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Materials Testing
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SOILS AND GEOLOGY STUDY

Please provide an OWTS report

10805 Milan Road
EPC Schedule No. 622400
El Paso County, Colora

PREPARED FOR:

Paul and Amy Kinch
10805 Milam Rd.
Colorado Springs, CO 80908

JOB NO. 180317

February 4, 2021

Respectfully Submitted,
RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,
RMG – Rocky Mountain Group

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PROFESSIONAL ENGINEER

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

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Soils Report, Lot #2, 10805 Milam Road, El Paso County, Colorado, prepared by Geoquest, LLC, Job #20-0216, dated December 1, 2020 (Report refers to now Lot 4)

Soils Report, Future Lot #3, 10805 Milam Road, El Paso County, Colorado, prepared by Geoquest, LLC, Job #20-1218, dated November 18, 2020 (Report refers to now Lot 3)

APPENDIX D

Wastewater Study, 10805 Milam Road, EPC Schedule No. 6221000011, El Paso County, Colorado, prepared by RMG – Rocky Mountain Group, Job No. 180317, dated February 3, 2021.

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in these SW¼ of the SW¼ of Section 12S, Township 12 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. 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 of partially developed land. The parcel included is:

- Schedule No. 62204000011, and consists of 29.12-acres.

Current zoning is "RR-5" – *Residential Rural.*

1.3 Project Description

RMG understands the 29.12-acre parcel is to be subdivided into four Lots. Lot 1 will be approximately 6.1-acres, Lot 2 and Lot 3 will be approximately 5.0-acres, and Lot 4 will be approximately 12.6-acres. An existing single-family residence with septic and well will remain on Lot 1. Lots 2, 3, and 4 will allow for one single-family residence with well and On-site Wastewater Treatment System (OWTS). It is anticipated zoning will remain RR-5 for each new Lot.

Access to Lot 1 will remain from Milam Road. Access to Lots 2, 3, and 4 will be from the creation of a new cul-de-sac that is to extend south from Sierra Ridge Trail. The Proposed Lot Layout, Figure 2, presents the general boundaries of our investigation. The subject site includes all four proposed Lots.

2.0 QUALIFICATIONS OF PREPARERS

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

The 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 36 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 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.

Revisions to the conclusions presented in this report may be issued based upon submission of a Development Plan. This study has been prepared in general 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.

This report presents the findings of the study performed by RMG relating to the geotechnical and geologic conditions of the above-referenced site. Revisions and modifications to the conclusions and recommendations presented in this report may be issued subsequently by RMG based upon additional observations made during grading and construction that may indicate conditions that require re-evaluation of some of the criteria presented in this report.

3.1 Scope and Objective

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

The objectives of our study are to:

- Identify geologic conditions present on this site
- Analyze the potential negative impacts of these conditions on proposed site development
- Analyze the potential negative impacts to surrounding properties and/or public services resulting from 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 such as 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
- Test Pits performed by RMG
- Review of previous investigations by Geoquest, LLC
- 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 available for our review and are listed below:

1. *Soils Report, Lot #1, 10805 Milam Road, El Paso County, Colorado*, prepared by Geoquest, LLC, Job #17-0144, dated November 24, 2020 (Refers to now Lot 2)
2. *Soils Report, Lot #2, 10805 Milam Road, El Paso County, Colorado*, prepared by Geoquest, LLC, Job #20-0216, dated December 1, 2020 (Refers to now Lot 4)
3. *Soils Report, Future Lot #3, 10805 Milam Road, El Paso County, Colorado*, prepared by Geoquest, LLC, Job #20-1218, dated November 18, 2020 (Refers to now Lot 3)

For clarification, the Lot numbers referenced in the Geoquest Reports have changed per the Proposed Lot Layout as follows:

- Lot 1 is for Lot 2
- Lot 2 is for Lot 4
- Lot 3 remains for Lot 3

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

3.4 Additional Documents

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

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The entire 29-acre site is characterized by native grasses, weeds, dense copses of scrub oak, and stands of pine trees. A single-family residence and well currently exist in the location of proposed Lot 1 in the northwest portion of the site.

4.2 Topography

Based on observations made on December 24, 2020, the site topography is generally gently rolling terrain with some slopes ranging from 5 to 40 percent across the property. The site generally slopes downward from southeast to northwest, with an elevation difference of more than 90-feet across the site.

4.3 Vegetation

The majority of the site consists of low lying native grasses, weeds, pines, and dense deciduous trees.

4.4 Aerial photographs and remote-sensing imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1999, CGS surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. The original home is recorded as constructed in 1939 and has since had additions. Prior to 1955, the surrounding area was developed with few single-family homes. Prior to December 2019, Bradley Ranch located south of Old Ranch Road began the development of single-family residences. The subject site has remained generally undisturbed to the present.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

5.1 Test Borings

The subsurface conditions below proposed Lots 2, 3 and 4 were investigated by Geoquest, LLC on November 4, 2020, and included in the referenced site specific *Soil Reports*. RMG performed one test pit on each proposed Lots 2, 3 and 4 on December 24, 2020 for the Wastewater Study included in Appendix D.

The locations of Geoquest, LLC's test borings and RMG's test pits are presented on the Engineering and Geology Map, Figure 6.

5.2 Laboratory Testing

Geoquest LLC's investigations included soil laboratory testing including moisture contents, gradation tests, and swell-consolidation test results. Laboratory testing results are presented in Geoquest, LLC Soils Reports, included in Appendix C.

5.3 Profile Pit Excavations

Personnel of RMG performed a soil evaluation on December 9, 2020 that included one 5-foot deep test pit on each of Lots 2, 3, and 4, utilizing the visual and tactile method for evaluation of the site soils. The test pits were excavated in areas on each Lot that appeared most likely to be used for residential construction. Test pits were terminated at 5-feet depth due to a limiting layer of sandstone bedrock. Evidence of seasonally high groundwater was not observed in the test pits. The soils were evaluated to determine the soil types and structure. The approximate locations of the test pits are presented in the Engineering and Geology Map, Figure 6.

5.4 Groundwater

Groundwater, redoximorphic features indicating the fluctuation of groundwater or higher groundwater levels, or elevated water content were not encountered in the six 15-foot test borings performed by Geoquest, LLC, or in the three 5-foot deep test pits observed by RMG. 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.

Based on our knowledge of the area and engineering design and construction techniques employed in the El Paso County area at this time, it is our opinion that there is insufficient reason to preclude full-depth basements on any of the lots in this subdivision at this time. If shallow groundwater conditions are found to exist at the time of the site specific Subsurface Soil Investigations, the feasibility of basement construction and/or any recommended mitigation measures are to be addressed at that time.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

6.1 Geologic Conditions

The site 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 bedrock onsite.

6.2 Subsurface Soil Conditions

Geoquest, LLC classified the subsurface soils encountered in the test borings as silty sand (SM) and clayey sand (SC). Sandstone bedrock classified as clayey sand (SC).

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented in the Geoquest LLC Soils Report, presented in Appendix C. The materials encountered in the test pits observed by RMG are presented in the Test Pit Logs, Figures 4 and 5. The log descriptions are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

6.3 Bedrock Conditions

Bedrock as defined by USDA Soil Structure and Grade was encountered in the test pit excavations used for this investigation. As defined by Colorado Geologic Survey, bedrock beneath the site is considered part of the Dawson Formation – facies unit three, that 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 elevated clay contents. The sandstone is generally permeable, well drained, and has good foundation characteristics.

Based on review of the referenced Geoquest Test Borings, sandstone bedrock was encountered at depths ranging between 2 to 3-feet below the existing ground surface. Bedrock was encountered in RMG's Test Pits at a depth of 5-feet. Bedrock is anticipated in foundation excavations, and within OWTS treatment areas. A sandstone knoll is visible near the southern boundary of Lot 4. Placement of a single-family residence is not anticipated in this area. The sandstone bedrock is generally easily excavated with standard construction equipment.

6.4 U.S. Soil Conservation Service

The U.S. Soil Conservation Service (USCS) and the United States Department of Agriculture (USDA) have identified the soils on the entire property as:

- 41 – Kettle gravelly sandy loam, 8 to 40 percent slopes. The Kettle gravelly sandy loam was mapped by the USDA to encompass the entire property. Properties of the gravelly sandy loam 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 Survey Map is presented in Figure 7.

6.5 General Geologic Conditions

Based on RMG's field observations and the Geologic Map of the NW Falcon Quadrangle, an interpreted geologic map of significant surficial deposits and features was mapped for the site. The

identified geologic conditions affecting the development are presented in the Engineering and Geology Map, Figure 6.

The site generally consists of sand with various amounts of silt and clay. One geologic unit was mapped at the site as:

- *TKda – Dawson Formation* – The Dawson Formation underlies the entire site. *Tkda* typically is light gray to tan and typically consists of arkose, arkosic conglomerate, sandstone and interbedded gray claystone seams. The residual soils overlying this formation were derived from the in-situ weathering of the bedrock materials on-site and typically weather to brown or reddish brown.
- *Hb* – hard bedrock, sandstone outcropping at the surface.

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, in the surrounding area, or in the soil samples collected by RMG.

6.7 Surficial (Unconsolidated) Deposits

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

6.8 Engineering Geology

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

- 1A – Stable alluvium, colluvium and bedrock on flat to gentle slopes (0 to 5%).
- 2A – Stable alluvium, colluvium and bedrock on gentle to moderate slops (5% to 12%).

Slopes greater than 12 percent are prominent around the sandstone knoll near the southern boundary of Lot 4. The remaining slopes on the site are generally less than 12 percent.

6.9 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.

6.10 Flooding and Surface Drainage

Based on review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0526G, the online ArcGIS Pikes Peak Regional Floodplain Map, the entire site lies outside of mapped 100-year and 500-year floodplains. The FEMA Map is presented in Figure 9.

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 not platted and/or undeveloped and therefore mineral extraction is not identified.

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 (ECM) 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 constraints were considered in the preparation of this report, and are not anticipated to pose a significant risk to the proposed development:

- Avalanches
- Debris Flows-Fans/Mudslides
- Floodplains
- Ground Subsidence
- Landslides
- Rockfall
- Ponding water
- Steeply Dipping Bedrock
- Unstable or Potentially Unstable Slopes
- Scour, Erosion, accelerated erosion along creek banks and drainageways
- Springs and High Groundwater
- Corrosive Minerals

The following sections present geologic constraints that have been identified on the property:

8.1 Expansive Soils

Based on the Soils Reports completed by Geoquest, LLC, the sand and sandstone exhibited nil expansive potential. However, clayey sand was encountered at depth in each test boring. The clayey soils and bedrock can be readily mitigated with typical construction practices common to this region of El Paso County, Colorado. Mitigation measures for each Lot were presented in the individual Soils Report by Geoquest, the conclusions of each report were "snipped" and are presented below.

<u>Mitigation</u>
Lot 2:

Due to encountering clayey sand (SC) at the depth of 10 feet, the excavation and the placement of the foundation components must not penetrate more than 6 feet. If the excavation is planned to penetrate deeper, excavate 4 feet below the bottom of the foundation grade in at least two locations to confirm 4 foot separation from the unsuitable material. If this unsuitable material is encountered, it must be removed and replaced, compaction testing will be required, and a bearing of 1,500 pounds per square foot will be used. The over-excavated area shall extend to a minimum depth of 4 feet below the bottom of the foundation elevation and 4 feet laterally from the location of the foundation. Additional drainage may be required during construction due to the high moisture content. If the bottom of the excavation becomes unstable, the use of 1' to 2' of 4" to 8" ballast rock may be required.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **5,000 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **The laboratory testing revealed that the on-site soil is silty sand with underlying clayey sand (U.S.C.S. Classification Symbol SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM) and 85 (SC) pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

Lot 3:

Additional drainage may be required during construction due to the high moisture content. If the bottom of the excavation becomes unstable, the use of 1' to 2' of 4" to 8" ballast rock may be required.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **5,000 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **The laboratory testing revealed that the on-site soil is silty sand with underlying clayey sand (U.S.C.S. Classification Symbol SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM) and 85 (SC) pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

Lot 4:

Due to encountering zones of clay, an Over-Excavation Scheme may be required pending the results of the Open Hole Observation. If the Over-Excavation Scheme is necessary, compaction testing will be required and a bearing of 1,500 pounds per square foot will be used. The over-excavated area shall extend to a minimum depth of 4 feet below the bottom of the foundation elevation and 4 feet laterally from the location of the foundation.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **4,000 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **The laboratory testing revealed that the on-site soil is silty sand with underlying clayey sand (U.S.C.S. Classification Symbol SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM) and 85 (SC) pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

8.2 Steep Slopes and Hard Bedrock

Slopes greater than 25 percent do exist on the property and are present along the sandstone knoll, located near the northeast corner of Lot 4. The sandstone knoll exists due to its resistance to weathering and is generally considered stable. The sandstone is known to have good foundation characteristics and additional mitigation is not anticipated near the steep slopes of the sandstone knoll.

The sandstone with low to moderate clay content was encountered in all the test borings and test pits, based on the blow counts encountered at the time of Geoquest LLC's drilling and RMG's observation of Test Pit excavations, it is anticipated the bedrock can be dug with standard excavating equipment. The sandstone knoll with its steep slopes is depicted on the Engineering and Geology Map, Figure 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 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 0.185g 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.

8.4 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.*

Southern El Paso County and the 80106 zip code which the site is located in, 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 and crawlspaces, creating slightly positive pressures within structures, and sealing of joints and cracks in the foundations, slabs, and below-grade walls can help mitigate radon hazards.

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

Geologic hazards (as described in Section 8.0 of this report) were not found to be present at this site. Geologic constraints (also as described in section 8.0 of this report) such as potentially expansive soils, faults and seismicity, and radon were found on the site. Where avoidance is not

feasible, it is our opinion that the existing geologic and engineering conditions can be satisfactorily mitigated through proper engineering, design, and contraction practices.

10.0 ADDITIONAL STUDIES

The findings, conclusions and recommendations presented in this report were provided to evaluate the suitability of the site development. Unless indicated otherwise, the test borings, laboratory test results, conclusions and recommendations presented in this report are only intended for the use of the minor subdivision. The Soils Reports by Geoquest, LLC may be used for design and construction of the proposed single family residences if located within the general vicinity of the test borings, however Geoquest, LLC as Geotechnical Engineer of Record would need to make this determination once the location of the future homes is decided upon.

Future lot-specific subsurface soil investigations should consider the proposed structure type, anticipated foundation loading conditions, location within the property, and local construction methods. Recommendations resulting from the investigations should be used for design and confirmed by on-site observation and testing during development and construction.

11.0 CONCLUSIONS

Based upon our evaluation of the geologic conditions, it is our opinion that the proposed development is feasible. The geologic conditions identified (potentially expansive soils, faults and seismicity, and radon) 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.

We believe the surficial sand soils will classify as Type C materials 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) unless the excavation is shored or braced. Flatter slopes will likely be necessary should groundwater conditions occur.

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.

12.0 CLOSING

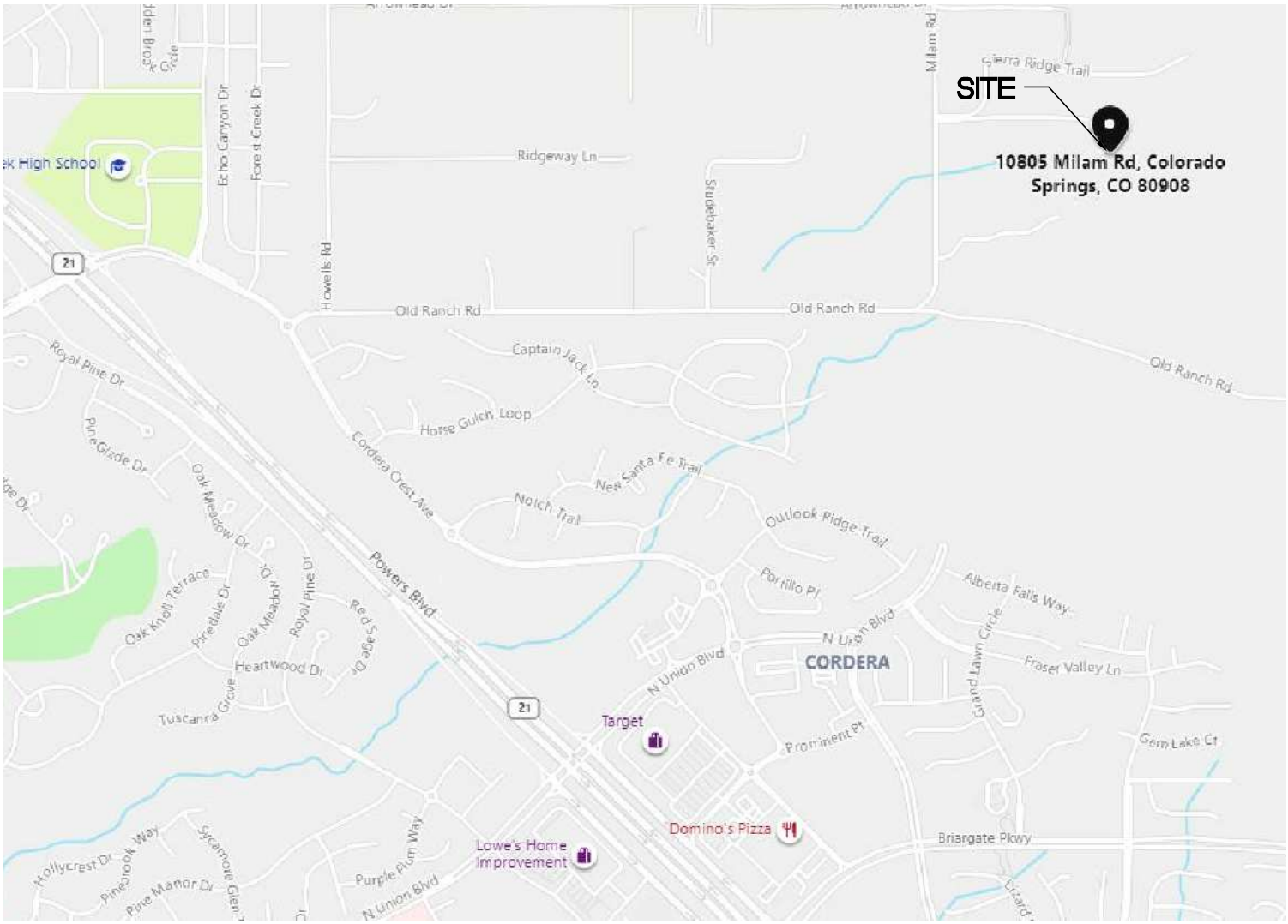
This report is for the exclusive purpose of providing geologic hazards information and preliminary geotechnical engineering recommendations. The scope of services did not include, either specifically or by implication, evaluation of wild fire hazards, environmental assessment of the site, or identification 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 **Paul and Amy Kinch** 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



NOT TO SCALE

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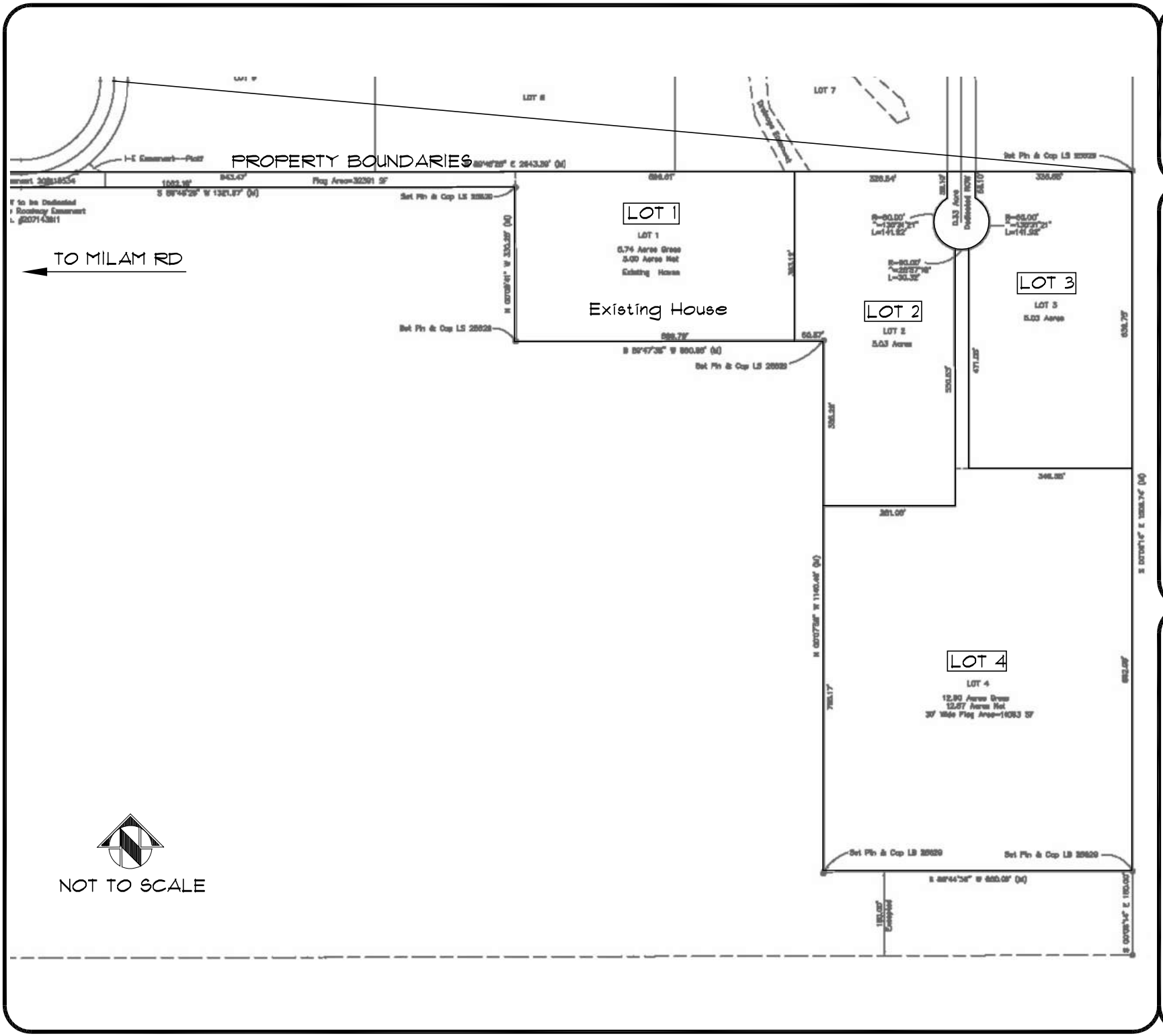
SITE VICINITY MAP

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

JOB No. 180317

FIG No. 1

DATE 2-5-2021



JOB No. 180317

FIG No. 2

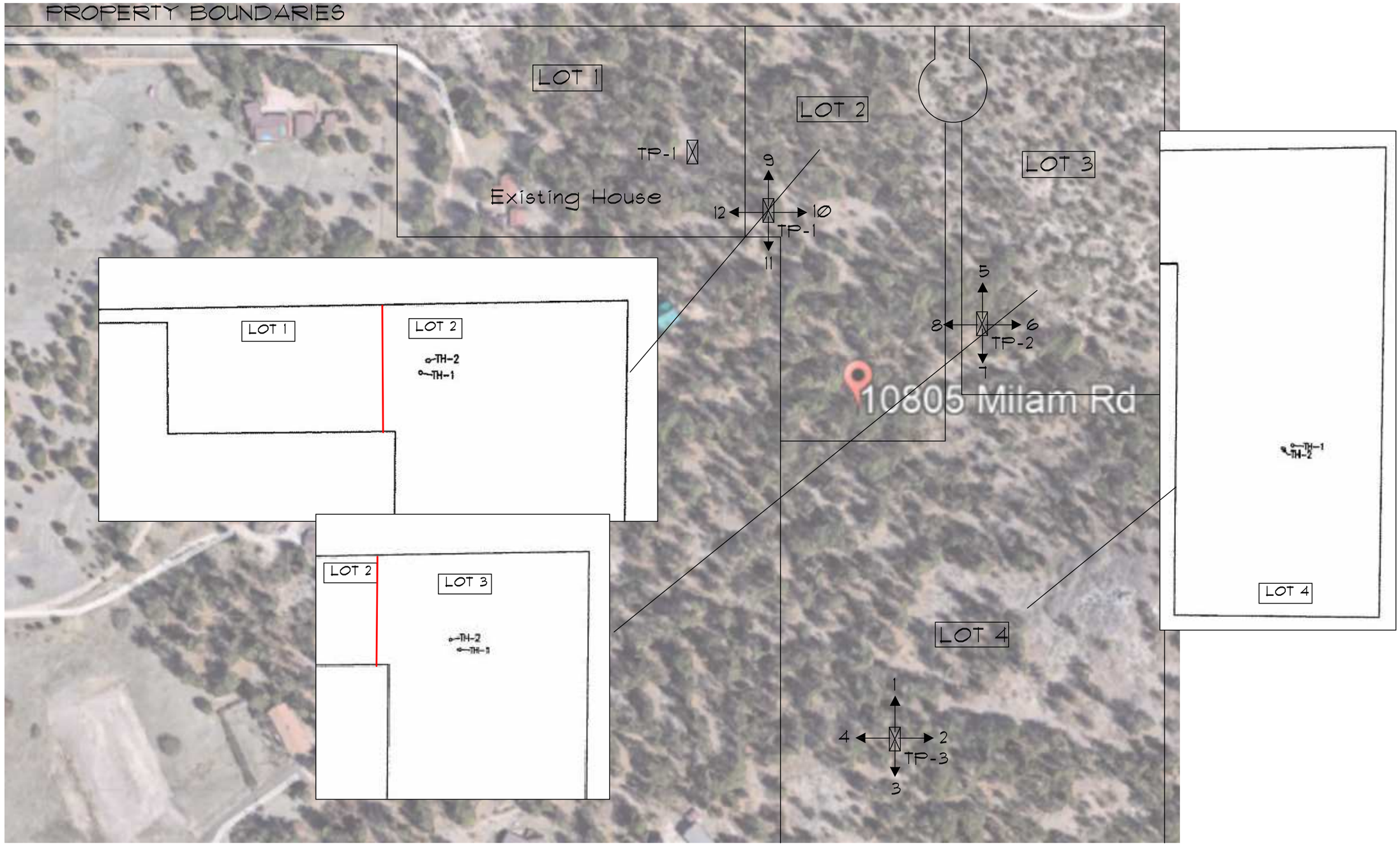
DATE 2-5-2021

PROPOSED LOT LAYOUT

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

Southern Office
Colorado Springs,CO
80918
(719) 548-0600
Central Office:
Englewood, CO 80112
(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071



REFERENCE
NOT TO SCALE

DENOTE APPROXIMATE LOCATION OF TEST PITS PERFORMED BY RMG

TH-2
TH-1
DENOTES APPROXIMATE LOCATION OF TEST BORINGS PERFORMED BY GEOQUEST, LLC

1
DENOTES PICTURE NUMBER AND DIRECTION

JOB No. 180317

ARCHITECTS
RMG
ENGINEERS
ROCKY MOUNTAIN GROUP

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(970) 330-1071
Woodland Park Office:
(719) 687-6077
Monument Office:
(719) 488-2145
Pueblo / Canon City:
(719) 544-7750

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	2-5-2021
REVISION:	DATE:
	JOB #:

TEST PIT AND BORING LOCATIONS

SHEET No.
FIG-3

TEST PIT TP-1

DATE OBSERVED: 12/09/20

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 2.5 FT SAND (SINGLE GRAIN, STRUCTURELESS)	2ft		1
2.5 FT - 5.0 FT SAND (MASSIVE) 47% PASSING >2mm	4ft		2
TEST PIT TERMINATED AT 5 FEET DUE TO LIMITING LAYER (SANDSTONE)	6ft 8ft		

TEST PIT TP-2

DATE OBSERVED: 12/09/20

SOIL DESCRIPTION	DEPTH (FT)	SYMBOL	SOIL TYPE
0 - 5.0 FT SAND (SINGLE GRAIN, STRUCTURELESS)	2ft 4ft		1
5.0 FT SANDSTONE (MASSIVE) LIMITING LAYER TEST PIT TERMINATED AT 5 FEET DUE TO LIMITING LAYER	6ft 8ft		

SOIL DESCRIPTIONS

SAND (SINGLE-GRAIN)

SAND (MASSIVE)

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(970) 330-1071

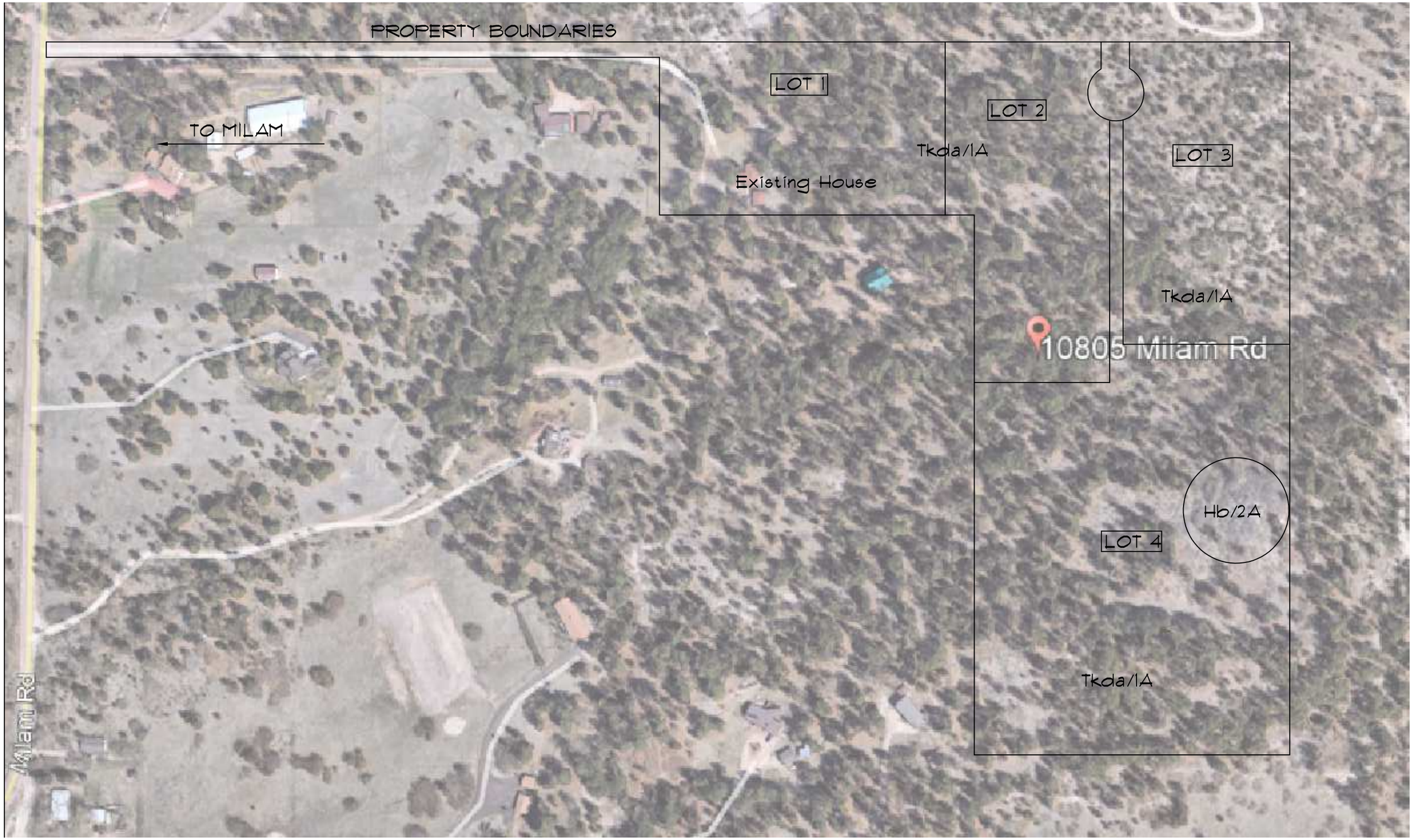
PROFILE PIT LOGS

MILAM ROAD
EPC SHCEDULE NO. 6224000011
EL PASO COUNTY, CO

JOB No. 180317

FIG NO 4

DATE 2-5-2021



Geologic

- *TKda - Dawson Formation* - The Dawson Formation underlies the entire site. *Tkda* typically is light gray to tan and typically consists of arkose, arkosic conglomerate, sandstone and interbedded gray claystone seams. The residual soils overlying this formation were derived from the in-situ weathering of the bedrock materials on-site and typically weather to brown or reddish brown.
- *hb* - sandstone outcropping

Engineering

- 1A - Stable alluvium, colluvium and bedrock on flat to gentle slopes (0 to 5%).
- 2A - Stable alluvium, colluvium and bedrock on gentle to moderate slops (5% to 12%).

NOT TO SCALE

BASE MAP PROVIDED BY: GOOGLE

JOB No. 180317

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ROCKY MOUNTAIN GROUP

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Pueblo / Canon City:
(719) 544-7750

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

ENGINEER:	GGW
DRAWN BY:	KZ
CHECKED BY:	GGW
ISSUED:	2-5-2021
REVISION:	DATE:
	JOB #:

ENGINEERING AND GEOLOGY MAP

SHEET No.
FIG-6

41- KETTLE GRAVELLY SAND LOAM, 8 TO 40% SLOPES

NOT TO SCALE
BASE MAP PROVIDED BY: USDA

USDA SOILS SURVEY MAP

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

JOB No. 180317
FIG No. 7
DATE 2-5-2021

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

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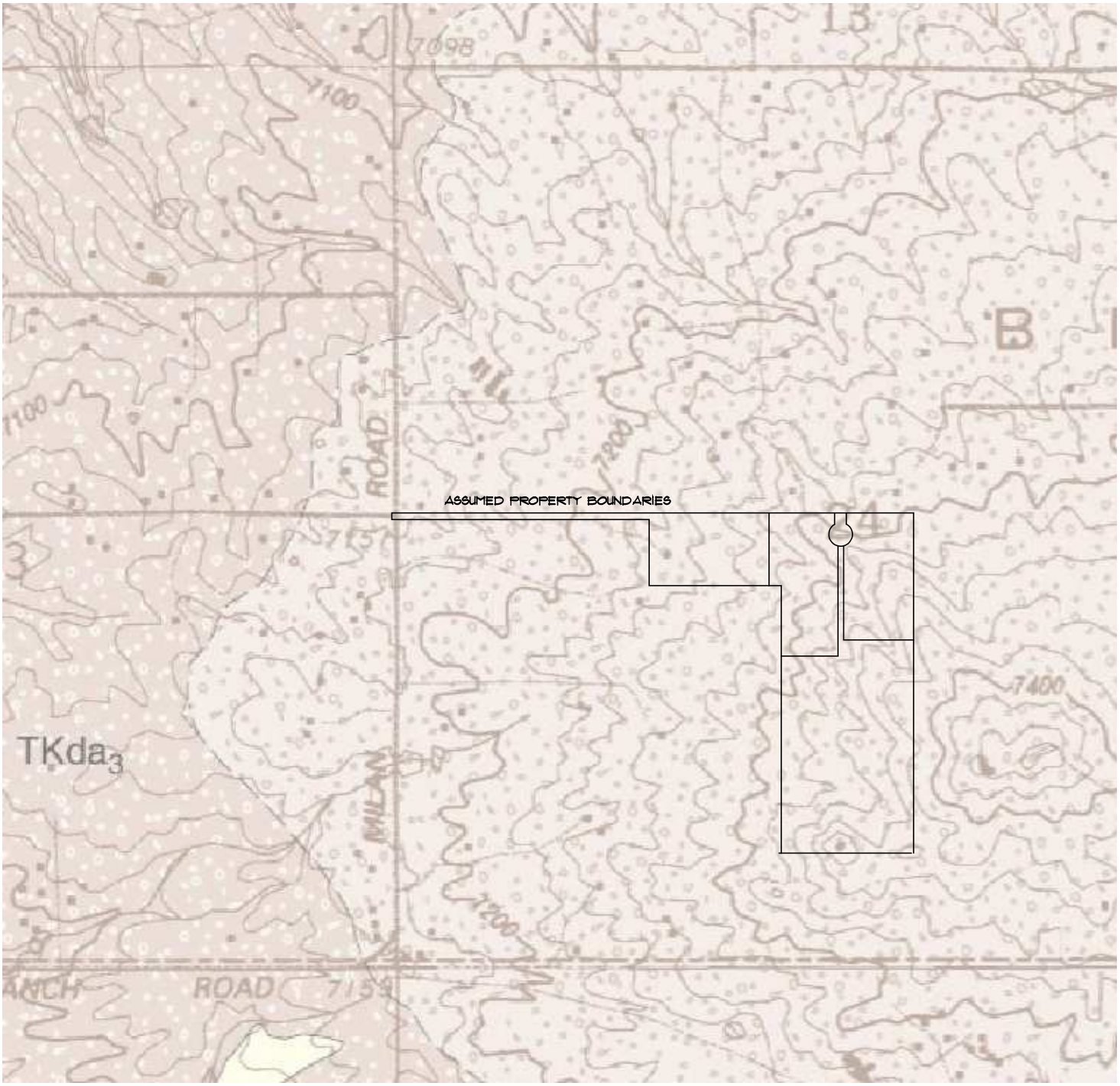

NOT TO SCALE
BASE MAP PROVIDED BY: CGS

ARCHITECTS
RMG
ENGINEERS
ROCKY MOUNTAIN GROUP

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FALCON NW QUADRANGLE

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

JOB No. 180317

FIG No. 8

DATE 2-5-2021

NOT TO SCALE
BASE MAP PROVIDED BY: CGS

ARCHITECTS RMG ENGINEERS
ROCKY MOUNTAIN GROUP

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Central Office:
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(303) 688-9475
Northern Office:
Greeley / Evans, CO 80620
(970) 330-1071

FEMA MAP

10805 MILAM ROAD
EPC SCHEDULE NO. 6224000011
EL PASO COUNTY, CO
PAUL AND AMY KINCH

JOB No. 180317

FIG No. 9

DATE 2-5-2021

APPENDIX A
Additional Reference Documents

1. *Wastewater Study, 10805 Milam Road, EPC Schedule No. 6224000011, El Paso County, Colorado*, prepared by RMG – Rocky Mountain Group, Job No. 180317, last dated February 4, 2021.
2. *Loy Layout*, received via email from Client, December 9, 2020.
3. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 081041C0526G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
4. *Geologic Map of the Falcon NW Quadrangle, El Paso County, Colorado*, by Richard F. Madole, Colorado Geological Survey, 2003.
5. *Falcon NW Quadrangle, Environmental and Engineering Geologic Map for Land Use*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
6. *Falcon NW Quadrangle, 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/. https://property.spatialest.com/co/elpaso/#/property/6224000011 Schedule No.: 6224000011.
8. *Colorado Geological Survey, USGS Geologic Map Viewer*: https://ngmdb.usgs.gov/mapview/?center=-104.733,38.988&zoom=15
9. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1947, 1955, 1969, 1983, 1999, 2005, 2009, 2011, 2013, 2015, 2017.
10. *USGS Historical Topographic Map Explorer:* http://historicalmaps.arcgis.com/usgs/ Colorado Springs Quadrangles dated 1893, 1909, 1948, 1961, 1975, and 1981.
11. *Google Earth Pro*, Imagery dated 1999, 2003, 2004, 2005, 2006, 2010, 2011, 2015, 2017, 2019 and 2020.

Site Photos – Appendix B

Photo 1: Looking North from test pit TP-1

Photo 2: Looking East from TP-1

Photo 3: Looking South from TP-1

Photo 4: Looking West from TP-1

Photo 5: Looking North from TP-2

Photo 6: Looking East from TP-2

Photo 7: Looking South from TP-2

Photo 8: Looking West from TP-2

Photo 9: Looking North from TP-3

Photo 10: Looking East from TP-3

Photo 11: Looking South from TP-3

Photo 12: Looking West from TP-3

APPENDIX C

Soils Report, Lot #1, 10805 Milam Road, El Paso County, Colorado,
prepared by Geoquest, LLC, Job #17-0144, dated November 24, 2020

Soils Report, Lot #2, 10805 Milam Road, El Paso County, Colorado,
prepared by Geoquest, LLC, Job #20-0216, dated December 1, 2020

Soils Report, Future Lot #3, 10805 Milam Road, El Paso County, Colorado,
prepared by Geoquest, LLC, Job #20-1218, dated November 18, 2020

GEOQUEST, LLC

6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

23 November 2020

Paul and Amy Kinch
10805 Milam Road
Colorado Springs, Colorado 80908

RE: Soil Test Receipt, 10805 Milam Road, Geoquest #17-0144

Dear Sir or Madam,

Thank you for choosing Geoquest to perform the Soils Report for the property at the above location.

The attached Soils Report provided by Geoquest, LLC, has been prepared in accordance with the standard of practice. This report does not address possible geologic hazards, environmental hazards, or drainage that exist on-site. There are specific requirements for the design and construction of the foundation of a structure at the location noted in the report. Some of these requirements are placed on the homeowner of the property and may be outside of the builders' control. **Accordingly, we are requiring both the builder and the homeowner to sign this letter indicating both parties have accepted a copy of the report, have read and understood the contents, and know they each have specific responsibilities. Failure to follow the recommendations and requirements of the report by any party can result in unsatisfactory performance of the foundation or building components. Builder and Owner understand the risks, as noted in the Soils Report, and accept all risk, including movement of slabs.**

After the excavation has been completed an **Open Hole Observation is required** to be performed by the Soils Engineer. **After the Open Hole Observation is complete, the owner/builder should inform the Foundation Engineer of any changes to the soil conditions or allowable bearing. The Open Hole Observation is an additional cost.**

Geoquest, LLC, will not provide any documentation for site inspections until we have received this letter with the required signatures. If the property is being developed as a speculative investment and no homeowner has been contracted to purchase the property, you can indicate that under the homeowner signature line. Upon the sale of the property the builder understands that both this letter and a copy of the Soils Report shall be provided to the buyer, and a homeowner signed copy returned to Geoquest, LLC.

If you have any questions, feel free to contact us at (719) 481-4560.

Sincerely,

Charles E. Milligan, P.E.

Builder Representatives

Homeowner(s)

_____ _____

_____ _____

GEOQUEST, LLC

6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

SOILS REPORT

FOR

PAUL AND AMY KINCH

JOB #17-0144

Lot #1,
10805 Milam Road,
El Paso County,
Colorado

COLORADO REGISTERED PROFESSIONAL ENGINEER
CHARLES E. MILLIGAN
34608
24 NOV 20

Sincerely,

Charles E. Milligan, P.E.
Civil Engineer

TABLE OF CONTENTS

INTRODUCTION

The owners must be made aware of the contents of this report. If there are any questions or concerns regarding the information in this report, please contact Geoquest, LLC. It is the responsibility of the contractor on this project to make subsequent owners aware of the contents of this report. This is to ensure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for **Paul and Amy Kinch, owners, Lot #1, 10805 Milam Road, El Paso County, Colorado.** This report is prepared with the understanding that a single-family residence is planned for this site. The site is currently vacant.

CONCLUSIONS

Due to encountering clayey sand (SC) at the depth of 10 feet, the excavation and the placement of the foundation components must not penetrate more than 6 feet. If the excavation is planned to penetrate deeper, excavate 4 feet below the bottom of the foundation grade in at least two locations to confirm 4 foot separation from the unsuitable material. If this unsuitable material is encountered, it must be removed and replaced, compaction testing will be required, and a bearing of 1,500 pounds per square foot will be used. The over-excavated area shall extend to a minimum depth of 4 feet below the bottom of the foundation elevation and 4 feet laterally from the location of the foundation. Additional drainage may be required during construction due to the high moisture content. If the bottom of the excavation becomes unstable, the use of 1' to 2' of 4" to 8" ballast rock may be required.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **5,000 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **The laboratory testing revealed that the on-site soil is silty sand with underlying clayey sand (U.S.C.S. Classification Symbol SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM) and 85 (SC) pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

GENERAL

The investigation was made to reveal important characteristics of the soils and of the site influencing the foundation design. Also evaluated during the investigation were subsurface conditions that affect the depth of the foundation and subsequent loading design, such as ground water levels, soil types, and other factors which affect the bearing capacity of the soils. Design loadings are based on soils characteristics and represent the maximum permissible loads for these conditions.

FIELD AND LABORATORY INVESTIGATION

Two exploratory holes were drilled on November 4, 2020, at the locations shown on the enclosed site map. The location of these test holes was determined by Paul and Amy Kinch. The test holes were drilled with a 3-inch diameter auger. At intervals anticipated to be the foundation depths, and as determined by the soils conditions, the drill tools were removed, and samples were taken by the use of a 2 inch "split barrel" sampler connected to a 140-pound drop-hammer. This hammer is dropped 30 inches to drive the penetration sampler into the soil **(ASTM D-1586).** The depths and descriptions of the materials encountered in each test boring at which the samples were taken are shown on the enclosed log sheets. All samples were classified both in the field and in the laboratory to evaluate the physical and mechanical properties of the materials encountered.

TOPOGRAPHY

The topography of this site is that of an incline sloping down towards the northwest at 10%.

WEATHER

The weather at the time of the soil examination consisted of clear skies with moderate temperatures.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Slabs-on-grade may move and crack. Vertical slab movement of one to three inches is considered normal for soils of low to moderate expansion potential and for compacted structural fill after removal of expansive soils. In some cases, vertical movement may exceed this range. If movement and associated damage to basement floors and finish cannot be tolerated, a structural floor system should be installed. If compaction is not performed, settlement may occur causing cracking of foundation walls and floors. Soil located beneath concrete walls shall be compacted to at least 95% Modified Proctor density. Soil located beneath concrete slabs shall be compacted to at least 85% Modified Proctor density. Special care is to be taken to re-compact the material above utility lines to a minimum of 85% Modified Proctor density. During construction, conditions that could cause settlement shall be eliminated. Interior non-bearing partition walls shall be constructed such that they do not transmit floor slab movement to the roof or overlying floor. The gap or void (1.5 inch min.) installed in these non-bearing partitions may require re-construction over the life of the structure to re-establish the gap or void to allow for vertical slab movement. Stairwells, doorways and sheeted walls should be designed for this movement. The following are general recommendations of on-grade slabs:

1. Slabs shall be placed on well-compacted, non-expansive materials, and all soft spots shall be thoroughly excavated and replaced with non-expansive fill materials as stated above.

2. Slabs shall be separated from all foundation walls, load bearing members, and utility lines.

3. At intervals not to exceed 12 feet in each direction, provide control joints to reduce problems with shrinkage and curling as recommended by the American Concrete Institute (ACI). Moisten the ground beneath the slab prior to placement of concrete.

4. All concrete placed must be cured properly as recommended by the American Concrete Institute (ACI). Separate load bearing members from slabs, as discussed above. Care must be exercised to prevent excess moisture from entering the soil under the structure, both during and after construction.

5. Due to the exposure of exterior concrete to variations in moisture fluctuations, heaving and cracking of exterior slabs-on-grade should be expected. Placement of at least 3 feet of non-expansive fill beneath the slabs can help to reduce the impact of differential movement and cracking but may not eliminate movement. Exterior concrete shall slope away from the structure a minimum of 2% grade.

6. **The clayey sand (SC) has been tested for its expansion and/or consolidation potential. This material has a -0.3% consolidation potential with an applied force of 1000 pounds per square foot.** Basement slabs, garage slabs, and all concrete floor slabs, exert a very low dead-load pressure on the soil. Since this soil contains a small amount of swell potential, slabs will crack and heave or settle if excess water is allowed to penetrate the subgrade. For example, column openings to pads below the placed slab, if exposed to precipitation during construction, will conduct water to the sub-grade, possibly causing it to expand. Also, if the slab is placed with concrete too wet, expansion may occur. We recommend 3,000 psi concrete placed at a maximum slump of 4 inches.

RECOMMENDATION REMARKS

The recommendations provided in this report are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soil or from the settlement induced by the application of loads. **It must be recognized that the foundation will undergo some movement on all soil types.** In addition, concrete floor slabs will move vertically, therefore, adherence to those recommendations which isolate floor slabs from columns, walls, partitions or other structural components is extremely important if damage to the superstructure is to be minimized.

RECOMMENDATION REMARKS (CONTINUED)

Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage and partition framing, drywall and finish work above floor slabs.

Geoquest, LLC does not assure that the contractor and/or homeowner will comply with the recommendations provided in this report. Geoquest, LLC provides recommendations and requirements only and does not supervise, direct or control the implementation of the recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon frozen soil.

2. Concrete shall be protected from freezing until it has been allowed to cure for at least 7 days after placement in forms.

3. Snow or other frozen water shall not be allowed in the forms during placement of concrete.

4. Concrete shall be cured in forms for at least 72 hours.

5. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

6. The site shall be kept well drained at all times.

SURFACE DRAINAGE

After construction of foundation walls, the backfill material shall be well compacted to 80% Modified Proctor density, to reduce future settlement. Any areas that settle after construction shall be filled to eliminate ponding of water adjacent to the foundation walls. **The finished grade shall have a positive slope away from the structure with an initial slope of 6 inch in the first 10 feet.** If a 10 feet zone is not possible on the upslope site of the structure, then a well-defined swale should be created a minimum of 5 feet from the foundation and sloped parallel with the wall at a 2% grade to intercept the surface water and carry it around and away from the structure. Homeowners shall maintain the surface grading and drainage installed by the builder to prevent water directed in the wrong direction. All downspouts shall have splash blocks that will remove runoff to outside the foundation area and carried across backfill zones. No irrigation devices shall be placed within 10 feet of the foundation. Shrubs and plants requiring minimal watering shall be established in this area. Irrigated grass shall not be located within 5 feet of the foundation. Sprinklers shall not discharge water within 5 feet of the foundation. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase likelihood of floor slab and foundation movement.

All exterior grading and location of downspouts and their performance shall be inspected by Geoquest, LLC. **The native clayey sand (SC) material is not suitable and shall not be used as backfill material around the perimeter of the foundation.** It is the responsibility of the contractor to schedule all inspections.

SUBSURFACE DRAINAGE

Perimeter drains are required around all walls of the living area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement. Crawlspaces are not considered living area. Walkout areas need not be drained unless specified at the time of the Open Hole Observation. The final determination of the necessity for perimeter drains will be made at the time of the Open Hole Observation.

REINFORCING

The concrete foundation walls shall be properly reinforced as per the specific design for this foundation by a **Colorado Registered Professional Engineer. Exact requirements are a function of the design of the structure. Questions concerning the specific design requirements shall be referred to the design engineer.**

FOOTING DESIGN

The design for footings for this structure is determined by applying the dead load and full live load to the foundation walls.

CONSTRUCTION DETAILS

It is necessary with any soils investigation to assume that the materials from the test holes are representative of the materials in the area. On occasion variations in the subsurface materials do occur, therefore, should such variations become apparent during construction, the owner is advised to contact this office for a determination as to whether these variations will affect the design of the structure's foundation. If anomalies are observed during the excavation for the dwelling, this office should be contacted to determine whether the layers will adversely affect the design.

MINIMUM MATERIALS SPECIFICATIONS

1. Minimum materials specifications of the concrete, reinforcing, etc., shall be determined by the Professional Foundation Design Engineer.
2. Compact beneath foundation walls a minimum of 95% Modified Proctor density to prevent settlement.
3. Compact all backfill material located around the perimeter of the foundation to a minimum of 80% Modified Proctor density.
4. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.
5. The site shall be kept well drained at all times.

OPEN HOLE OBSERVATION (added cost)

If anyone other than Geoquest, LLC, performs the Open Hole Observation, that person/company assumes liability for the soils, and any possible changes to the foundation design.

The owner, or a representative of the construction company shall contact **Geoquest, LLC.** a minimum of **24 hours** prior to excavating for the foundation. An Open Hole Observation must be performed on each individual structure prior to the placement of concrete, and preferably prior to the placement of forms in the excavated area. **The failure to request or obtain an Open Hole Observation prior to the placement of foundation components may result in this Soils Report being declared null and void.** This is to ensure that soft areas, anomalies, etc., are not present in the foundation region. At the time of the open hole observation the **foundation type recommendations, maximum allowable bearing capacity may be revised** according to soil conditions found at that time. If revisions are made to the Soils Report due to the soil conditions of the excavation, **the Foundation Design Engineer must be notified of all revisions.**

FINAL OBSERVATIONS

The owner, or a representative of the construction company, shall contact Geoquest, LLC at the time final grading and landscaping procedures are completed. This is to ensure that sprinkler systems are not installed adjacent to the structure and that only shrubs or plants that require minimal watering are established in this area. All exterior grading as well as the location of downspouts and their performance shall be inspected by Geoquest, LLC. Any additional landscaping or grading changes performed by subsequent contractors and/or owners shall be inspected and approved. It is the responsible of the contractor and/or owner to schedule all these inspections at the appropriate times.

GEOQUEST, INC
481-4560

DRILL LOGS

JOB #: 17-0144

TEST BORING NO.: TH-1

DATE: 11/4/2020

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
2					
			25/3"	8.5	
4					
6					
8					
10					
12			20/3"	11.8	SC
14					
16					
18					
20					

0"-4" Topsoil

4"-2' Sand

Fine-coarse grained
Moderate density
Low-moderate moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

2'- 10' Sandstone

Fine-coarse grained
Very high density
Moderate moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color
Zones Of Clay

10'- 15' Sandstone (SC)

Fine-coarse grained
Very high density
Moderate moisture content
Moderate clay content
Moderate plasticity
Brown color
Zones Of Clay

JOB #: 17-0144

TEST BORING NO.: TH-2

DATE: 11/4/2020

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
2					
4			30/6"	4.9	SM
6					
8					
10					
12					
14			Bag 12"	10.2	
16					
18					
20					

0"-4" Topsoil

4"-2' Sand

Fine-coarse grained
Moderate density
Low moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

2'- 10' Sandstone (SM)

Fine-coarse grained
Very high density
Moderate moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

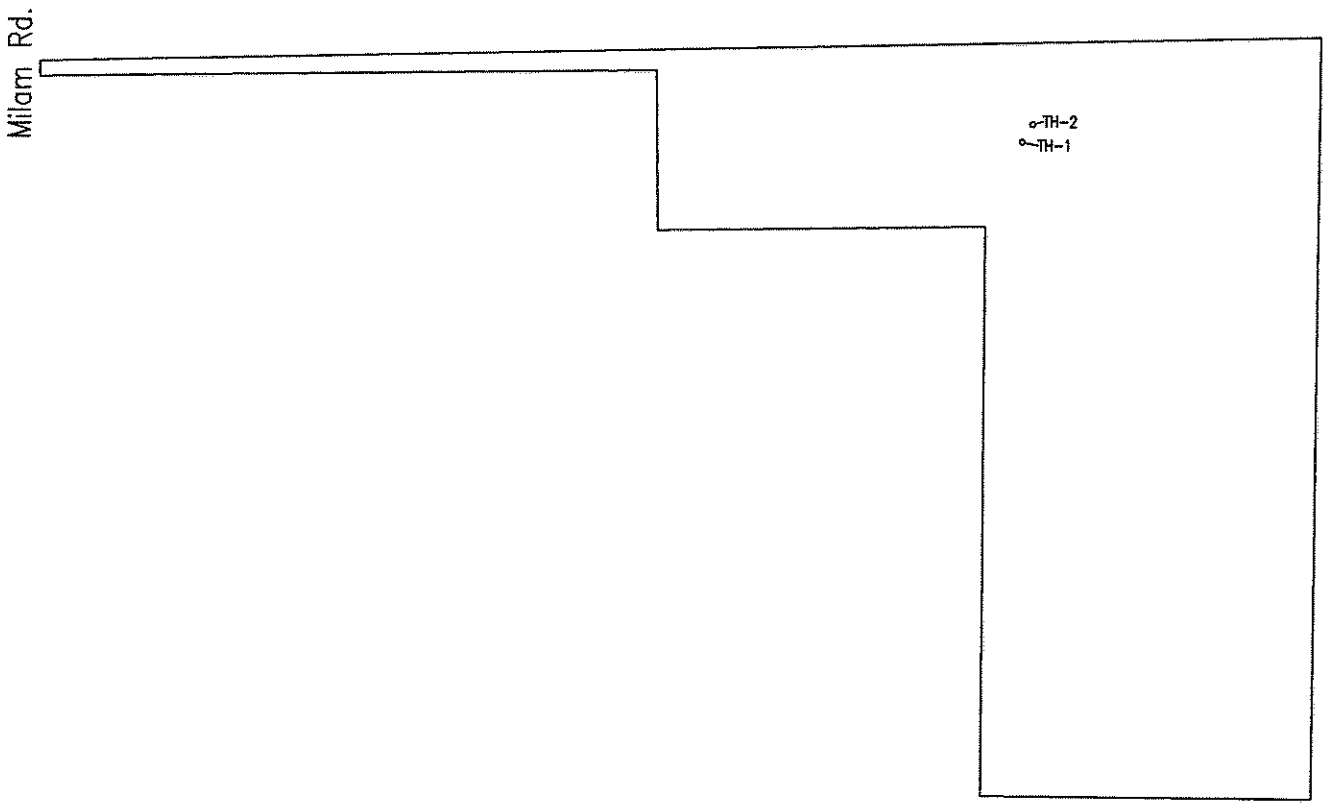
10'- 15' Sandstone

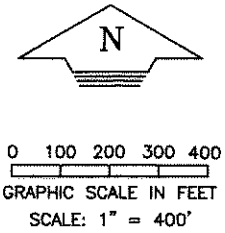
Fine-coarse grained
Very high density
Moderate moisture content
Moderate clay content
Moderate plasticity
Brown color
Zones Of Clay

GEOQUEST LLC

SITE MAP

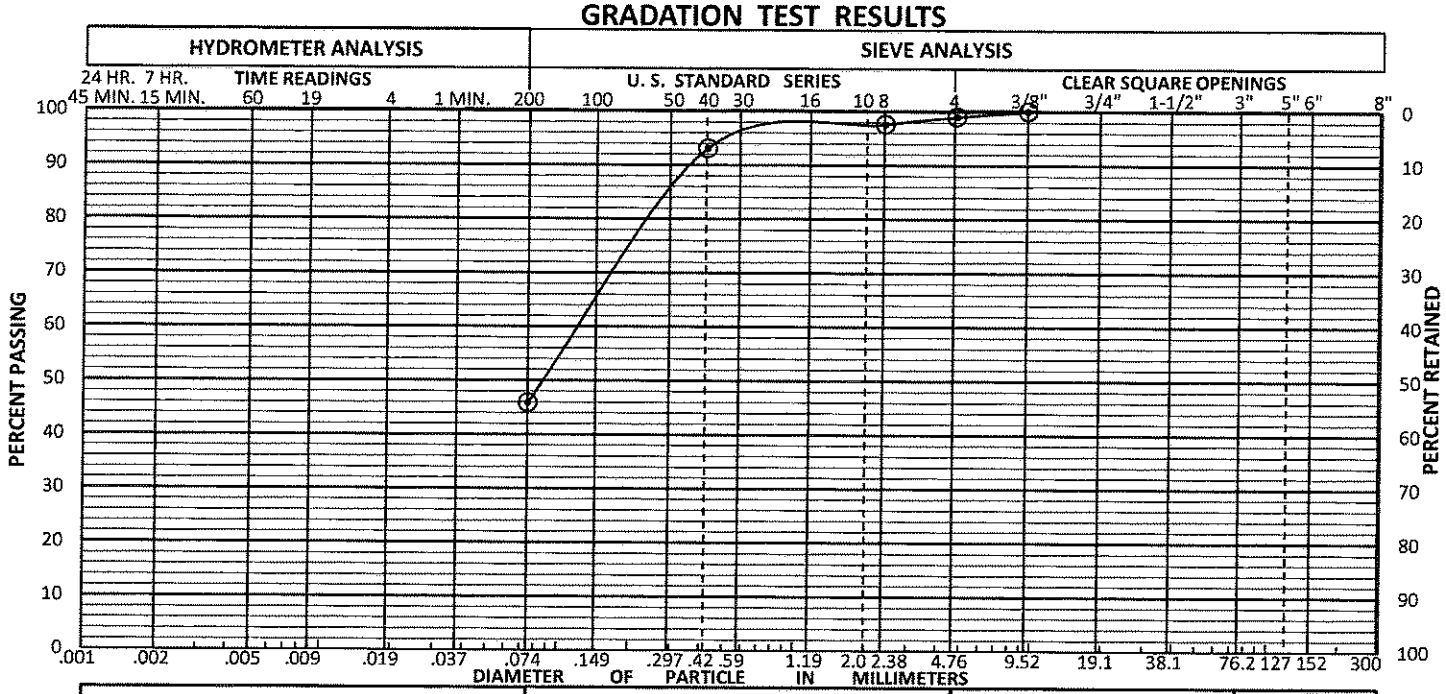
Lot 1
10805 Milam Rd.
El Paso County
Colorado
Job #17-0114





GEOQUEST LLC

GRADATION TEST RESULTS



CLAY TO SILT	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

CLASSIFICATION SC

GRAVEL 1.0 %

SAND 53.2 %

FINES 45.8 %

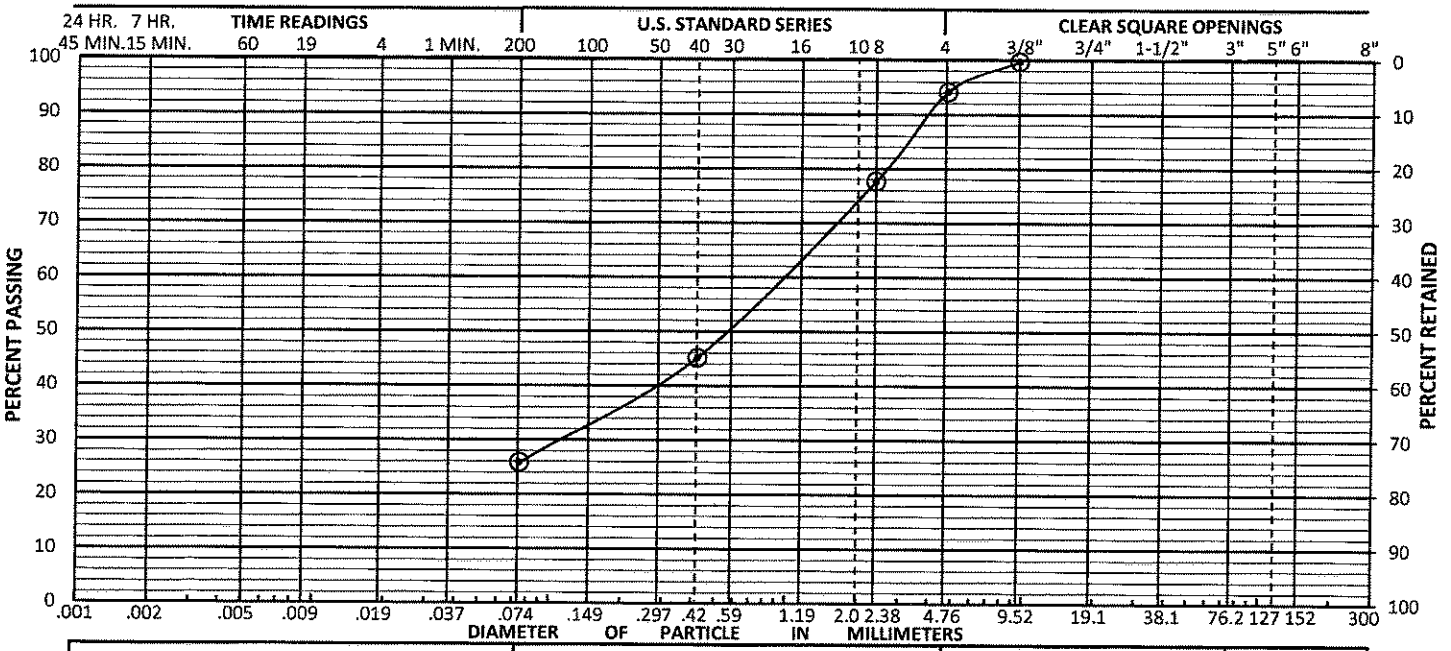
SAMPLE # 1 HOLE # TH-1 DEPTH 12 FEET

NOTES: 11.8 % Moisture Content

LL = 27.7

PL = 19.8

PI = 7.9



CLAY TO SILT	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

CLASSIFICATION SM

GRAVEL 5.9 %

SAND 68.3 %

FINES 25.8 %

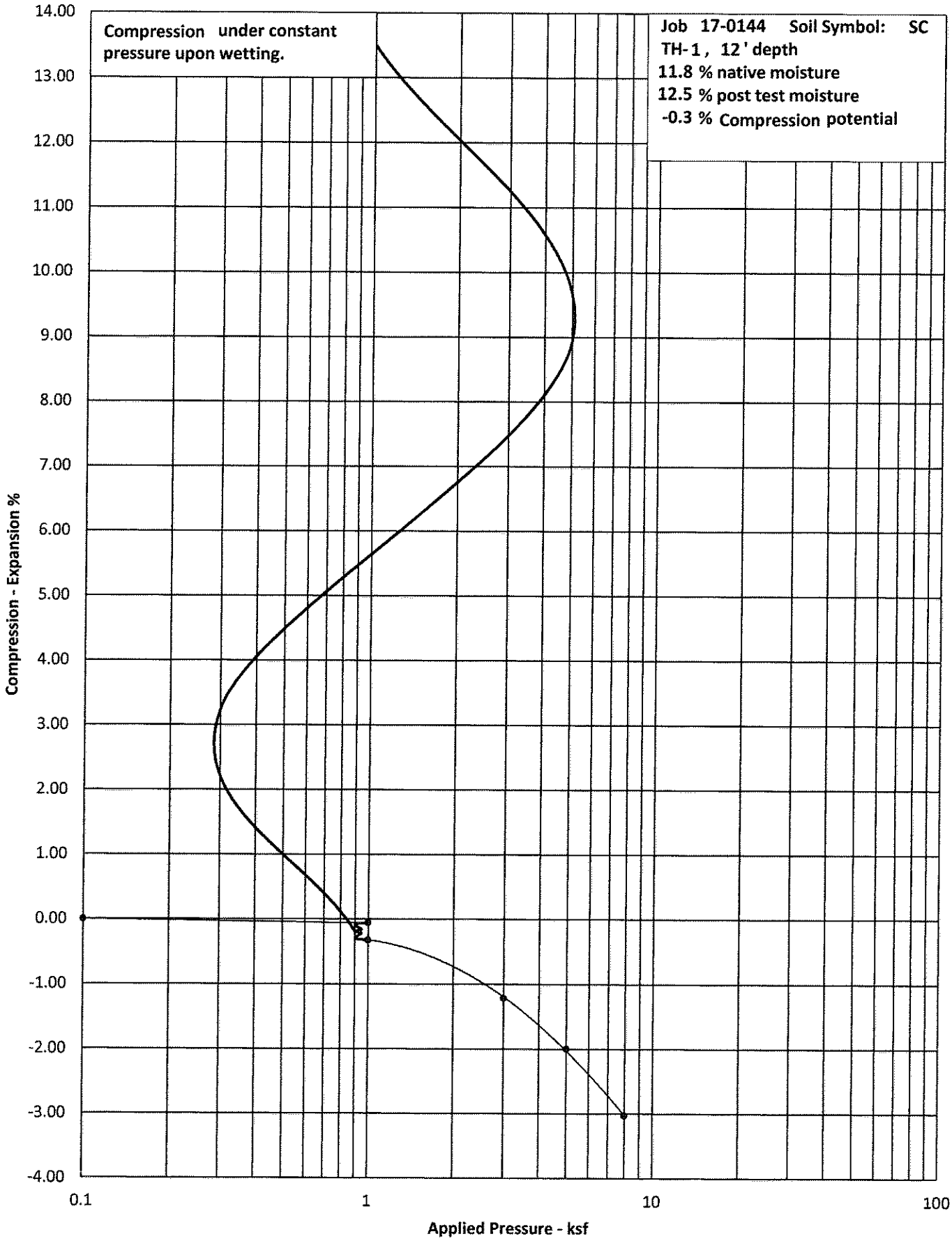
SAMPLE # 1 HOLE # TH- 2 DEPTH 4 FEET

NOTES: 4.9 % Moisture Content

Job #: 17-0144 By: MJ 11/4/2020

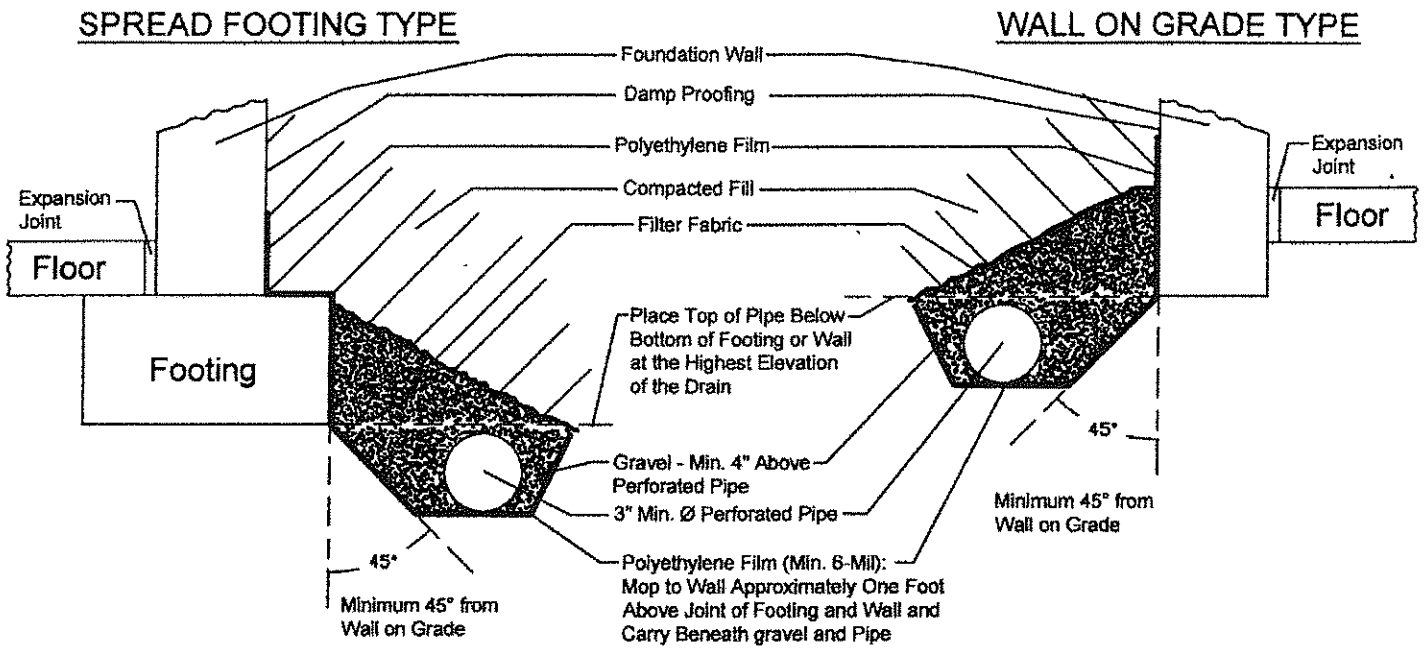
GEOQUEST LLC

SWELL-CONSOLIDATION TEST RESULTS



GEOQUEST, LLC
481-4560

EXTERIOR DRAIN DETAIL



1. Gravel to be Not More Than 1-1/2" and Not Less Than 1/2" Diameter.

2. Perforated Pipe Diameter Varies With Expected Seepage. 3"Ø and 4"Ø are Most Common. ABS and PVC are Most Common Materials for Pipe. We approve the use of an "EZ Flow Drainage System" by Infiltrator. All specifications in this drain detail are still applicable.

3. Pipe to be Laid out in a Minimum Slope of 1" in 10'.

4. Gravity Outfall is Desired if Possible. Portion of Pipe in Area Not Drained Shall be Non-Perforated. Daylight Must be Maintained Clear of Debris in Order to Function Properly.

5. If Gravity Outfall is Not Possible, Provide a Sump With Operational Pump. Pump May Not Connect to Any Sanitary or Storm Sewer.

6. Soil Backfill Should be Compacted to at Least 80% of the Modified Proctor Denisty in the Upper Three Feet of Fill.

7. Filter Fabric to be Mirafi 140s or Approved Equivalent. Roofing Felt and Sheet Plastic are Not Acceptable.

8. Drain Pipe Shall be Laid Below Protected Area, as Shown in The Detail Above.

9. Mop Polyethylene Film to Wall Approximately One Foot Above Joint of Footing and Wall (Do Not Pull Plastic Tight) and Carry Beneath Gravel and Pipe.

10. The Polyethylene Film Shall be Continued to the Edge of the Excavation.

LIMITATIONS

This report is issued based on the understanding that the owner or his representative will bring the information, data, and recommendations contained in this report to the attention of the project engineer and architect, in order that they may be incorporated into the plans for the structure. It is also the owner's responsibility to ensure that all contractors and sub-contractors carry out these recommendations during the construction phase.

This report was prepared in accordance with generally accepted professional geotechnical/engineering methods. However, Geoquest, LLC makes no other warranty, express or implied, as to the findings, data, specifications, or professional advice rendered hereunder.

This report is considered valid as of the present date. The owner acknowledges, however, that changes in the conditions of the property might occur with the passage of time, such as those caused by natural effects or man-made changes, both on this land and on abutting properties. Further, changes in acceptable tolerances or standards might arise as the result of new legislative actions, new engineering advances, or the broadening of geotechnical knowledge. Thus, certain developments beyond our control may invalidate this report, in whole or in part.

This report and its recommendations do not apply to any other site than the one described herein and are predicated on the assumption that the soil conditions do not deviate from those described. In the event that any variations or undesirable conditions should be detected during the construction phase or if the proposed construction varies from that planned as of this report date, the owner shall immediately notify Geoquest, LLC in order that supplemental recommendations can be provided, if so required.

GEOQUEST, LLC
6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

18 November 2020

Paul and Amy Kinch
10805 Milam Road
Colorado Springs, Colorado 80908

RE: Soil Test Receipt, 10805 Milam Road, Geoquest #20-1218

Dear Sir or Madam,

Thank you for choosing Geoquest to perform the Soils Report for the property at the above location.

The attached Soils Report provided by Geoquest, LLC, has been prepared in accordance with the standard of practice. This report does not address possible geologic hazards, environmental hazards, or drainage that exist on-site. There are specific requirements for the design and construction of the foundation of a structure at the location noted in the report. Some of these requirements are placed on the homeowner of the property and may be outside of the builders' control. **Accordingly, we are requiring both the builder and the homeowner to sign this letter indicating both parties have accepted a copy of the report, have read and understood the contents, and know they each have specific responsibilities. Failure to follow the recommendations and requirements of the report by any party can result in unsatisfactory performance of the foundation or building components. Builder and Owner understand the risks, as noted in the Soils Report, and accept all risk, including movement of slabs.**

After the excavation has been completed an **Open Hole Observation is required** to be performed by the Soils Engineer. **After the Open Hole Observation is complete, the owner/builder should inform the Foundation Engineer of any changes to the soil conditions or allowable bearing. The Open Hole Observation is an additional cost.**

Geoquest, LLC, will not provide any documentation for site inspections until we have received this letter with the required signatures. If the property is being developed as a speculative investment and no homeowner has been contracted to purchase the property, you can indicate that under the homeowner signature line. Upon the sale of the property the builder understands that both this letter and a copy of the Soils Report shall be provided to the buyer, and a homeowner signed copy returned to Geoquest, LLC.

If you have any questions, feel free to contact us at (719) 481-4560.

Sincerely,

Charles E. Milligan, P.E.

Builder Representatives

Homeowner(s)

_____ _____

_____ _____

GEOQUEST, LLC
6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

SOILS REPORT

FOR

PAUL AND AMY KINCH

JOB #20-1218

Future Lot #3,
10805 Milam Road,
El Paso County,
Colorado

Sincerely,

Charles E. Milligan, P.E.
Civil Engineer

COLORADO REGISTERED
CHARLES E. MILLIGAN
34608
18 Nov 20
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

INTRODUCTION

The owners must be made aware of the contents of this report. If there are any questions or concerns regarding the information in this report, please contact Geoquest, LLC. It is the responsibility of the contractor on this project to make subsequent owners aware of the contents of this report. This is to ensure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for **Paul and Amy Kinch, owners, on Future Lot #3, 10805 Milam Road, El Paso County, Colorado.** This report is prepared with the understanding that a single-family residence is planned for this site. The site is currently vacant.

CONCLUSIONS

Additional drainage may be required during construction due to the high moisture content. If the bottom of the excavation becomes unstable, the use of 1' to 2' of 4" to 8" ballast rock may be required.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **5,000 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **The laboratory testing revealed that the on-site soil is silty sand with underlying clayey sand (U.S.C.S. Classification Symbol SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM) and 85 (SC) pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

GENERAL

The investigation was made to reveal important characteristics of the soils and of the site influencing the foundation design. Also evaluated during the investigation were subsurface conditions that affect the depth of the foundation and subsequent loading design, such as ground water levels, soil types, and other factors which affect the bearing capacity of the soils. Design loadings are based on soils characteristics and represent the maximum permissible loads for these conditions.

FIELD AND LABORATORY INVESTIGATION

Two exploratory holes were drilled on November 4, 2020, at the locations shown on the enclosed site map. The location of these test holes was determined by Paul and Amy Kinch. The test holes were drilled with a 3-inch diameter auger. At intervals anticipated to be the foundation depths, and as determined by the soils conditions, the drill tools were removed, and samples were taken by the use of a 2 inch "split barrel" sampler connected to a 140-pound drop-hammer. This hammer is dropped 30 inches to drive the penetration sampler into the soil **(ASTM D-1586).** The depths and descriptions of the materials encountered in each test boring at which the samples were taken are shown on the enclosed log sheets. All samples were classified both in the field and in the laboratory to evaluate the physical and mechanical properties of the materials encountered.

TOPOGRAPHY

The topography of this site is that of an incline sloping down towards the southwest at 7%.

WEATHER

The weather at the time of the soil examination consisted of clear skies with moderate temperatures.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Slabs-on-grade may move and crack. Vertical slab movement of one to three inches is considered normal for soils of low to moderate expansion potential and for compacted structural fill after removal of expansive soils. In some cases, vertical movement may exceed this range. If movement and associated damage to basement floors and finish cannot be tolerated, a structural floor system should be installed. If compaction is not performed, settlement may occur causing cracking of foundation walls and floors. Soil located beneath concrete walls shall be compacted to at least 95% Modified Proctor density. Soil located beneath concrete slabs shall be compacted to at least 85% Modified Proctor density. Special care is to be taken to re-compact the material above utility lines to a minimum of 85% Modified Proctor density. During construction, conditions that could cause settlement shall be eliminated. Interior non-bearing partition walls shall be constructed such that they do not transmit floor slab movement to the roof or overlying floor. The gap or void (1.5 inch min.) installed in these non-bearing partitions may require re-construction over the life of the structure to re-establish the gap or void to allow for vertical slab movement. Stairwells, doorways and sheeted walls should be designed for this movement. The following are general recommendations of on-grade slabs:

1. Slabs shall be placed on well-compacted, non-expansive materials, and all soft spots shall be thoroughly excavated and replaced with non-expansive fill materials as stated above.

2. Slabs shall be separated from all foundation walls, load bearing members, and utility lines.

3. At intervals not to exceed 12 feet in each direction, provide control joints to reduce problems with shrinkage and curling as recommended by the American Concrete Institute (ACI). Moisten the ground beneath the slab prior to placement of concrete.

4. All concrete placed must be cured properly as recommended by the American Concrete Institute (ACI). Separate load bearing members from slabs, as discussed above. Care must be exercised to prevent excess moisture from entering the soil under the structure, both during and after construction.

5. Due to the exposure of exterior concrete to variations in moisture fluctuations, heaving and cracking of exterior slabs-on-grade should be expected. Placement of at least 3 feet of non-expansive fill beneath the slabs can help to reduce the impact of differential movement and cracking but may not eliminate movement. Exterior concrete shall slope away from the structure a minimum of 2% grade.

6. The clayey sand (SC) has been analyzed for its expansion and/or consolidation potential. Basement slabs, garage slabs, and all concrete floor slabs, exert a very low dead-load pressure on the soil. Since this soil contains a small amount of swell potential, slabs will crack and heave or settle if excess water is allowed to penetrate the subgrade. For example, column openings to pads below the placed slab, if exposed to precipitation during construction, will conduct water to the sub-grade, possibly causing it to expand. Also, if the slab is placed with concrete too wet, expansion may occur. We recommend 3,000 psi concrete placed at a maximum slump of 4 inches.

RECOMMENDATION REMARKS

The recommendations provided in this report are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soil or from the settlement induced by the application of loads. **It must be recognized that the foundation will undergo some movement on all soil types.** In addition, concrete floor slabs will move vertically, therefore, adherence to those recommendations which isolate floor slabs from columns, walls, partitions or other structural components is extremely important if damage to the superstructure is to be minimized.

RECOMMENDATION REMARKS (CONTINUED)

Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage and partition framing, drywall and finish work above floor slabs.

Geoquest, LLC does not assure that the contractor and/or homeowner will comply with the recommendations provided in this report. Geoquest, LLC provides recommendations and requirements only and does not supervise, direct or control the implementation of the recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon frozen soil.

2. Concrete shall be protected from freezing until it has been allowed to cure for at least 7 days after placement in forms.

3. Snow or other frozen water shall not be allowed in the forms during placement of concrete.

4. Concrete shall be cured in forms for at least 72 hours.

5. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

6. The site shall be kept well drained at all times.

SURFACE DRAINAGE

After construction of foundation walls, the backfill material shall be well compacted to 80% Modified Proctor density, to reduce future settlement. Any areas that settle after construction shall be filled to eliminate ponding of water adjacent to the foundation walls. **The finished grade shall have a positive slope away from the structure with an initial slope of 6 inch in the first 10 feet.** If a 10 feet zone is not possible on the upslope site of the structure, then a well-defined swale should be created a minimum of 5 feet from the foundation and sloped parallel with the wall at a 2% grade to intercept the surface water and carry it around and away from the structure. Homeowners shall maintain the surface grading and drainage installed by the builder to prevent water directed in the wrong direction. All downspouts shall have splash blocks that will remove runoff to outside the foundation area and carried across backfill zones. No irrigation devices shall be placed within 10 feet of the foundation. Shrubs and plants requiring minimal watering shall be established in this area. Irrigated grass shall not be located within 5 feet of the foundation. Sprinklers shall not discharge water within 5 feet of the foundation. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase likelihood of floor slab and foundation movement.

All exterior grading and location of downspouts and their performance shall be inspected by Geoquest, LLC. **The native clayey sand (SC) material is not suitable and shall not be used as backfill material around the perimeter of the foundation.** It is the responsibility of the contractor to schedule all inspections.

SUBSURFACE DRAINAGE

Perimeter drains are required around all walls of the living area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement. Crawlspaces are not considered living area. Walkout areas need not be drained unless specified at the time of the Open Hole Observation. The final determination of the necessity for perimeter drains will be made at the time of the Open Hole Observation.

REINFORCING

The concrete foundation walls shall be properly reinforced as per the specific design for this foundation by a **Colorado Registered Professional Engineer. Exact requirements are a function of the design of the structure. Questions concerning the specific design requirements shall be referred to the design engineer.**

FOOTING DESIGN

The design for footings for this structure is determined by applying the dead load and full live load to the foundation walls.

CONSTRUCTION DETAILS

It is necessary with any soils investigation to assume that the materials from the test holes are representative of the materials in the area. On occasion variations in the subsurface materials do occur, therefore, should such variations become apparent during construction, the owner is advised to contact this office for a determination as to whether these variations will affect the design of the structure's foundation. If anomalies are observed during the excavation for the dwelling, this office should be contacted to determine whether the layers will adversely affect the design.

MINIMUM MATERIALS SPECIFICATIONS

1. Minimum materials specifications of the concrete, reinforcing, etc., shall be determined by the Professional Foundation Design Engineer.
2. Compact beneath foundation walls a minimum of 95% Modified Proctor density to prevent settlement.
3. Compact all backfill material located around the perimeter of the foundation to a minimum of 80% Modified Proctor density.
4. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.
5. The site shall be kept well drained at all times.

OPEN HOLE OBSERVATION (added cost)

If anyone other than Geoquest, LLC, performs the Open Hole Observation, that person/company assumes liability for the soils, and any possible changes to the foundation design.

The owner, or a representative of the construction company shall contact **Geoquest, LLC.** a minimum of **24 hours** prior to excavating for the foundation. An Open Hole Observation must be performed on each individual structure prior to the placement of concrete, and preferably prior to the placement of forms in the excavated area. **The failure to request or obtain an Open Hole Observation prior to the placement of foundation components may result in this Soils Report being declared null and void.** This is to ensure that soft areas, anomalies, etc., are not present in the foundation region. At the time of the open hole observation the **foundation type recommendations, maximum allowable bearing capacity may be revised** according to soil conditions found at that time. If revisions are made to the Soils Report due to the soil conditions of the excavation, **the Foundation Design Engineer must be notified of all revisions.**

FINAL OBSERVATIONS

The owner, or a representative of the construction company, shall contact Geoquest, LLC at the time final grading and landscaping procedures are completed. This is to ensure that sprinkler systems are not installed adjacent to the structure and that only shrubs or plants that require minimal watering are established in this area. All exterior grading as well as the location of downspouts and their performance shall be inspected by Geoquest, LLC. Any additional landscaping or grading changes performed by subsequent contractors and/or owners shall be inspected and approved. It is the responsible of the contractor and/or owner to schedule all these inspections at the appropriate times.

GEOQUEST, inc
481-4560

DRILL LOGS

JOB #: 20-1218

TEST BORING
NO.: TH-1

DATE: 11/4/2020

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
2					
			32/6"	4.8	
4					
6					
8					
10					
12			20/2"	11.7	SC
14					
16					
18					
20					

0"-4" Topsoil

4"-2' Sand

Fine-coarse grained
Low-moderate density
Low moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

2'- 5' Sandstone

Fine-coarse grained
Very high density
Low moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

5'- 15' Sandstone (SC)

Fine-coarse grained
Very high density
Moderate moisture content
Moderate clay content
Moderate plasticity
Light Brown color

JOB #: 20-1218

TEST BORING
NO.: TH-2

DATE: 11/4/2020

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
2					
4			30/6"	3.1	SM
6					
8					
10					
12					
14			Bag 12"	9.9	
16					
18					
20					

0"-4" Topsoil

4"-2' Sand

Fine-coarse grained
Low-moderate density
Low moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

2'- 5' Sandstone (SM)

Fine-coarse grained
Very high density
Low moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color

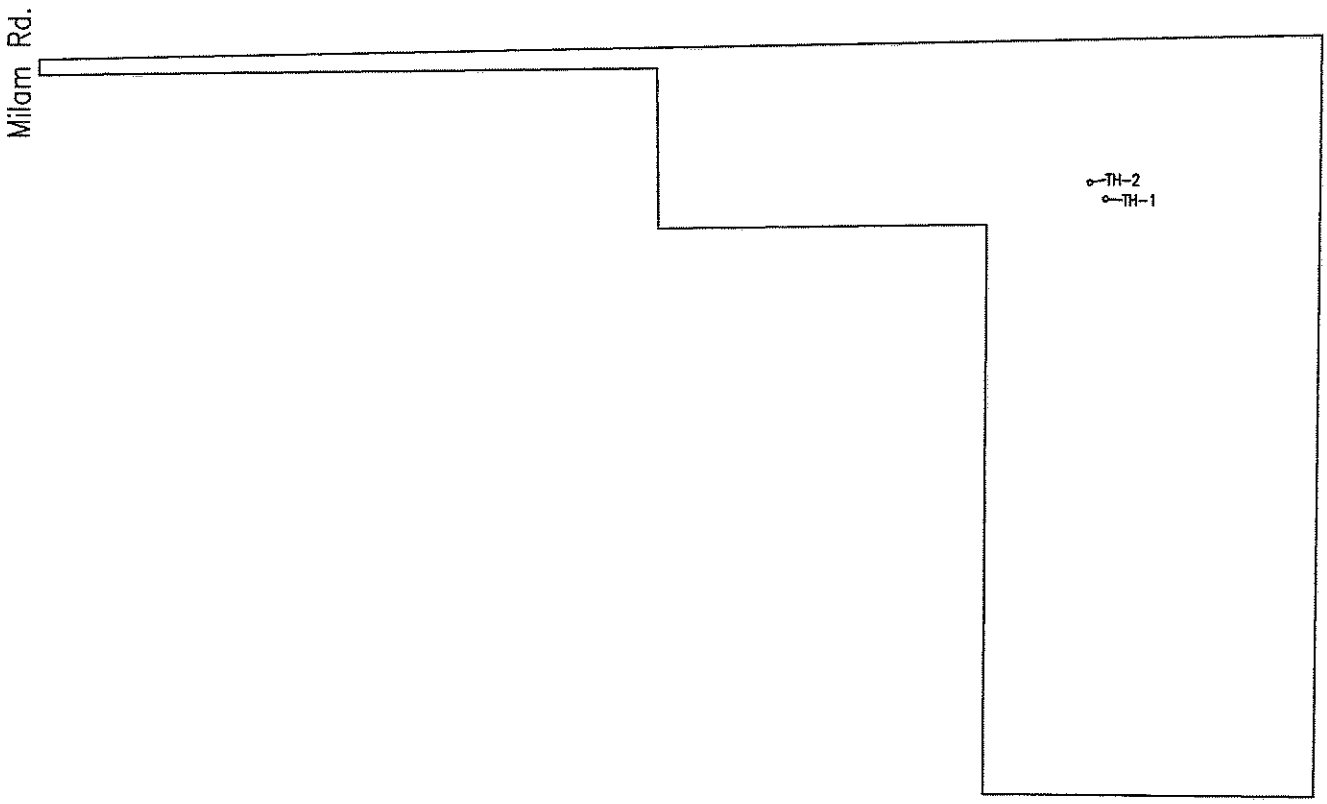
5'- 15' Sandstone

Fine-coarse grained
Very high density
Low-moderate moisture content
Moderate clay content
Moderate plasticity
Light Brown color

GEOQUEST LLC

SITE MAP

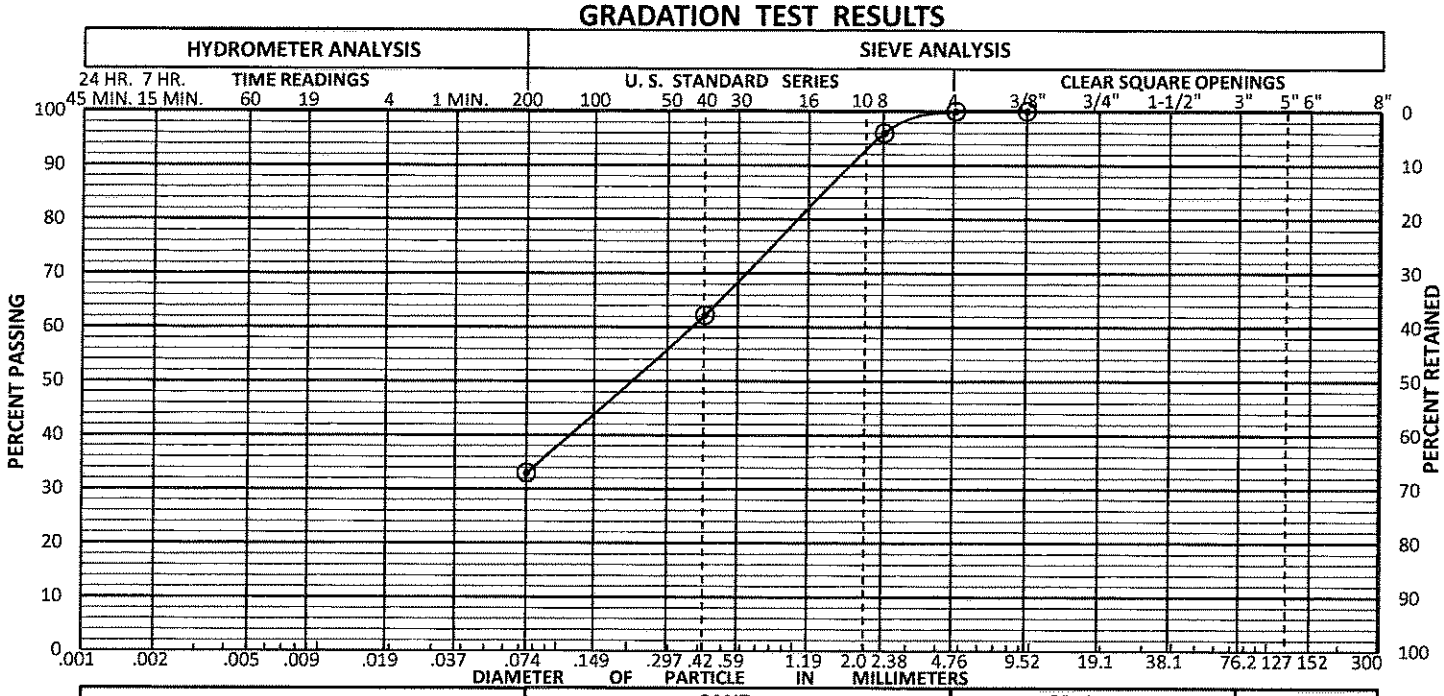
Lot 3
10805 Milam Rd.
El Paso County
Colorado
Job #20-1218



0 100 200 300 400
GRAPHIC SCALE IN FEET
SCALE: 1" = 400'

GEOQUEST LLC

GRADATION TEST RESULTS



CLAY TO SILT	SAND			GRAVEL		COBBLES
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CLASSIFICATION SC

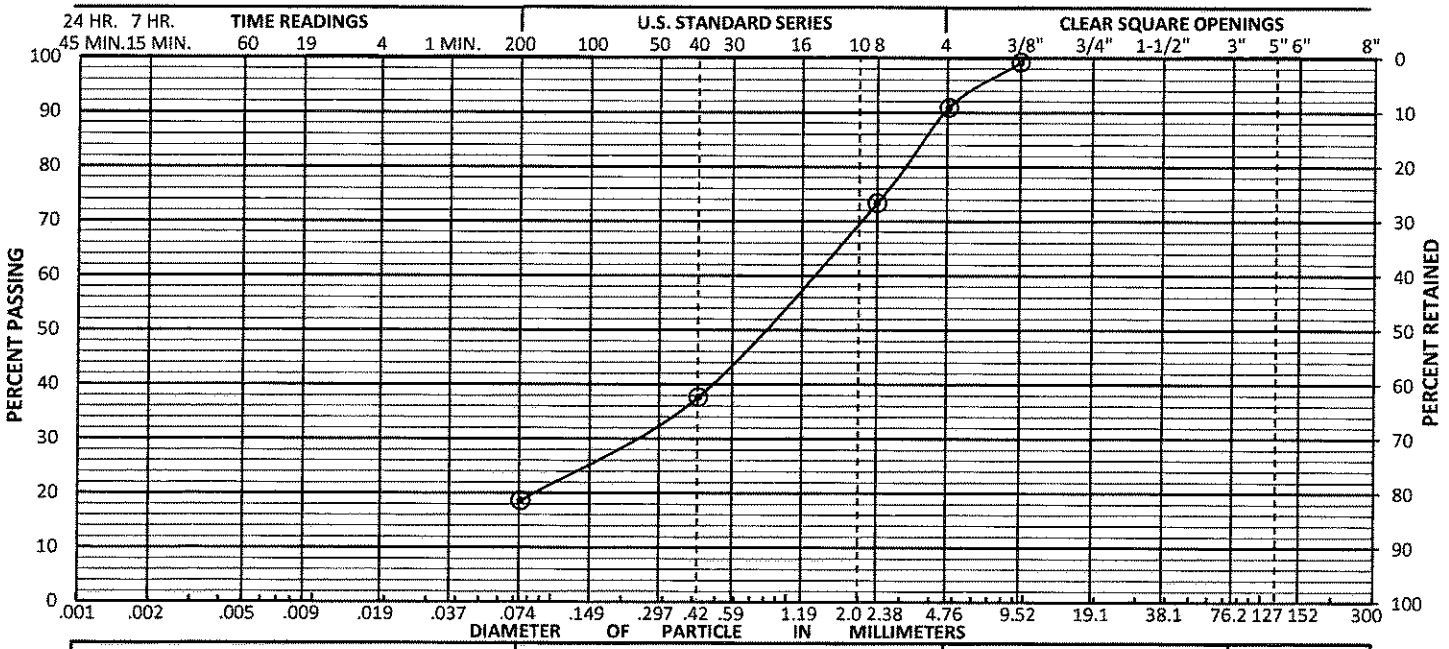
GRAVEL 0.0 %

SAND 67.1 %

FINES 32.9 %

SAMPLE # 1 HOLE # TH-1 DEPTH 12 FEET

NOTES: 11.7 % Moisture Content



CLAY TO SILT	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

CLASSIFICATION SM

GRAVEL 9.2 %

SAND 72.2 %

FINES 18.6 %

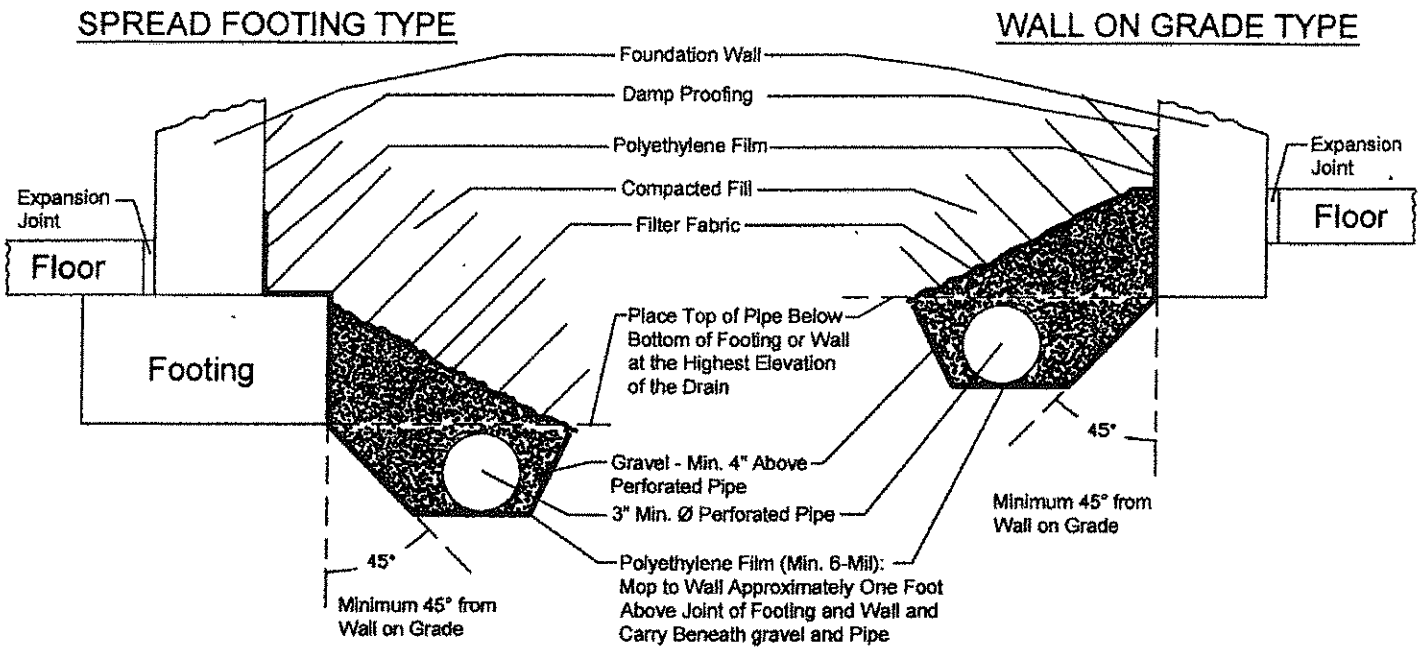
SAMPLE # 1 HOLE # TH-2 DEPTH 4 FEET

NOTES: 3.1 % Moisture Content

Job #: 20-1218 By: MJ 11/4/2020

GEOQUEST, LLC
481-4560

EXTERIOR DRAIN DETAIL



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LIMITATIONS

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GEOQUEST, LLC

6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

1 December 2020

Paul and Amy Kinch
10805 Milam Road
Colorado Springs, Colorado 80908

RE: Soil Test Receipt, 10805 Milam Road, Geoquest #20-1216

Dear Sir or Madam,

Thank you for choosing Geoquest to perform the Soils Report for the property at the above location.

The attached Soils Report provided by Geoquest, LLC, has been prepared in accordance with the standard of practice. This report does not address possible geologic hazards, environmental hazards, or drainage that exist on-site. There are specific requirements for the design and construction of the foundation of a structure at the location noted in the report. Some of these requirements are placed on the homeowner of the property and may be outside of the builders' control. **Accordingly, we are requiring both the builder and the homeowner to sign this letter indicating both parties have accepted a copy of the report, have read and understood the contents, and know they each have specific responsibilities. Failure to follow the recommendations and requirements of the report by any party can result in unsatisfactory performance of the foundation or building components. Builder and Owner understand the risks, as noted in the Soils Report, and accept all risk, including movement of slabs.**

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If you have any questions, feel free to contact us at (719) 481-4560.

Sincerely,

Charles E. Milligan, P.E.

Builder Representatives

Homeowner(s)

_____ _____

_____ _____

GEOQUEST, LLC

6825 Silver Ponds Heights #101
Colorado Springs, CO 80908
(719) 481-4560

SOILS REPORT

FOR

PAUL AND AMY KINCH

JOB #20-1216

Lot #2,
10805 Milam Road,
El Paso County,
Colorado

Sincerely,

Charles E. Milligan, P.E.
Civil Engineer

COLORADO REGISTERED
CHARLES E. MILLIGAN
34608
1 DEC 20
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

INTRODUCTION

The owners must be made aware of the contents of this report. If there are any questions or concerns regarding the information in this report, please contact Geoquest, LLC. It is the responsibility of the contractor on this project to make subsequent owners aware of the contents of this report. This is to ensure that the recommendations and requirements of the report, especially regarding the surface drainage, are acknowledged and followed. This report is prepared for **Paul and Amy Kinch, owners, on Lot #2, 10805 Milam Road, El Paso County, Colorado.** This report is prepared with the understanding that a single-family residence is planned for this site. The site is currently vacant.

CONCLUSIONS

Due to encountering zones of clay, an Over-Excavation Scheme may be required pending the results of the Open Hole Observation. If the Over-Excavation Scheme is necessary, compaction testing will be required and a bearing of 1,500 pounds per square foot will be used. The over-excavated area shall extend to a minimum depth of 4 feet below the bottom of the foundation elevation and 4 feet laterally from the location of the foundation.

A satisfactory foundation for this structure is a properly designed shallow foundation system consisting of foundation components resting directly on undisturbed materials. Foundation components resting directly on undisturbed materials shall be designed for a loading of not greater than **4,000 pounds per square foot. Any design by any engineer is subject to revision based on the results of the open hole observation.** The compressibility of this material is low. This bearing capacity is calculated with a safety factor of three. The type of foundation configuration used depends on the building loads applied. The depth of foundation elements shall be determined by the foundation engineer but should be at least as deep as the minimum depth required by the governing building authority. **The laboratory testing revealed that the on-site soil is silty sand with underlying clayey sand (U.S.C.S. Classification Symbol SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM) and 85 (SC) pounds per cubic foot. The owners shall be made aware that movement will occur if surface or subsurface water is allowed to collect around the foundation wall.**

GENERAL

The investigation was made to reveal important characteristics of the soils and of the site influencing the foundation design. Also evaluated during the investigation were subsurface conditions that affect the depth of the foundation and subsequent loading design, such as ground water levels, soil types, and other factors which affect the bearing capacity of the soils. Design loadings are based on soils characteristics and represent the maximum permissible loads for these conditions.

FIELD AND LABORATORY INVESTIGATION

Two exploratory holes were drilled on November 4, 2020, at the locations shown on the enclosed site map. The location of these test holes was determined by Paul and Amy Kinch. The test holes were drilled with a 3-inch diameter auger. At intervals anticipated to be the foundation depths, and as determined by the soils conditions, the drill tools were removed, and samples were taken by the use of a 2 inch "split barrel" sampler connected to a 140-pound drop-hammer. This hammer is dropped 30 inches to drive the penetration sampler into the soil **(ASTM D-1586).** The depths and descriptions of the materials encountered in each test boring at which the samples were taken are shown on the enclosed log sheets. All samples were classified both in the field and in the laboratory to evaluate the physical and mechanical properties of the materials encountered.

TOPOGRAPHY

The topography of this site is that of an incline sloping down towards the west at 16%.

WEATHER

The weather at the time of the soil examination consisted of clear skies with moderate temperatures.

DESIGN AND CONSTRUCTION CONSIDERATIONS

Slabs-on-grade may move and crack. Vertical slab movement of one to three inches is considered normal for soils of low to moderate expansion potential and for compacted structural fill after removal of expansive soils. In some cases, vertical movement may exceed this range. If movement and associated damage to basement floors and finish cannot be tolerated, a structural floor system should be installed. If compaction is not performed, settlement may occur causing cracking of foundation walls and floors. Soil located beneath concrete walls shall be compacted to at least 95% Modified Proctor density. Soil located beneath concrete slabs shall be compacted to at least 85% Modified Proctor density. Special care is to be taken to re-compact the material above utility lines to a minimum of 85% Modified Proctor density. During construction, conditions that could cause settlement shall be eliminated. Interior non-bearing partition walls shall be constructed such that they do not transmit floor slab movement to the roof or overlying floor. The gap or void (1.5 inch min.) installed in these non-bearing partitions may require re-construction over the life of the structure to re-establish the gap or void to allow for vertical slab movement. Stairwells, doorways and sheeted walls should be designed for this movement. The following are general recommendations of on-grade slabs:

1. Slabs shall be placed on well-compacted, non-expansive materials, and all soft spots shall be thoroughly excavated and replaced with non-expansive fill materials as stated above.

2. Slabs shall be separated from all foundation walls, load bearing members, and utility lines.

3. At intervals not to exceed 12 feet in each direction, provide control joints to reduce problems with shrinkage and curling as recommended by the American Concrete Institute (ACI). Moisten the ground beneath the slab prior to placement of concrete.

4. All concrete placed must be cured properly as recommended by the American Concrete Institute (ACI). Separate load bearing members from slabs, as discussed above. Care must be exercised to prevent excess moisture from entering the soil under the structure, both during and after construction.

5. Due to the exposure of exterior concrete to variations in moisture fluctuations, heaving and cracking of exterior slabs-on-grade should be expected. Placement of at least 3 feet of non-expansive fill beneath the slabs can help to reduce the impact of differential movement and cracking but may not eliminate movement. Exterior concrete shall slope away from the structure a minimum of 2% grade.

6. **The clayey sand (SC) has been tested for its expansion and/or consolidation potential. This material has a -0.1% consolidation potential with an applied force of 1000 pounds per square foot.** Basement slabs, garage slabs, and all concrete floor slabs, exert a very low dead-load pressure on the soil. Since this soil contains a small amount of swell potential, slabs will crack and heave or settle if excess water is allowed to penetrate the subgrade. For example, column openings to pads below the placed slab, if exposed to precipitation during construction, will conduct water to the sub-grade, possibly causing it to expand. Also, if the slab is placed with concrete too wet, expansion may occur. We recommend 3,000 psi concrete placed at a maximum slump of 4 inches.

RECOMMENDATION REMARKS

The recommendations provided in this report are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soil or from the settlement induced by the application of loads. **It must be recognized that the foundation will undergo some movement on all soil types.** In addition, concrete floor slabs will move vertically, therefore, adherence to those recommendations which isolate floor slabs from columns, walls, partitions or other structural components is extremely important if damage to the superstructure is to be minimized.

RECOMMENDATION REMARKS (CONTINUED)

Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage and partition framing, drywall and finish work above floor slabs.

Geoquest, LLC does not assure that the contractor and/or homeowner will comply with the recommendations provided in this report. Geoquest, LLC provides recommendations and requirements only and does not supervise, direct or control the implementation of the recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon frozen soil.

2. Concrete shall be protected from freezing until it has been allowed to cure for at least 7 days after placement in forms.

3. Snow or other frozen water shall not be allowed in the forms during placement of concrete.

4. Concrete shall be cured in forms for at least 72 hours.

5. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.

6. The site shall be kept well drained at all times.

SURFACE DRAINAGE

After construction of foundation walls, the backfill material shall be well compacted to 80% Modified Proctor density, to reduce future settlement. Any areas that settle after construction shall be filled to eliminate ponding of water adjacent to the foundation walls. **The finished grade shall have a positive slope away from the structure with an initial slope of 6 inch in the first 10 feet.** If a 10 feet zone is not possible on the upslope site of the structure, then a well-defined swale should be created a minimum of 5 feet from the foundation and sloped parallel with the wall at a 2% grade to intercept the surface water and carry it around and away from the structure. Homeowners shall maintain the surface grading and drainage installed by the builder to prevent water directed in the wrong direction. All downspouts shall have splash blocks that will remove runoff to outside the foundation area and carried across backfill zones. No irrigation devices shall be placed within 10 feet of the foundation. Shrubs and plants requiring minimal watering shall be established in this area. Irrigated grass shall not be located within 5 feet of the foundation. Sprinklers shall not discharge water within 5 feet of the foundation. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase likelihood of floor slab and foundation movement.

All exterior grading and location of downspouts and their performance shall be inspected by Geoquest, LLC. **The native clayey sand (SC) material is not suitable and shall not be used as backfill material around the perimeter of the foundation.** It is the responsibility of the contractor to schedule all inspections.

SUBSURFACE DRAINAGE

Perimeter drains are required around all walls of the living area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement. Crawlspaces are not considered living area. Walkout areas need not be drained unless specified at the time of the Open Hole Observation. The final determination of the necessity for perimeter drains will be made at the time of the Open Hole Observation.

REINFORCING

The concrete foundation walls shall be properly reinforced as per the specific design for this foundation by a **Colorado Registered Professional Engineer. Exact requirements are a function of the design of the structure. Questions concerning the specific design requirements shall be referred to the design engineer.**

FOOTING DESIGN

The design for footings for this structure is determined by applying the dead load and full live load to the foundation walls.

CONSTRUCTION DETAILS

It is necessary with any soils investigation to assume that the materials from the test holes are representative of the materials in the area. On occasion variations in the subsurface materials do occur, therefore, should such variations become apparent during construction, the owner is advised to contact this office for a determination as to whether these variations will affect the design of the structure's foundation. If anomalies are observed during the excavation for the dwelling, this office should be contacted to determine whether the layers will adversely affect the design.

MINIMUM MATERIALS SPECIFICATIONS

1. Minimum materials specifications of the concrete, reinforcing, etc., shall be determined by the Professional Foundation Design Engineer.
2. Compact beneath foundation walls a minimum of 95% Modified Proctor density to prevent settlement.
3. Compact all backfill material located around the perimeter of the foundation to a minimum of 80% Modified Proctor density.
4. Concrete shall be vibrated or rodded in forms to avoid segregation and cold joints.
5. The site shall be kept well drained at all times.

OPEN HOLE OBSERVATION (added cost)

If anyone other than Geoquest, LLC, performs the Open Hole Observation, that person/company assumes liability for the soils, and any possible changes to the foundation design.

The owner, or a representative of the construction company shall contact **Geoquest, LLC.** a minimum of **24 hours** prior to excavating for the foundation. An Open Hole Observation must be performed on each individual structure prior to the placement of concrete, and preferably prior to the placement of forms in the excavated area. **The failure to request or obtain an Open Hole Observation prior to the placement of foundation components may result in this Soils Report being declared null and void.** This is to ensure that soft areas, anomalies, etc., are not present in the foundation region. At the time of the open hole observation the **foundation type recommendations, maximum allowable bearing capacity may be revised** according to soil conditions found at that time. If revisions are made to the Soils Report due to the soil conditions of the excavation, **the Foundation Design Engineer must be notified of all revisions.**

FINAL OBSERVATIONS

The owner, or a representative of the construction company, shall contact Geoquest, LLC at the time final grading and landscaping procedures are completed. This is to ensure that sprinkler systems are not installed adjacent to the structure and that only shrubs or plants that require minimal watering are established in this area. All exterior grading as well as the location of downspouts and their performance shall be inspected by Geoquest, LLC. Any additional landscaping or grading changes performed by subsequent contractors and/or owners shall be inspected and approved. It is the responsible of the contractor and/or owner to schedule all these inspections at the appropriate times.

GEOQUEST, inc
481-4560

DRILL LOGS

JOB #: 20-1216

TEST BORING
NO.: TH-1

DATE: 11/4/2020

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
2					
			50/12"	5.6	SM
4					
6					
8					
10					
12			20/3"	7.8	
14					
16					
18					
20					

0"-4" Topsoil

4"-3' Sand

Fine-coarse grained
Moderate-high density
Low-moderate moisture content
Low-moderate clay content
Low plasticity
Brown color

3'- 10' Sandstone (SM)

Fine-coarse grained
Very high density
Low-moderate moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color
Zones Of Clay

10'- 15' Sandstone

Fine-coarse grained
Very high density
Low-moderate moisture content
Moderate clay content
Moderate plasticity
Brown color

JOB #: 20-1216

TEST BORING
NO.: TH-2

DATE: 11/4/2020

DEPTH (in ft.)	SYMBOL	SAMPLES	BLOW COUNT	WATER %	SOIL TYPE
2					
			30/6"	6.1	
4					
6					
8					
10					
12					
			25/3"	10.3	SC
14					
16					
18					
20					

0"-4" Topsoil

4"-3' Sand

Fine-coarse grained
Moderate-high density
Low-moderate moisture content
Low-moderate clay content
Low plasticity
Brown color

3'- 10' Sandstone

Fine-coarse grained
Very high density
Moderate moisture content
Low-moderate clay content
Low-moderate plasticity
Brown color
Zones Of Clay

10'- 15' Sandstone (SC)

Fine-coarse grained
Very high density
Low-moderate moisture content
Moderate clay content
Moderate plasticity
Brown color

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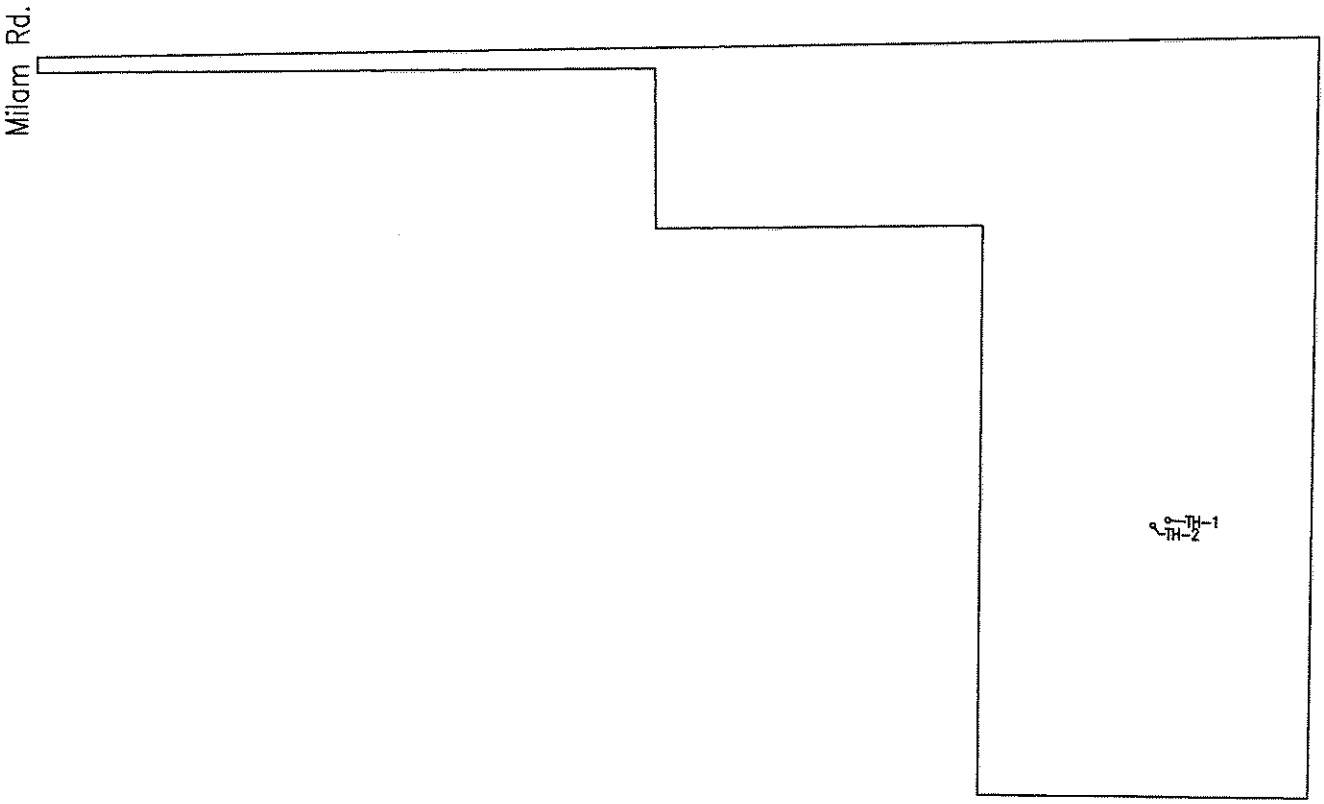
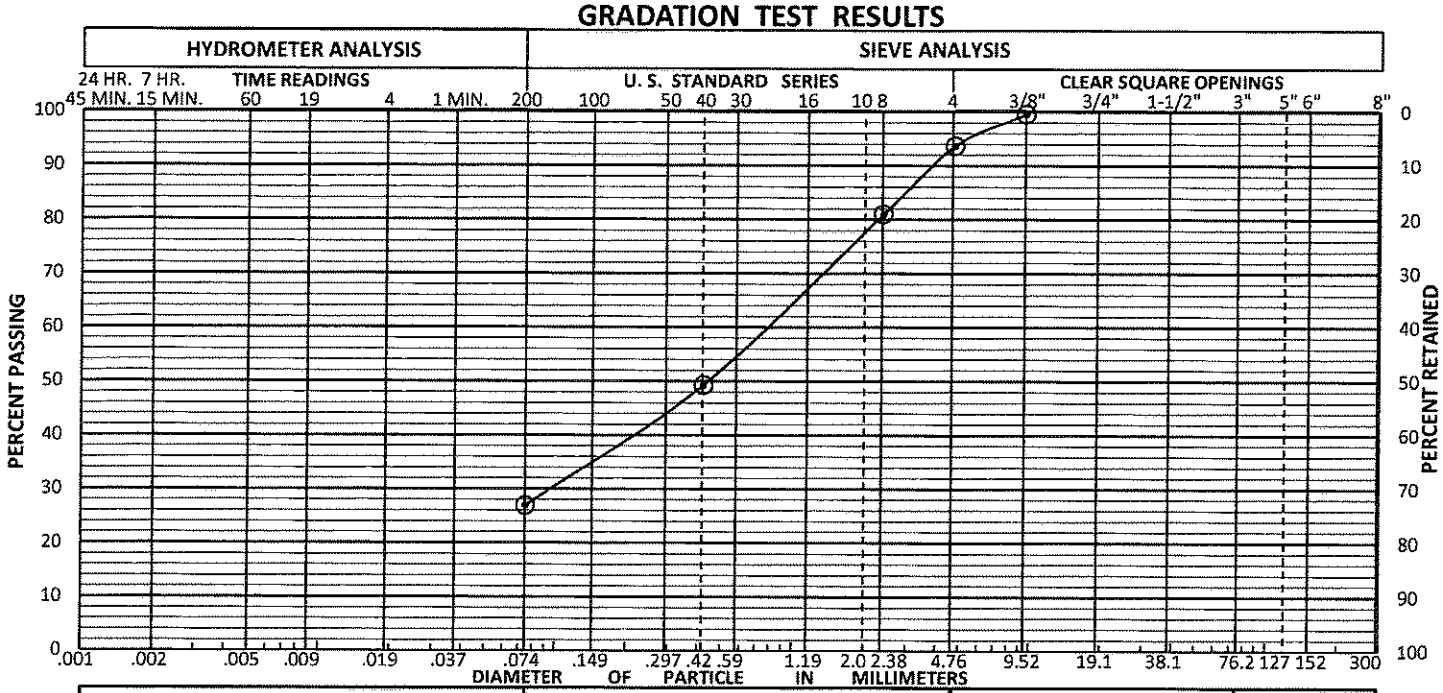
SITE MAP

Lot 2
10805 Milam Rd.
El Paso County
Colorado
Job #20-1216



0 100 200 300 400
GRAPHIC SCALE IN FEET
SCALE: 1" = 400'

GEOQUEST LLC
GRADATION TEST RESULTS



CLASSIFICATION SM

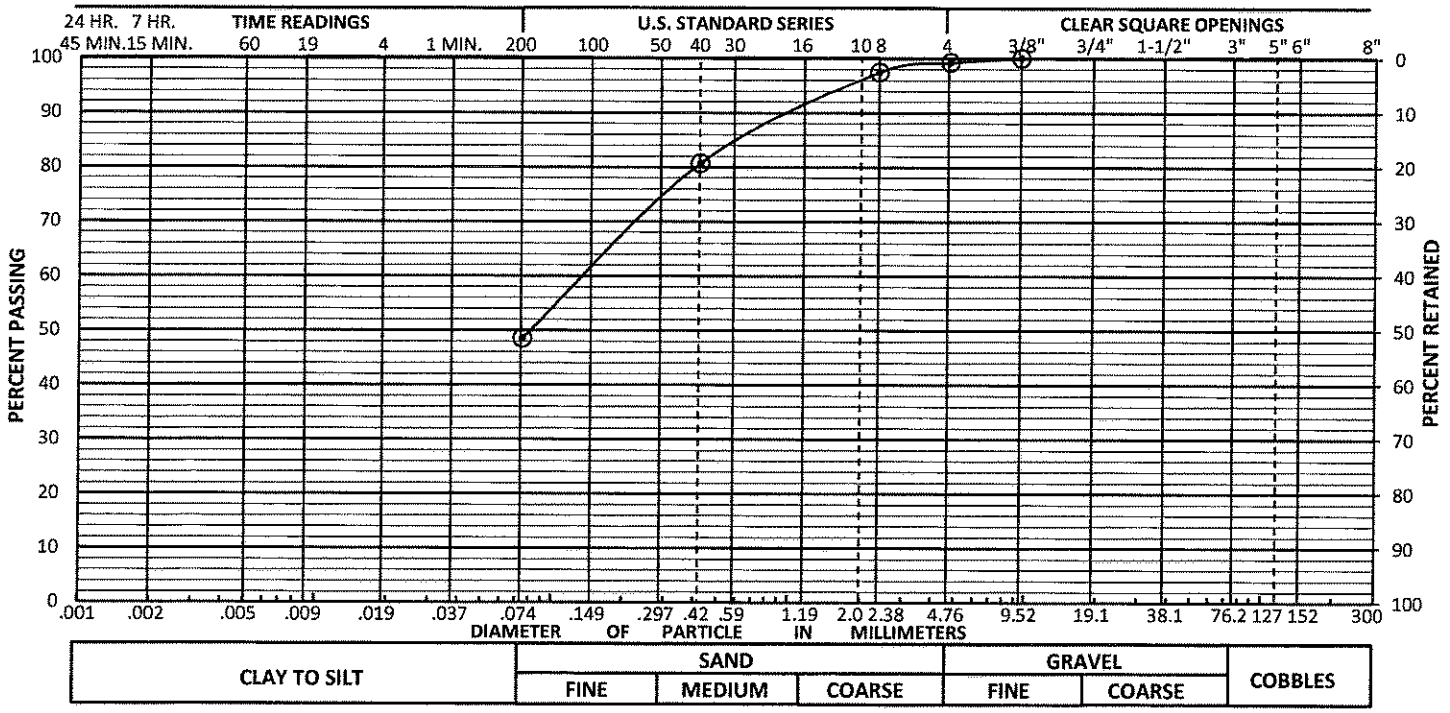
GRAVEL 6.4 %

SAND 66.7 %

FINES 26.9 %

SAMPLE # 1 **HOLE #** TH-1 **DEPTH** 3 **FEET**

NOTES: 5.6 % Moisture Content



CLASSIFICATION SC

GRAVEL 0.8 %

SAND 50.7 %

FINES 48.5 %

SAMPLE # 1 **HOLE #** TH- 2 **DEPTH** 13 **FEET**

NOTES: 10.3 % Moisture Content

LL = 28.6

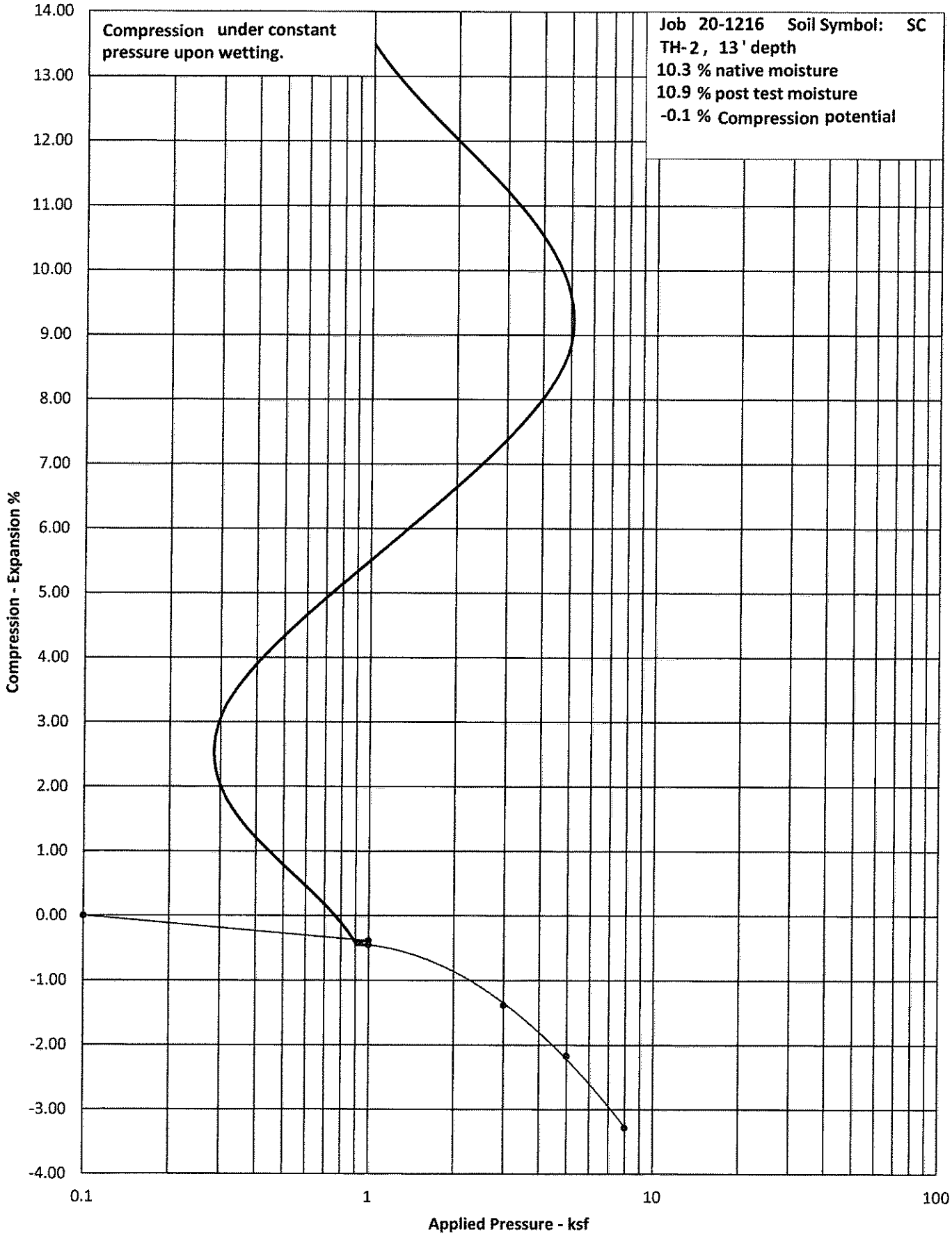
PL = 20.8

PI = 7.8

Job #: 20-1216 By: MJ 11/4/2020

GEOQUEST LLC

SWELL-CONSOLIDATION TEST RESULTS



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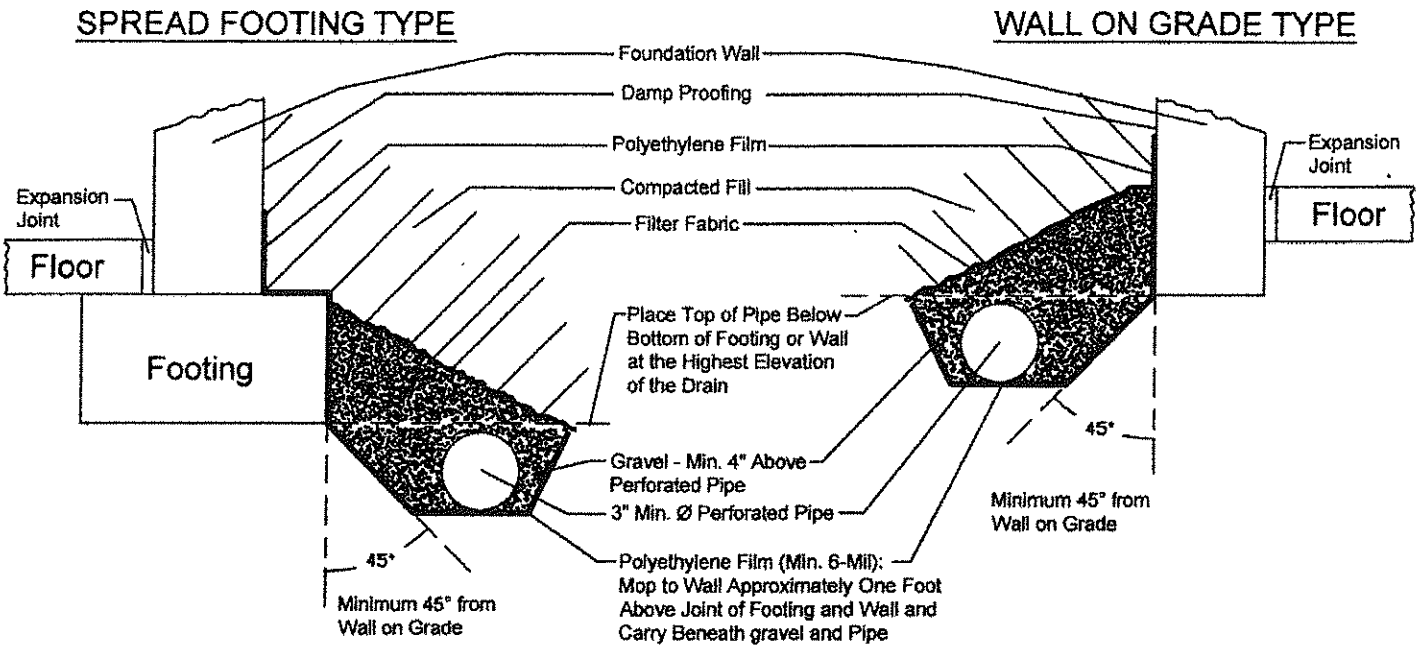
EXTERIOR DRAIN DETAIL



1. Gravel to be Not More Than 1-1/2" and Not Less Than 1/2" Diameter.

2. Perforated Pipe Diameter Varies With Expected Seepage. 3"Ø and 4"Ø are Most Common. ABS and PVC are Most Common Materials for Pipe. We approve the use of an "EZ Flow Drainage System" by Infiltrator. All specifications in this drain detail are still applicable.

3. Pipe to be Laid out in a Minimum Slope of 1" in 10'.

4. Gravity Outfall is Desired if Possible. Portion of Pipe in Area Not Drained Shall be Non-Perforated. Daylight Must be Maintained Clear of Debris in Order to Function Properly.

5. If Gravity Outfall is Not Possible, Provide a Sump With Operational Pump. Pump May Not Connect to Any Sanitary or Storm Sewer.

6. Soil Backfill Should be Compacted to at Least 80% of the Modified Proctor Denisty in the Upper Three Feet of Fill.

7. Filter Fabric to be Mirafi 140s or Approved Equivalent. Roofing Felt and Sheet Plastic are Not Acceptable.

8. Drain Pipe Shall be Laid Below Protected Area, as Shown in The Detail Above.

9. Mop Polyethylene Film to Wall Approximately One Foot Above Joint of Footing and Wall (Do Not Pull Plastic Tight) and Carry Beneath Gravel and Pipe.

10. The Polyethylene Film Shall be Continued to the Edge of the Excavation.

LIMITATIONS

This report is issued based on the understanding that the owner or his representative will bring the information, data, and recommendations contained in this report to the attention of the project engineer and architect, in order that they may be incorporated into the plans for the structure. It is also the owner's responsibility to ensure that all contractors and sub-contractors carry out these recommendations during the construction phase.

This report was prepared in accordance with generally accepted professional geotechnical/engineering methods. However, Geoquest, LLC makes no other warranty, express or implied, as to the findings, data, specifications, or professional advice rendered hereunder.

This report is considered valid as of the present date. The owner acknowledges, however, that changes in the conditions of the property might occur with the passage of time, such as those caused by natural effects or man-made changes, both on this land and on abutting properties. Further, changes in acceptable tolerances or standards might arise as the result of new legislative actions, new engineering advances, or the broadening of geotechnical knowledge. Thus, certain developments beyond our control may invalidate this report, in whole or in part.

This report and its recommendations do not apply to any other site than the one described herein and are predicated on the assumption that the soil conditions do not deviate from those described. In the event that any variations or undesirable conditions should be detected during the construction phase or if the proposed construction varies from that planned as of this report date, the owner shall immediately notify Geoquest, LLC in order that supplemental recommendations can be provided, if so required.