services (NRCS) soil survey identified the following soil types on the property. The soil conditions as indicated by the USDS data are anticipated to consist of:

- 41 – Kettle gravelly loamy sand, 8 to 40 percent slopes. The Kettle gravelly loamy sand was mapped by the USDA to encompass all of Lot 1, the southern portion 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.
- 68 – Peyton-Pring complex, 3 to 8 percent slopes. The Peyton-Pring complex was mapped by the USDA to encompass all of Lot 2, the northern portion of the property. Properties of the Peyton-Pring complex include, well-drained soils, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be low, frequency of flooding and ponding is none, and landforms include hills.

The USDA Soil Survey Map is presented in Figure 4.

6.4 General Geologic Conditions

Based on review of relevant geologic maps, we identified the geologic conditions (listed below) affecting the development, as shown on the Engineering and Geology Map, Figure 3.

The site generally consists of alluvium deposits of the Holocene and Pleistocene overlying the Dawson Formation at depth. The following general geologic units were mapped/observed at the site:

- *TKda5 – Dawson formation, facies unit five* – white to light tan, thin to medium bedded, fine to medium-grained feldspathic sandstone or pebbly conglomerate. The Dawson is known to contain occasional interbedded sandy claystone. Estimated thickness is around 500 feet. The Dawson sandstone was encountered in the test boring near the surface and extended to the 20-foot termination depth of the boring. The sandstone bedrock is anticipated to be encountered at various depths across the site.
- *Af – Artificial Fill* – fill that may remain from the demolition of the previous residence and detached garage and/or areas of recent ground modifications (test pits).

6.5 Engineering Geology

One engineering geology unit was mapped at the site and is shown on the Engineering and Geology Map, Figure 3.

- *2D* – Eolian deposits generally on flat to gentle slopes of upland areas.

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

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

6.8 Features of Special Significance

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

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

6.9 Groundwater and Drainage of Surface Water

The overall topography of the site slopes down from the north to the southeast. It is anticipated the direction of surface water and groundwater is to flow in the same direction. Groundwater was not encountered in the test holes performed by others. As discussed in Section 5.2, indications of redoximorphic conditions were noted on the Solid Stem Auger (STA) Log TH-1 at a depth of 15 feet and on STA Log TH-2 at 9 feet. Both TH-1 and TH-2 were located on proposed Lot 1. The test holes located on the proposed Lot 2 did not indicate redoximorphic conditions.

6.10 Flooding and Surface Drainage

Based on our review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0315G and the online ArcGIS El Paso County Risk Map, the entire site lies outside of a 100-year floodplain.

Zone X is defined by FEMA as an area of minimal flood hazard that is determined to be outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The entire site lies within Zone X.

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 2* indicates the site is identified as Upland Deposits. The overburden upland deposits consist of sand and gravel with silt and clay deposited by older stream deposits on topographic highs or beach like features. Extraction of the sand and gravel more than likely would not be 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 southern part of the Denver Basin Coal Region. However, the area of the site has been mapped "Somewhat 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. No oil and gas wells are drilled on this tract, or within two miles of it. There are no historic coal mines in the vicinity. In this part of the Denver coal region, coal resources are locally present within the lower part of the Laramie Formation of Upper Cretaceous age.

The alluvium on this tract may contain sand or gravel. Due to the high clay content in the sandstone of the upper Dawson Formation and the interbedded claystone, the sand and gravel are often unusable.

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

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

Hazards

- Avalanches
- Debris Flow-Fans/Mudslides
- Ground Subsidence and Abandoned Mining Activity
- Landslides
- Rockfall

Constraints

- Ground Subsidence and Abandoned Mining Activity
- Ponding Water
- Steeply Dipping Bedrock
- Downhill/Down-slope Creep
- Unstable or Potentially Unstable Slopes

- Scour, Erosion, accelerated erosion along creek banks and drainage ways
- Corrosive Minerals

The following sections present the geologic conditions that have been identified on (or anticipated to be on) the property:

8.1 Compressible Soils - *constraint*

Based on the test borings performed by others for the site specific *Soils Report*, the upper silty sands are likely to underlie the entire site at various depths. It is anticipated that the on-site sandy soils will be encountered within each building excavation. The silty and clayey sand were encountered at medium dense to dense densities which is generally acceptable for foundations without extensive mitigation. But in some cases, the sands may be encountered in loose conditions within the excavations which would require mitigation.

Mitigation

If loose soils are encountered beneath the proposed foundations, mitigation will be required. Mitigations are anticipated to consist of additional compaction to achieve suitable allowable bearing pressures. Fluctuations in material density may occur. In some cases, removal and recompaction of up to 2 to 3 feet of soil may be required. The removal and recompaction shall extend a minimum of the same distance 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.

As noted in the *Soils Report*, *"Foundation components should bear on soils of similar bearing capacity. Foundation components bearing on dissimilar soils should be avoided. The owners shall be aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall."*

The potential for settlement is directly related to the moisture content of the soils below the foundation areas. Therefore, good surface and subsurface drainage is critical in order to reduce the risk of settlement of the soils. Provided appropriate mitigations and/or foundation design adjustments are implemented as recommended in the lot-specific soil reports, the presence of compressible soil is not considered to pose a risk to the proposed structures.

8.2 Potentially Expansive Soils and Bedrock – *constraint*

Based on the test holes performed for the site specific *Soils Report* by others, which was utilized for this investigation (and our knowledge of the surrounding area), sandy clay and claystone bedrock are not anticipated but if encountered generally possess low to high swell potential. If expansive soils or bedrock are encountered, they can be readily mitigated with typical construction practices common to this region of El Paso County, Colorado. Bedrock is not expected to be encountered in the excavations.

Mitigation

Sporadic areas of expansive soils may be encountered within the excavations. If expansive soils are encountered beneath the foundations, mitigation will be required. "Mass" subexcavation during land development is currently not proposed, nor are we proposing it at this time. Overexcavation and replacement with non-expansive soils at a minimum of 95 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) is generally considered a suitable mitigation. Floor slabs bearing directly on expansive material should be expected to experience movement. Overexcavation and replacement has

also been successful in minimizing slab movement. Overexcavation is not anticipated for the two lots. However, if clay seams are encountered, overexcavation may be required. Moisture conditioning and recompacting the on-site clays may also be considered for mitigation of expansive materials. Final recommendations for mitigation of expansive soils or bedrock (if encountered) are to be provided at the time of construction.

Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of expansive soils (or bedrock) is not considered to pose a risk to the proposed structures.

8.3 Seasonally Fluctuating Surface Water and Groundwater – *constraint*

Based on the site observations, review of USGS topographic maps dating back to 1947, and review of Google Earth images dating back to 1999, springs do not appear to originate on the subject site. Groundwater was not encountered in the four 15-foot test borings performed by others. As noted in Section 5.2, indications of redoximorphic conditions were noted on the Solid Stem Auger (STA) Log TH-1 at a depth of 15 feet and on STA Log TH-2 at 9 feet. Both TH-1 and TH-2 were located on proposed Lot 1. The test holes located on the proposed Lot 2 did not indicate redoximorphic conditions. Redoximorphic conditions generally indicate a fluctuating groundwater table. Isolated areas of seasonal shallow groundwater may exist. Fluctuating surface water within the drainageway should be anticipated during heavy rain storms and precipitation events.

Drilling reportedly occurred in February of 2023, when seasonal groundwater levels are generally anticipated to be lower. Fluctuations in groundwater and subsurface moisture conditions will likely occur due to variations in rainfall and other factors not readily apparent at this time. Groundwater information obtained at the time of the preliminary investigations performed prior to any future land development 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, wells, OWTS, 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.

<u>Mitigation</u>
Foundations must have a minimum 30-inch depth for frost protection. Perimeter drains are recommended around portions of the structures which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas but not the walkout trench, if applicable. Perimeter drains are recommended for portions of the structures which will have below-grade spaces to help reduce the intrusion of water into areas below grade. A typical perimeter (exterior) drain detail is presented in the *Soils Report*, presented in Appendix B.

During the planning phase, careful consideration should be given to the location of the proposed structures on the lot and the foundation type/depth, to ensure adequate separation from the anticipated groundwater depths (as indicated by the redoximorphic conditions identified in the boring logs).

If water (surface, perched groundwater, or true groundwater) is encountered at the time of the open excavation observation, by others, within 4 to 6 feet of the proposed basement slab elevation, an underslab drain should be considered in conjunction with 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 areas.

8.4 Undocumented Fill or History of Landfill - *constraint-*

Fill soils were not encountered in the test holes by others. Overall, fill is not anticipated to be encountered on the majority of the site. However, a previous residence was demolished and reportedly removed from the site. If the new home on Lot 1 is located in the general vicinity of the previous residence and/or septic field, unsuitable fill soils should be anticipated. Additionally, it is uncertain whether the previous septic tank and components were removed from the site and/or properly collapsed and abandoned.

Mitigation

It is anticipated the majority of the unsuitable fill soils, if encountered would be penetrated by the proposed excavation. However, if unsuitable fill soils remain below the proposed foundation components, they will require removal (overexcavation) and replacement with newly placed and compacted structural fill. The zone of overexcavation shall extend to the bottom of the unsuitable fill zone and shall extend at least that same distance beyond the building perimeter (or lateral extent of the fill, if encountered first).

It is our understanding new Onsite Wastewater Treatment Systems are to be utilized for the proposed new construction. It is unknown if the existing system has been removed (e.g. tank, components and/or soil) or if it still remains. The new treatment areas are not to be located within the existing septic field area unless the existing system has been properly removed and disposed of.

8.5 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 period. The nearest recorded earthquakes over 1.6 occurred in December of 1995 in Manitou Springs, which experienced magnitudes ranging between 2.8 to 3.5. Additional earthquakes over 1.6 occurred between 1926 and 2001 in Woodland Park, which experienced magnitudes ranging from 2.7 to 3.3. Both of these locations are located near the Ute Pass Fault, which is greater than 10 miles from the subject site. Earthquakes felt at this site will most likely result from minor shifting of the granite mass within the Pikes Peak Batholith, which includes pull from minor movements along faults found in the Denver basin. It is our opinion that ground motions resulting from minor earthquakes may affect structures (and the surrounding area) at this site if minor shifting were to occur.

Mitigation

The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.218g for a short period (S_s) and 0.059g 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 B, with average shear wave velocities ranging from 2,500 to 5,000 feet per second for the materials in the upper 100 feet.

8.6 Radon – *constraint*

Radon is a gas that can move feely 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".*

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

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

Mitigation

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

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

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in section 8 of this report) found to be present at this site include faults and seismicity. Geologic conditions (as described in section 8 of this report) found to be present at this site include potentially compressible and expansive soils, artificial fill, seasonally fluctuating groundwater, and radon. It is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering, design, and construction practices.

10.0 CONCLUSIONS

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

In addition to the previously identified mitigation alternatives, surface and subsurface drainage systems should be considered for any future structures. 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.

We believe the sand with varying amounts of silt and clay will classify as Type B material as defined by OSHA. OSHA requires that temporary excavations made in Type B materials be laid back at ratios no steeper than 1:1 (horizontal to vertical), unless the excavation is shored and braced. Excavations deeper

than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer.

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

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

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

11.0 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 **BR&C, Inc.** 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.

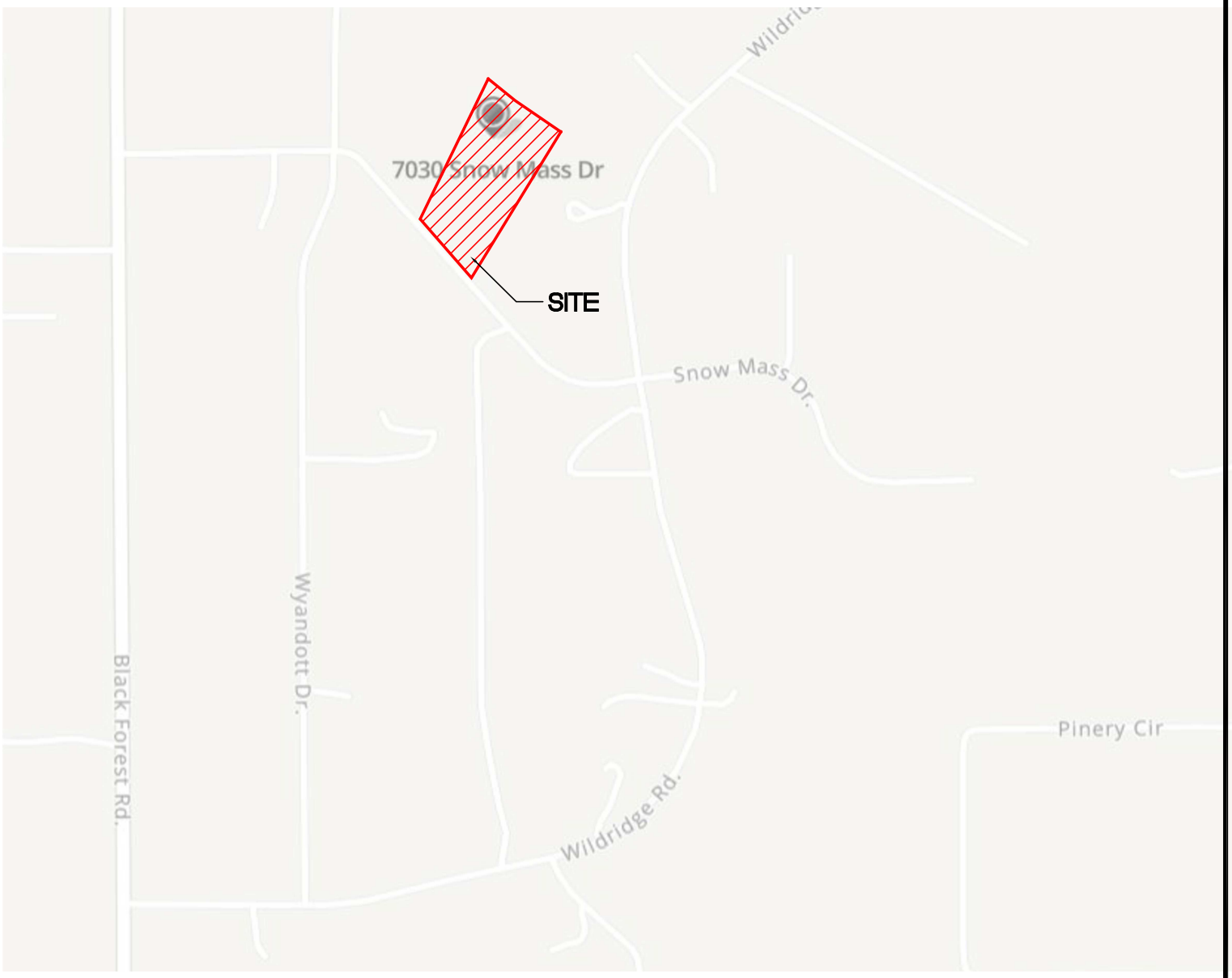
FIGURES

APPENDIX A
Additional Reference Documents

1. *Greaves Subdivision, Filing No. 1 Final Plat, El Paso County, Colorado*, prepared by Polaris Surveying, Inc., last dated December 27, 2023.
2. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 08041C0315G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
3. *Generalized Surficial Geologic Map of the Pueblo 1 degree X 2 degree Quadrangle, Colorado. U.S. Geological Survey, Map MF-2388, 2002.*
4. *Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
5. *Pikes Peak Regional Building Department:* https://www.pprbd.org/.
6. El Paso County Assessor Website
   https://property.spatialest.com/co/elpaso/#/property/5205209004
   Schedule No. 5205209004
7. *Colorado Geological Survey, USGS Geologic Map Viewer*:
   http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/.
8. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1947, 1952, 1955, 1960, 1969, 1983, 1984, 1999, 2005, 2009, 2011, 2013, 2015, 2017, 2019, and 2021.
9. *USGS Historical Topographic Map Explorer:* http://historicalmaps.arcgis.com/usgs/ El Paso County, Ellicott Quadrangle, 2019.
10. *Google Earth Pro*, Imagery dated 1985, 1999, 2004, 2005, 2006, 2011, 2013, 2015, 2017, 2019 2020, 2022, and 2023.
11. Kirkham, R.M., and Ladwig, L.R., 1979, Coal resources of the Denver and Cheyenne basins, Colorado: Colorado Geological Survey Resource Series 5, 70 p., 5 plates
12. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands*
13. The *El Paso Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction*, *Map 1*
14. Generalized surficial geologic map of the Pueblo 1 degree X 2 degree quadrangle, Colorado. Moore, D.W., Straub, A.W., Berry, M.E., Baker, M.L., and Brandt, T.R

APPENDIX B

Soil Report, prepared by A Better Soil Solution



NOT TO SCALE

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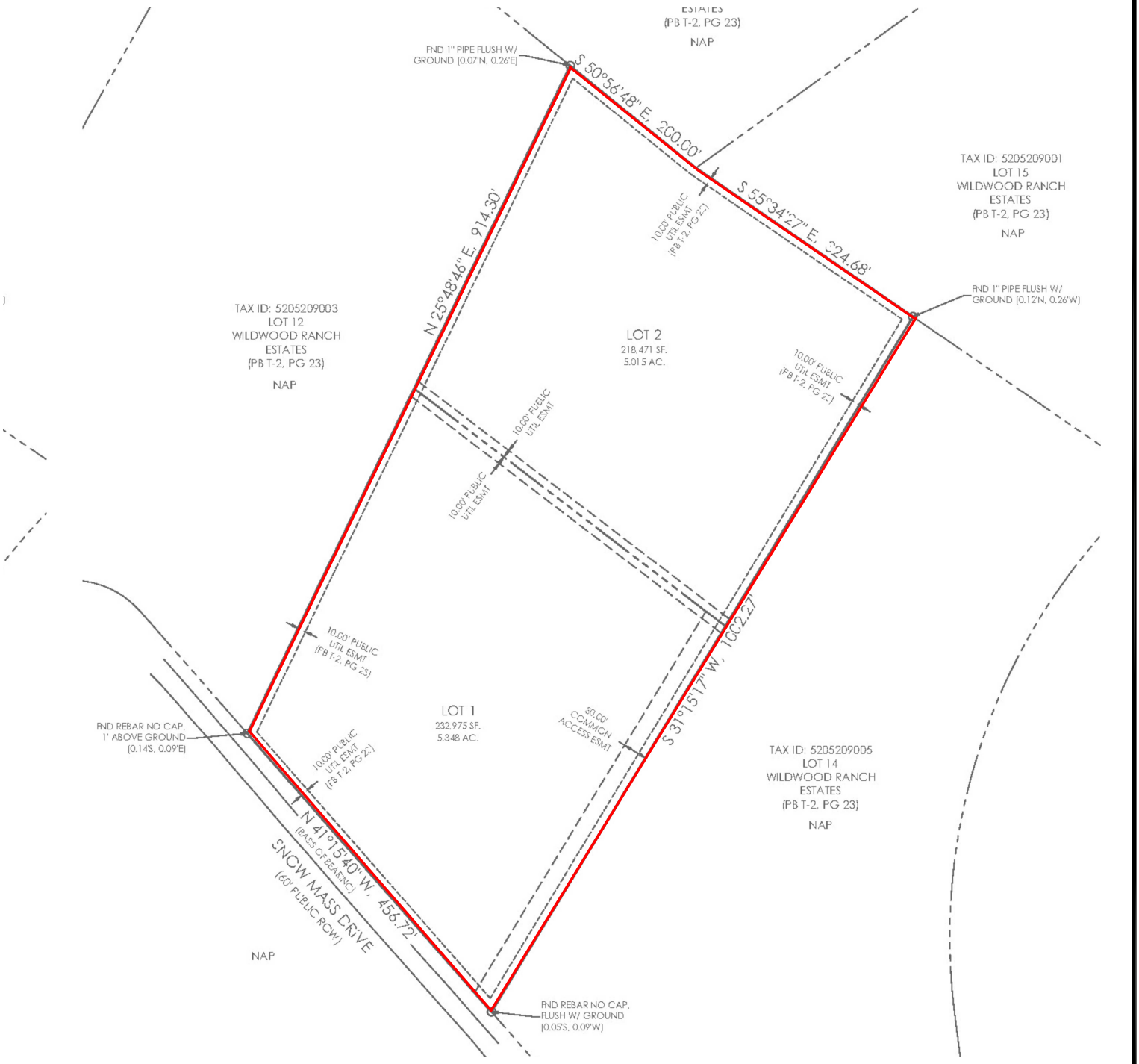
SITE VICINITY MAP

GREAVES SUBDIVISION, FILING NO. 1
REPLAT OF LOT 13, WILDWOOD RANCH ESTATES, FILING NO. 7
EL PASO COUNTY, CO
ALAN GREAVES

JOB No. 196053

FIG No. 1

DATE 4-8-2024



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TEST BORING LOCATION PLAN

GREAVES SUBDIVISION, FILING NO. 1
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FIG No. 2

DATE 4-8-2024

Geologic

- *TKda5- Dawson formation, facies unit five* - The Dawson is known to contain occasional interbedded sandy claystone. Estimated thickness is around 500 feet. The Dawson sandstone was not encountered in the test holes performed by others.
- *Af - Artificial Fill* - fill that may remain from the demolition of the previous residence and detached garage and/or areas of recent ground modifications (test pits).

Engineering

- *2D* - Eolian deposits generally on flat to gentle slopes of upland areas.

DENOTES APPROXIMATE LOCATION OF TEST HOLES PERFORMED BY OTHERS

NOT TO SCALE

BASE MAP PROVIDED BY: GOOGLE AND POLARIS SURVEYING

JOB No. 196053

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Monument Office:
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GREAVES SUBDIVISION, FILING NO. 1
REPLAT OF LOT 13, WILDWOOD RANCH ESTATES, FILING NO. 7
EL PASO COUNTY, CO
ALAN GREAVES

ENGINEER: TPM
DRAWN BY: KZ
CHECKED BY: TPM
ISSUED: 4-8-2024

ENGINEERING AND GEOLOGY MAP

SHEET No.
FIG-3

41 - Kettle gravelly loamy sand, 8 to 40% slopes

68 - Peyton-Pring complex, 3 to 8% slopes

NOT TO SCALE

BASE MAP PROVIDED BY: USDA

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USDA SOIL SURVEY MAP

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FIG No. 4

DATE 4-8-2024