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SOIL AND GEOLOGY STUDY

11810 Stapleton Drive
Lot 2, The Shops, Filing No. 1 at Meridian Ranch
El Paso County, Colorado

PREPARED FOR:

Iqbal Singh Hunjan
12599 Mt. Lindsey Drive
Peyton, CO 80831

JOB NO. 192061

September 18, 2023

Respectfully Submitted,

RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,

RMG – Rocky Mountain Group

COLORADO REGISTERED
ANTHONY P. MUNGER
9/19/23
39818
PROFESSIONAL ENGINEER

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

TABLE OF CONTENTS

1.0 GENERAL SITE AND PROJECT DESCRIPTION

1.1 Project Location

The project lies in the S ½ of Section 30, Township 12 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. The site is generally located north and east of the intersection of Meridian Road and Stapleton Drive. The approximate location of the site is shown on the Site Vicinity Map, Figure 1.

1.2 Existing and Proposed Land Use

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

- Schedule No. 4230319056, addressed 11810 Stapleton Drive, zoned CR, consists of approximately 1.46 acres of vacant land;

The site is currently an undeveloped lot. The lot is to be accessed from the north via a paved interior road from Stapleton Drive or Meridian Road. The lot address and zoning are to remain as is.

1.3 Project Description

It is our understanding the site is to contain a 12,000 sf convenience and liquor store. Based on conversations with the client, the liquor store is to be atop a basement and the convenience store is to be atop a slab-on-grade foundation. The site is to have water and sewer provided by the Meridian Services Metropolitan District. An On-site Wastewater Treatment System (OWTS) is currently not proposed. The Site Plan is presented in Figure 2.

1.4 Previous Investigations

One previous geotechnical engineering investigation for this site was available for our review and is listed below:

1. *Soils Report, The Shops at Meridian Ranch, 11810 Stapleton Drive, El Paso County, Colorado*, A Better Soil Solution, Job #23-0022, dated January 30, 2023.

2.0 QUALIFICATIONS OF PREPARERS

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

The principle investigators for this study are Kelli Zigler P.G., and Tony Munger, P.E. Ms. Zigler is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) with over 20 years of experience in the geological and geotechnical engineering field. Ms. Kelli Zigler holds a B.S. in Geology from the University of Tulsa. Ms. Zigler has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Tony Munger, P.E. is a licensed professional engineer with over 20 years of experience in the construction engineering (residential) field. Mr. Munger holds a B.S. in Architectural Engineering from the University of Wyoming

3.0 STUDY OVERVIEW

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

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

3.1 Scope and Objective

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

The objectives of our study are to:

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

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

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

3.2 Site Evaluation Techniques

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

- Geologic and topographic maps

- Review of selected publicly available, pertinent engineering reports
- Available aerial photographs
- Geologic research and analysis

Geophysical investigations were not considered necessary for characterization of the site geology. Monitoring programs, which typically include instrumentation and/or observations for changes in groundwater, surface water flows, slope stability, subsidence, and similar conditions, are not known to exist and were not considered applicable for the scope of this report.

3.3 Additional Documents

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

4.0 SITE CONDITIONS

4.1 Existing Site Conditions

The site is currently vacant undeveloped land within The Shops at Meridian Ranch. The site is generally located north and east of the intersection of Meridian Road and Stapleton Drive, within El Paso County, Colorado. The site is bound to the north and east by an un-named interior roadway of The Shops at Meridian Ranch, to the south by Stapleton Drive, and to the west by a vacant parcel.

4.2 Topography

Based on aerial photographs and the 2022 topographic map of the Falcon Quadrangle, the site generally slopes down to the south and east. No drainageways or natural waterways were observed to exist on the property.

4.3 Vegetation

The site vegetation primarily consists of low lying native grasses, weeds, and other prairie-type vegetation that have repopulated after the overlot grading operations.

4.4 Aerial Photographs and Remote-Sensing Imagery

Personnel of RMG reviewed aerial photos available through Google Earth Pro dating back to 1985, Colorado Geological Survey (CGS) surficial geologic mapping, and historical photos by historicaerials.com dating back to 1947. The site has remained vacant, undeveloped land.

5.0 FIELD INVESTIGATION AND LABORATORY TESTING

5.1 Field and Laboratory Testing

The subsurface conditions below the subject site were investigated by A Better Soil Solution on January 12, 2023 as part of the site-specific Soils Report referenced in **Section 1.4 Previous Investigations**.

5.2 Drilling by Others

Four test borings were reportedly performed by A Better Soil Solution on the site to explore the subsurface soil conditions and provide recommendations for design and construction of the proposed foundation. The test borings were extended to depths of approximately 15 feet below the existing ground surface. The results of their investigations are presented in the referenced reports, attached and included in Appendix B. The approximate locations of A Better Soil Solution test holes are presented on the Engineering Geology Map, Figure 4.

5.3 Laboratory Testing by Others

Soil laboratory testing was reportedly performed as part of the investigation by A Better Soil Solution. The laboratory tests included moisture content, grain-size analyses, and Atterberg Limit tests. The results of their investigations are presented in the referenced reports, attached and included in Appendix B.

6.0 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

The site is located within the central portion of the Great Plains Physiographic Province. The site exists within the southern portion of a large structural feature known as the Denver Basin. In general, the geology at the site consists of alluvium and eolian composed of sand, silt, clay, gravel, and occasional boulders that overlie the Dawson Arkose sandstone.

6.1 Subsurface Soil Conditions

The subsurface materials encountered in the test borings were classified visually in the field and within the laboratory using the Unified Soil Classification System (USCS). The materials were identified in the Soils Report as well-graded sand (SW), poorly graded sand (SP), silty sand (SM), and clayey sand (SC)

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The classifications shown on the logs are based upon the visual 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.

6.2 Bedrock Conditions

In general, the bedrock (as mapped by Colorado Geologic Survey - CGS) beneath the site is considered to be part of the Dawson Formation. The sandstone bedrock was reportedly not encountered in the test borings by others. Overall, the on-site sands can readily be excavated with standard construction equipment such as a front-end loader or (mini) excavator.

6.3 U.S. Soil Conservation Service

The USDA/NRCS soil survey identified one soil type on the property:

- 19 – Columbine gravelly sandy loam, 0 to 3 percent slopes. The Columbine gravelly sandy loam was mapped by the USDA to encompass the majority of the property. Properties of the sandy loam

include, well-drained soils, depth of the water table is anticipated to be greater than 6.5 feet, runoff is anticipated to be low, frequency of flooding and/or ponding is none, and landforms include fans, floodplain and fan terraces.

The USDA Soil Survey Map is presented in Figure 3.

6.4 General Geologic Conditions

Based on review of relevant geologic maps, we identified the geologic conditions (listed below) affecting the development, as shown on the Engineering and Geology Map, Figure 4.

The site generally consists of alluvium and eolian deposits of the Holocene and Upper Pleistocene overlying the Dawson Formation. One general geologic unit was mapped at the site as:

- *Tkd – Dawson Arkose (Paleocene to Eocene)* – white and tan thick to massive, contains beds of medium-grained fledspathic and friable sandstone that is poorly sorted and have high clay contents. Unit also contains sparse interbeds of claystone and sandstone that contains fossilized plant fragments. Thickness is estimated to be approximately 700 feet in the in the Falcon quadrangle area.

6.5 Engineering Geology

One engineering geology unit was mapped at the site and is shown on the Engineering and Geology Map, Figure 4.

- *2A* – Stable alluvium, colluvium and bedrock on gentle to moderate slopes (0-12%)

The map unit description for the above units were provided by Charles Robinson and Associates (1977).

6.6 Structural Features

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

6.7 Surficial (Unconsolidated) Deposits

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

6.8 Features of Special Significance

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

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

6.9 Groundwater and Drainage of Surface Water

The overall topography of the site slopes down to the south and east. Groundwater was reportedly not encountered at the time of drilling by others. However, it was noted on the test hole TH-4 log that indications of redox was observed at 12 feet. Redox (redoximorphic) refers to the features indicating the fluctuation of groundwater.

It should be noted that in granular soils and bedrock, some subsurface water conditions might be encountered due to the variability of the soil profile. Isolated sand and gravel layers within the soil, even those of limited thickness and width, can convey subsurface water. Subsurface water may also flow atop the interface between the upper soils and the underlying bedrock. While not indicative of a "groundwater" condition, these occurrences of subsurface water migration can (especially in times of heavy rainfall or snowmelt) result in water migration into the excavation or (once construction is complete) the building envelope. Builders and planners should be cognizant of the potential for the occurrence of subsurface water conditions during on-site construction, and be prepared to evaluate and mitigate each individual occurrence as necessary.

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

6.10 Flooding and Surface Drainage

Based on our review of the Federal Emergency Management Agency (FEMA) Community Panel No. 08041C0551G and the online ArcGIS El Paso County Risk Map, the entire site lies outside of a 100-year floodplain.

Zone X is defined by FEMA as an area of minimal flood hazard that is determined to be outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The entire site lies within Zone X. The FEMA Map is presented in Figure 6.

7.0 ECONOMIC MINERAL RESOURCES

Under the provision of House Bill 1529, it was made a policy by the State of Colorado to preserve for extraction commercial mineral resources located in a populous county. Review of the *El Paso Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction*, *Map 2* indicates the site is identified as Upland Deposits. The deposits are composed of sand, gravel with silt and clay. These deposits are remnants of older streams deposited on topographic highs or bench like features. The tract is underlain primarily by the Dawson Arkose, a sedimentary formation of Tertiary age related to uplift and erosion of the Front Range.

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. In this part of the Denver coal region, coal resources are locally present within the lower part of the Laramie Formation of Upper Cretaceous age. The area contains strata that may contain coal. This area is not prospective for metallic mineral resources. No oil and gas wells are drilled in the area, or within two miles of it. Alluvial deposits are commonly mined in the region for sand and gravel.

There is an active gravel pit approximately one mile to the south of the site and several within a five-mile radius of it.

8.0 IDENTIFICATION AND MITIGATION OF POTENTIAL GEOLOGIC CONDITIONS

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

- Avalanches
- Debris Flow-Fans/Mudslides
- Ground Subsidence and Abandoned Mining Activity
- Landslides
- Rockfall
- Steeply Dipping Bedrock
- History of Landfill
- Valley Fill
- Downhill/Down-slope Creep
- Scour, Erosion, Accelerated Erosion Along Creek Banks and Drainageways
- Uncontrolled/Undocumented Fill Placement
- Corrosive Minerals

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

8.1 Compressible Soils - constraint

Based on the test borings performed for this investigation, the sand with varying amounts of silt and clay underlies the entire site. It is anticipated that the on-site sand soils will be encountered within the building excavation. In some cases, the sands encountered in the excavations may be loose.

Mitigation

If loose soils are encountered beneath the proposed foundations, mitigation will be required. Mitigations are anticipated to consist of additional compaction to achieve suitable allowable bearing pressures. Fluctuations in material density may occur. In some cases, removal and recompaction of up to 2 to 3 feet of soil may be required. The removal and recompaction shall extend a minimum of the same distance beyond the building perimeter, and at least that same distance beyond the perimeter of counterfort and "T" wall footings. The use of track-mounted excavation equipment, or other low ground pressure equipment, is recommended on loose soils to reduce the likelihood of loss of stability during excavation.

The potential for settlement is directly related to saturation of the soils below the foundation areas. Therefore, good surface and subsurface drainage is critical in these areas in order to reduce the potential for saturation of the soils. The **Surface Drainage** and **Subsurface Drainage** sections of the site specific Soils Report, referenced above and attached in Appendix B should be adhered to. It is the responsibility of the contractor to schedule all inspections.

8.2 Potentially Expansive Soils and Bedrock – constraint

Based on our experience with the soils and bedrock in the vicinity. Seams of sandy clay or claystone may be present even where non are indicated on the test boring logs. Sandy clay and claystone bedrock (if encountered) generally possess low to high swell potential. It is anticipated if lenses or seams of expansive clay soils or claystone bedrock are encountered at the time of the site-specific excavation observation, additional mitigations will be required at the time of the Open Excavation Observation. These materials are readily mitigated with typical construction practices common to this region of El Paso County, Colorado.

Mitigation

Sporadic areas of expansive soils and bedrock are anticipated within the Dawson Formation. If expansive soils or bedrock are encountered beneath the foundations, mitigation will be required. "Mass" subexcavation during land development is currently not proposed. Overexcavation and replacement with non-expansive (on-site or imported) soils is a suitable mitigation. Floor slabs bearing directly on expansive material should be expected to experience movement. Overexcavation and replacement has also been successful in reducing slab movement. Overexcavation is not anticipated to be required but if clay or claystone seams are encountered in the excavation, overexcavation depths of 3 to 4 feet may be recommended.

Recommendations for soil mitigation and foundation design criteria are included in the Soils Report, referenced above and included in Appendix B. Provided that appropriate mitigations and/or foundation design adjustments are implemented, the presence of expansive soils or bedrock is not considered to pose a risk to the proposed structure.

8.3 Springs and Groundwater – constraint

Based on the site observations, review of USGS topographic maps dating back to 1951, and review of Google Earth images dating back to 1999, springs do not appear to originate on the subject site. Furthermore, water and areas of seasonal shallow groundwater were not encountered during the investigation, by others.

Drilling reportedly occurred in January 2023, when seasonal groundwater levels are generally anticipated to be lower. The presence of groundwater was not reportedly observed in the test borings by others. However, it was noted on the test hole TH-4 log that indications of redox were observed at 12 feet. Groundwater measurements are limited to the time of year measured and are considered snapshots only.

Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Groundwater information obtained at the time of the preliminary investigations performed prior to any future land development may or may not be representative of the conditions present at the time of construction. Furthermore, the development processes (reshaping of the ground surface, installation of buried utilities, installation of an underdrain below the roadways, etc.) can significantly alter the depth and flow paths of the subsurface water. The

construction of surrounding lots can also alter the amount and depth of subsurface groundwater below a given lot. The potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas, the following mitigations should be followed.

Mitigation

Currently, the proposed development is to be a convenience and liquor store. Construction is anticipated to consist of wood framed structure atop a partial basement and slab-on-grade foundation. The shallow foundation is anticipated to have a minimum 4 to 6 feet separation from the underlying seasonally fluctuating groundwater.

It is assumed underground water beneath the subject site predominates in fractured weathered consolidated sedimentary bedrock located at depth. If deeper foundations are proposed in the future or if shallower underground water conditions are encountered during the open excavation observations, recommendations are to be provided at that time.

Due to the limited cut and fills proposed, groundwater is not anticipated to be encountered in the excavations or utility trenches. Foundations must have a minimum 30-inch depth for frost protection. Perimeter drains are recommended around portions of the structures which will have habitable or storage space located below the finished ground surface. Perimeter drains help reduce the risk of the intrusion of water into areas below grade.

8.4 Faults and Seismicity - hazard

Based on review of the Earthquake and Late Cenozoic Fault and Fold Map Server provided by CGS located at http://dnrwebmapgdev.state.co.us/CGSOnline/ and the recorded information dating back to November of 1900, Colorado Springs has not experienced a recorded earthquake with a magnitude greater than 1.6 during that period. The nearest recorded earthquakes over 1.6 occurred in December of 1995 in Manitou Springs, which experienced magnitudes ranging between 2.8 to 3.5. Additional earthquakes over 1.6 occurred between 1926 and 2001 in Woodland Park, which experienced magnitudes ranging from 2.7 to 3.3. Both of these locations are located near the Ute Pass Fault, which is greater than 10 miles from the subject site. Earthquakes felt at this site will most likely result from minor shifting of the granite mass within the Pikes Peak Batholith, which includes pull from minor movements along faults found in the Denver basin. It is our opinion that ground motions resulting from minor earthquakes may affect structures (and the surrounding area) at this site if minor shifting were to occur.

Mitigation

The Pikes Peak Regional Building Code, 2017 Edition, indicates maximum considered earthquake spectral response accelerations of 0.213g 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.

8.5 Radon – constraint

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

Northern El Paso County and the 80831 zip code in which the site is located, has an EPA assigned Radon Zone of *1*. A radon Zone of 1 predicts an average indoor radon screening level greater than 0.4 pCi/L

(picocuries per liter), which is above the recommended levels assigned by the EPA. *The EPA recommends corrective measures to reduce exposure to radon gas.*

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

Mitigation

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

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

9.0 BEARING OF GEOLOGIC CONDITIONS UPON PROPOSED DEVELOPMENT

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

10.0 CONCLUSIONS

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

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

We believe the sand with varying amounts of silt and clay will classify as Type B material as defined by OSHA. OSHA requires that temporary excavations made in Type B materials be laid back at ratios no steeper than 1:1 (horizontal to vertical), unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer.

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

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

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

11.0 CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

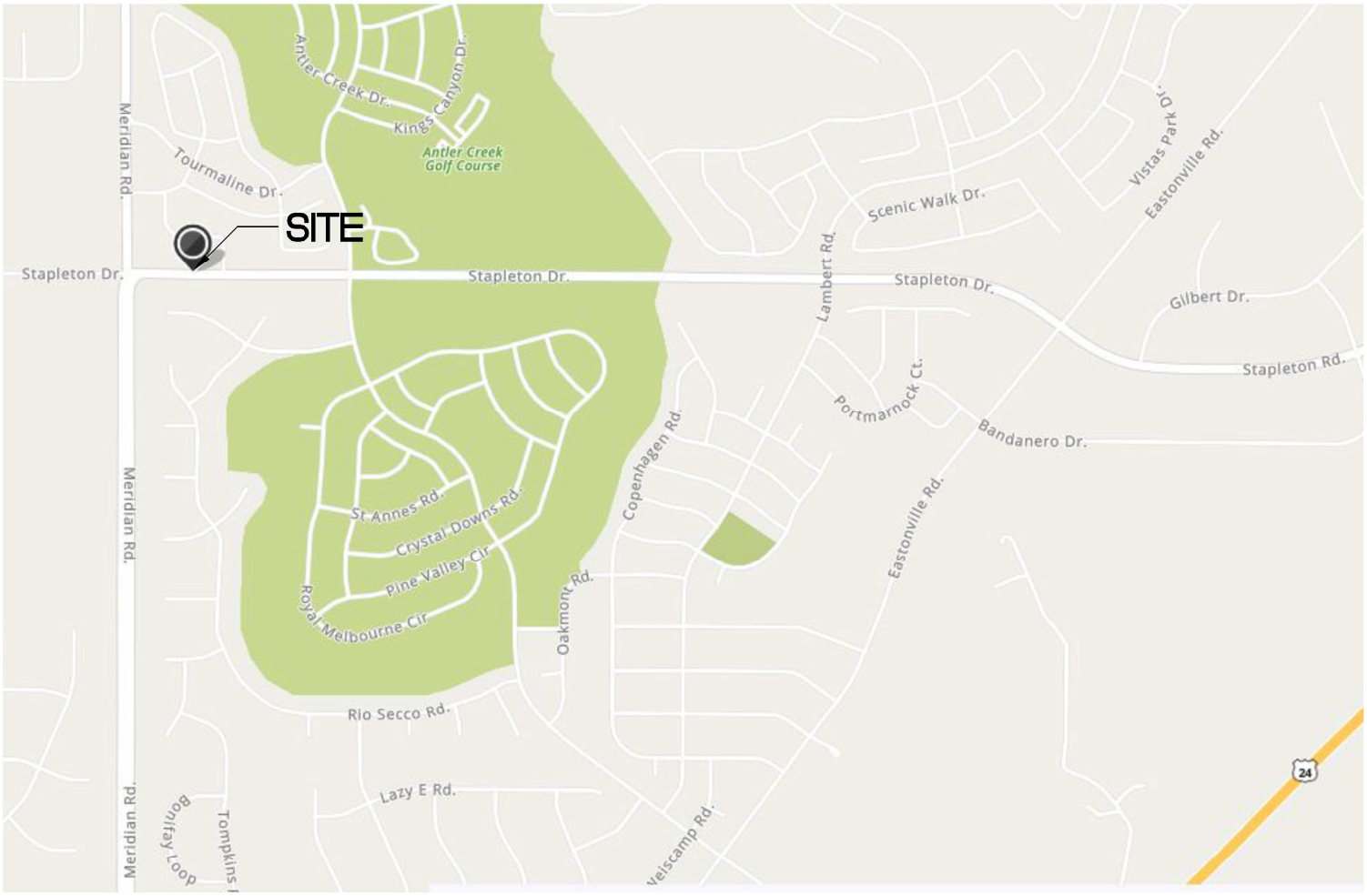
This report has been prepared for the exclusive use by **Iqbal Singh Hunjan** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers 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.

The scope of services for this project does not include, either specifically or by implication, 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 Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

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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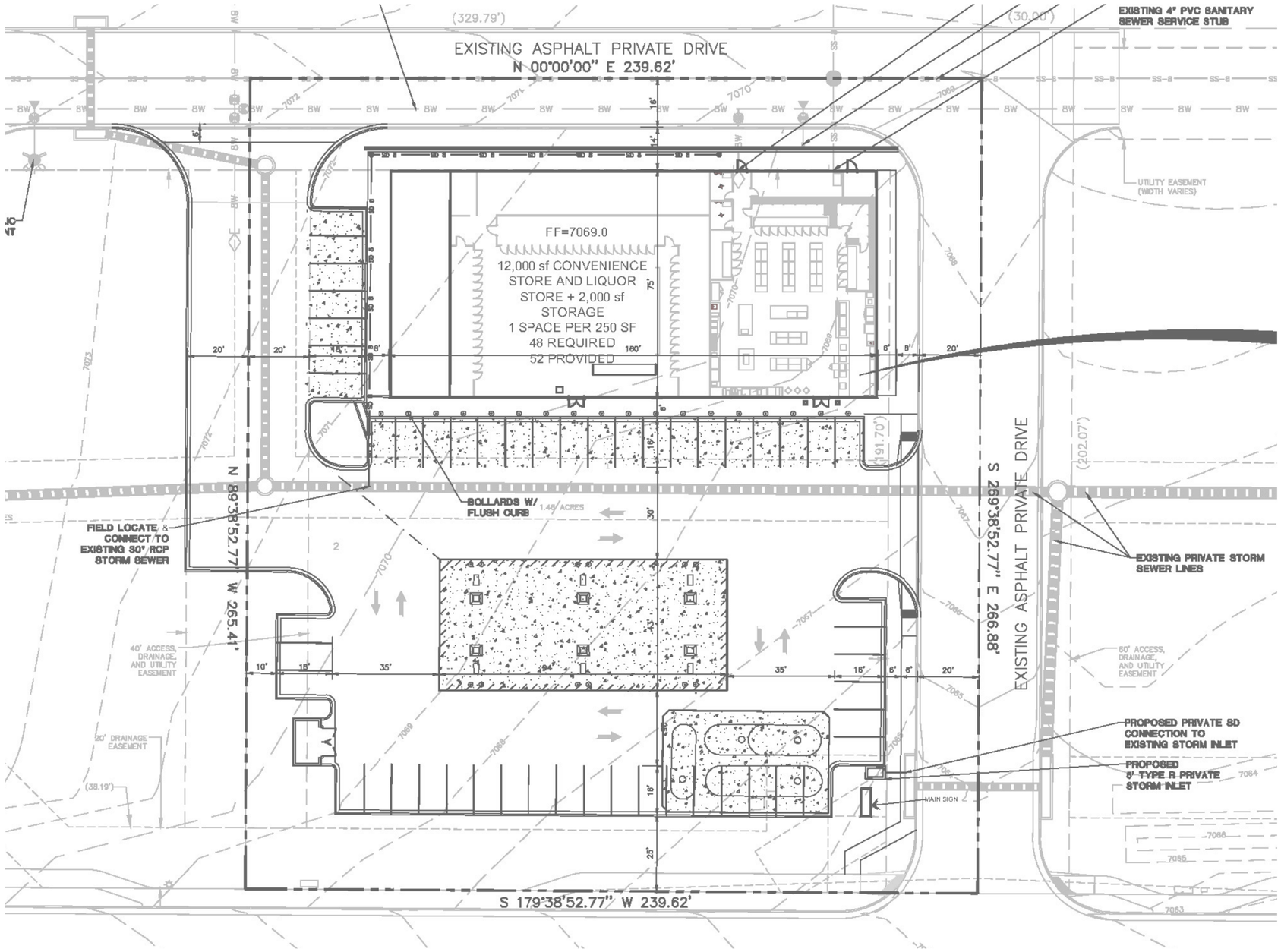
SITE VICINITY MAP

11810 STAPLETON DRIVE
LOT 2, THE SHOPS, FILING NO. 1
AT MERIDIAN RANCH
EL PASO COUNTY, COLORADO
IQBAL SINGH HUNJAN

JOB No. 192061

FIG No. 1

DATE 9-18-2023



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BASE MAP PROVIDED BY: JPS ENGINEERING

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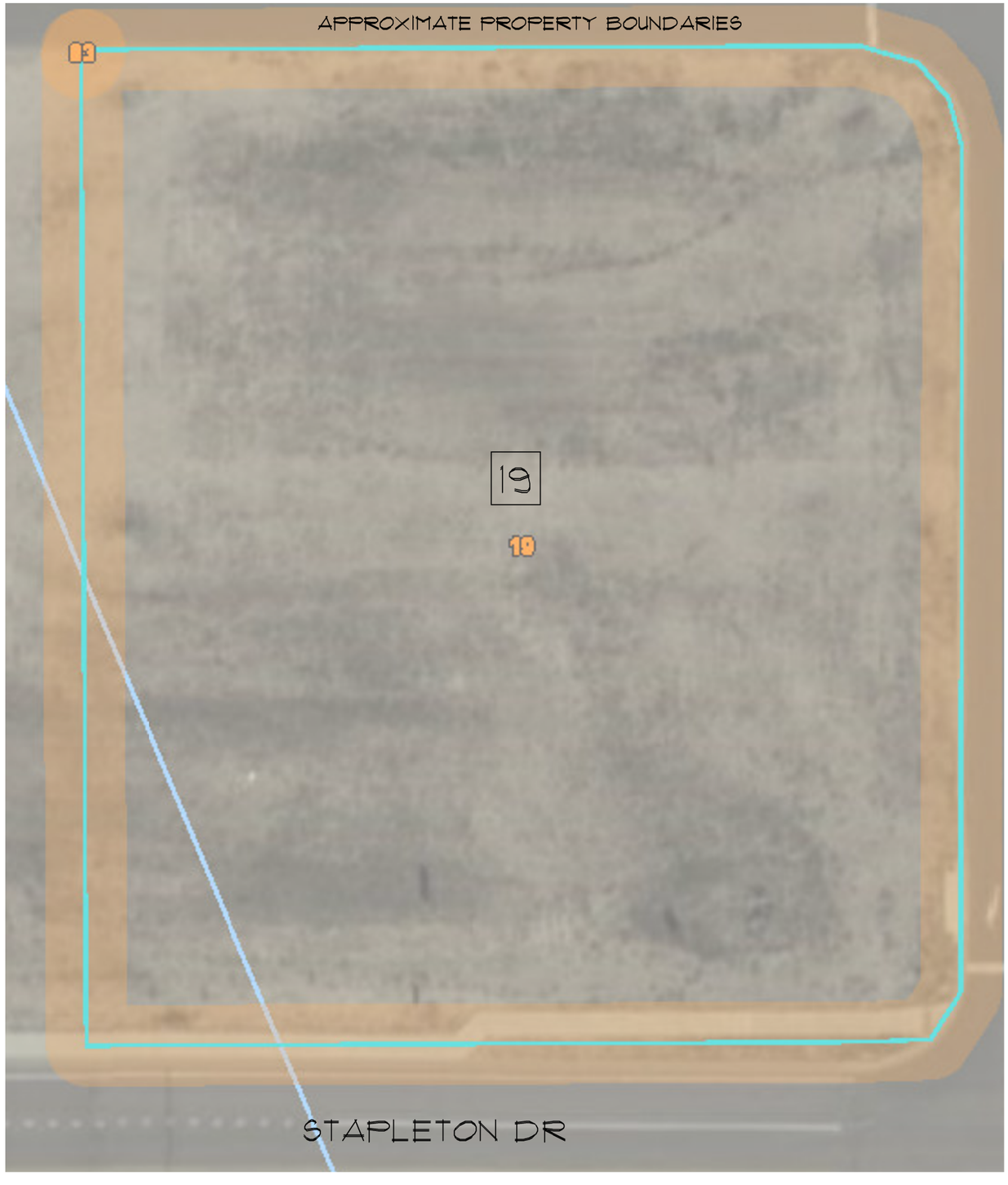
11810 STAPLETON DRIVE
LOT 2, THE SHOPS, FILING NO. 1
AT MERIDIAN RANCH
EL PASO COUNTY, COLORADO
IQBAL SINGH HUNHAN

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	9-11-2023

SITE PLAN

SHEET No.
FIG-2



19 - Columbine gravelly sandy loan, 0 to 3 percent slopes

NOT TO SCALE

BASE MAP PROVIDED BY: USDA

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11810 STAPLETON DRIVE
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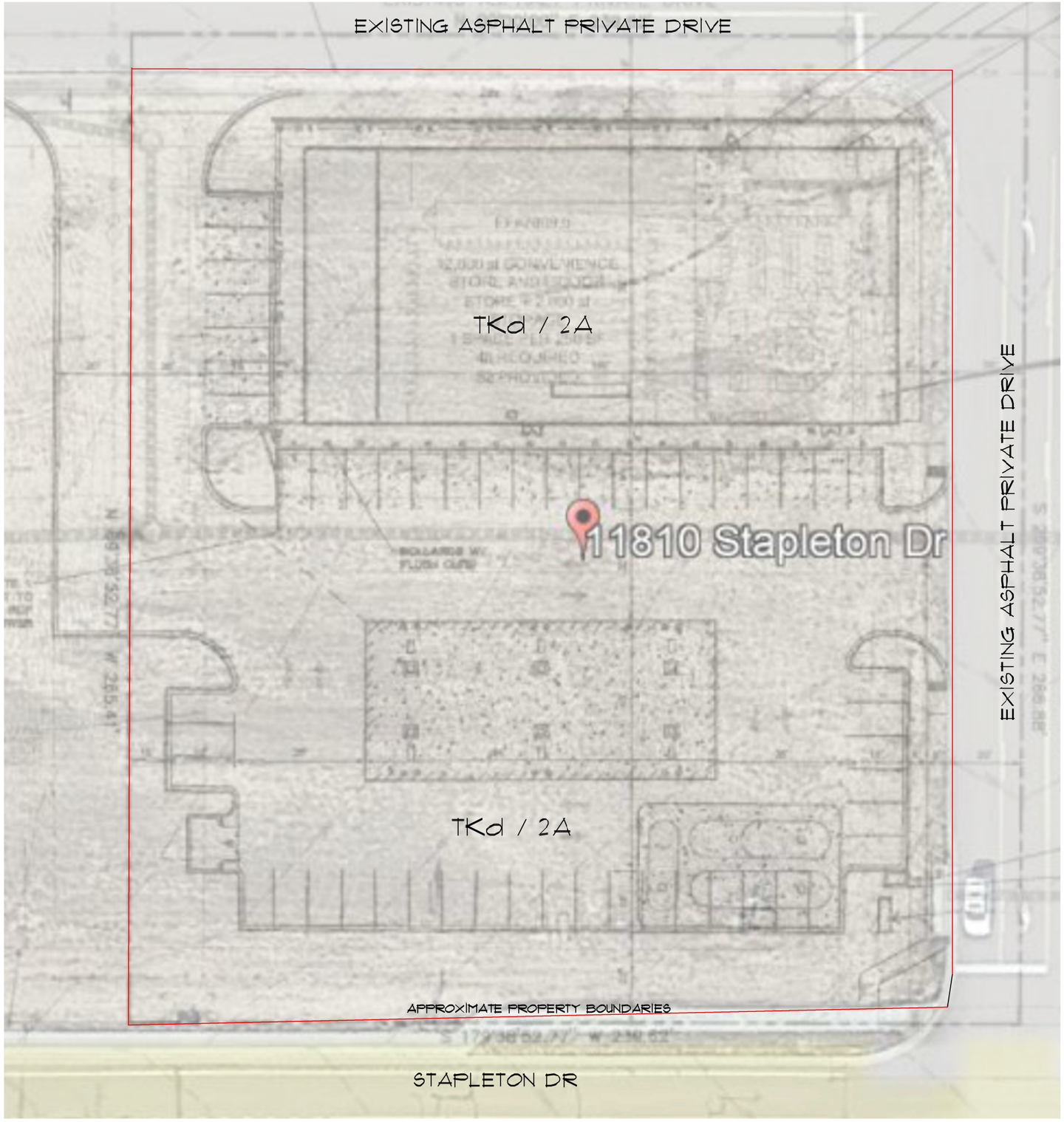
AT MERIDIAN RANCH
EL PASO COUNTY, COLORADO
IQBAL SINGH HUNHAN

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	9-11-2023

USDA SOIL SURVEY MAP

SHEET No.
FIG-3



General Geologic Conditions

- *Tkd - Dawson Arkose Formation* - sandstone bedrock with interbedded claystone seams underlies the entire site

Engineering Geology

- *2A* - Stable alluvium, colluvium and bedrock on gentle to moderate slopes (0-12%)

NOT TO SCALE

BASE MAP PROVIDED BY: JPS Engineering

JOB No. 192061

RMG
Materials Testing
Forensics
Civil / Planning
Architecture
Structural
Geotechnical
Engineers / Architects
SOUTHERN COLORADO OFFICE
2910 AUSTIN BLUFFS PKWY, SUITE 100,
COLORADO SPRINGS, CO 80918
(719) 548-0600 ~ WWW.RMGENGINEERS.COM
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

11810 STAPLETON DRIVE
LOT 2, THE SHOPS, FILING NO.1
AT MERIDIAN RANCH
EL PASO COUNTY, COLORADO
IQBAL SINGH HUNHAN

ENGINEER:	TM
DRAWN BY:	KZ
CHECKED BY:	TM
ISSUED:	9-11-2023

ENGINEERING AND GEOLOGY MAP

SHEET No.
FIG-4

NOT TO SCALE

Architecture
Structural
Geotechnical

RMG

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Forensics
Civil / Planning

Engineers / Architects

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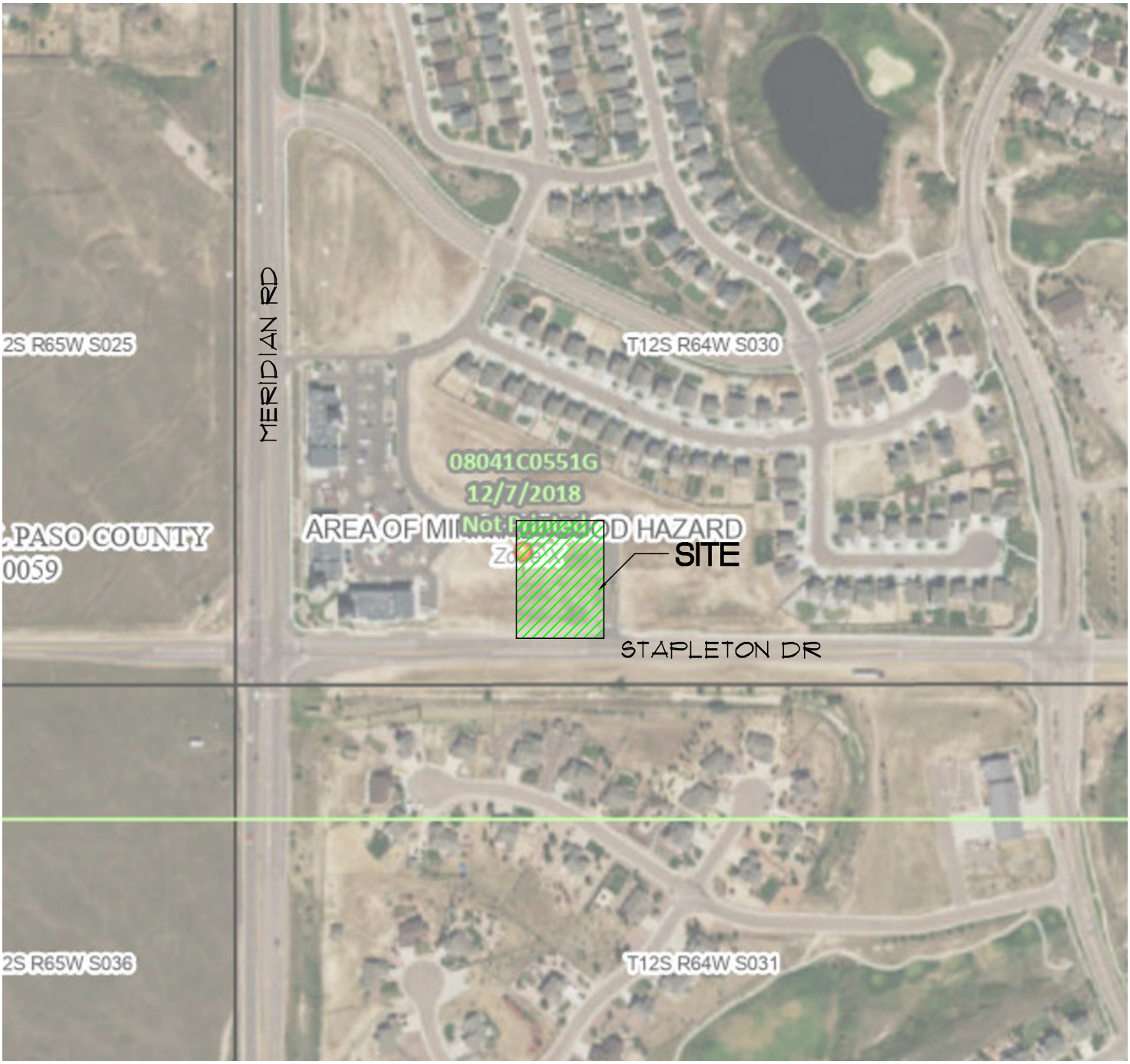
USGS TOPO MAP

11810 STAPLETON DRIVE
LOT 2, THE SHOPS, FILING NO. 1
AT MERIDIAN RANCH
EL PASO COUNTY, COLORADO

JOB No. 192061

FIG No. 5

DATE 9-18-2023



REFERENCE
NOT TO SCALE

Architecture
Structural
Geotechnical

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Engineers / Architects
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COLORADO SPRINGS, CO 80918
(719) 548-0600 ~ WWW.RMGENGINEERS.COM
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

FEMA MAP

11810 STAPLETON DRIVE
LOT 2, THE SHOPS, FILING NO. 1
AT MERIDIAN RANCH
EL PASO COUNTY, COLORADO
IQBAL SINGH HUNJAN

JOB No. 192061

FIG No. 6

DATE 9-18-2023

APPENDIX A
Additional Reference Documents

1. *Soils Report, The Shops at Meridian Ranch, 11810 Stapleton Drive, El Paso County, Colorado,* A Better Soil Solution, Job #23-0022, dated January 30, 2023.
2. *Site Development Plan, Shop's @ Meridian Ranch,* YOW Architects PC, Job No. 18.115, dated December 12, 2022.
3. *Site Utility Plan, Shops at Meridian Ranch Convenience Store,* JPS Engineering, Project No. 092202, dated December 7, 2022.
4. *Flood Insurance Rate Map, El Paso County, Colorado and Unincorporated Areas, Community Panel No. 08041C0551G,* Federal Emergency Management Agency (FEMA), effective December 7, 2018.
5. *Falcon Quadrangle Geologic Map, El Paso County, Colorado,* Morgan, M.L., and White, J.L. Colorado Geological Survey, Open-File Report OF-12-05, 2012.
6. *Environmental and Engineering Geologic Map for Land Use*, *Falcon Quadrangle*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
7. *Map of Potential Geologic Hazards and Surficial Deposits, Falcon Quadrangle*, compiled by Dale M. Cochran, Charles S. Robinson & Associates, Inc., Golden, Colorado, 1977.
8. Pikes Peak Regional Building Department: https://www.pprbd.org/.
9. *El Paso County Assessor Website:*
   https://property.spatialest.com/co/elpaso/#/property/5301000018
   Schedule No. 5301000018
10. *Colorado Geological Survey, USGS Geologic Map Viewer*:
    http://coloradogeologicalsurvey.org/geologic-mapping/6347-2/.
11. *Historical Aerials:* https://www.historicaerials.com/viewer, Images dated 1947, 1955, 1960, 1969, 1983, 1999, 2005, 2009, 2011, 2013, 2015, 2017, and 2019.
12. *USGS Historical Topographic Map Explorer:* http://historicalmaps.arcgis.com/usgs/ El Paso County, Falcon Quadrangle, 2022.
13. *Google Earth Pro*, Imagery dated 1999, 2003, 2004, 2005, 2006, 2011, 2013, 2015, 2017, 2019, *2020, 2021, and 2022.*
14. *Coal resources of the Denver and Cheyenne basins, Colorado,* Kirkham, R.M., and Ladwig, L.R., 1979,: Colorado Geological Survey Resource Series 5, 70 p., 5 plates
15. Mason, G. T., and Arndt, R. E., 1996, Mineral resource data system (MRDS): U.S. Geological Survey Digital Data Series DDS-20 (CD-ROM).
16. *Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands*
17. The *El Paso Aggregate Resource Evaluation Map, Master Plan for Mineral Extraction*, *Map 1*

APPENDIX B

Soils Report – A Better Soil Solution

30 January 2023

A Better Soil Solution

5072 List Drive
Colorado Springs, CO 80919

SOILS REPORT

FOR

HUNJAN GAS STATIONS LLC

JOB #23-0022

The Shops at Meridian Ranch,
11810 Stapleton Drive,
El Paso County,
Colorado

Sincerely,

Charles E. Milligan, P.E.

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 A Better Soil Solution, Inc. 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 **Hunjan Gas Stations LLC, owner, at The Shops at Meridian Ranch, 11810 Stapleton Drive, El Paso County, Colorado.** This report is prepared with the understanding that a Commercial Structure is planned for this site. The site does not have existing structures.

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 Low-Moderate density materials shall be designed for a loading of not greater **1,500 pounds per square foot.** Foundation components resting directly on undisturbed Moderate density materials shall be designed for a loading of not greater **2,000 pounds per square foot.** Foundation components resting directly on undisturbed Moderate-High density materials shall be designed for a loading of not greater **3,000 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, Poorly Graded Silty Sand, Well Graded Silty Sand, and Clayey Sand (U.S.C.S. Classification Symbol SM, SP-SM, SW-SM, SC). The unit weight of equivalent fluid soil pressure of this material is 45 (SM), 35 (SP-SM), 35 (SW-SM), and 85 (SC) pounds per cubic foot. The native SC material is not suitable and shall not be used as backfill material around the perimeter of the foundation.** The actual equivalent fluid soil pressure was not determined. The expected values are from ASCE 7-10, Table 3.2-1. **Foundation components should bear on soils of similar bearing capacity. Foundation components bearing on dissimilar soils should be avoided. 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. The bearing capacity is calculated with a safety factor of three.

FIELD AND LABORATORY INVESTIGATION

Four exploratory holes were drilled on January 12, 2023, at the locations shown on the enclosed site map. The location of these test holes was determined by Hunjan Gas Stations LLC. The test holes were drilled with a 4-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 southeast at 3%.

WEATHER

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

DESIGN AND CONSTRUCTION CONSIDERATIONS

Slabs-on-grade may move and crack. Vertical slab movement of up to one and a half inches should be expected for native soils with low expansion potential. In some cases, vertical movement may exceed this range. If movement and associated damage to basement floors and finishes 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 **(ASTM D-1557)**. 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 360R-10)**. Moisten the ground beneath the slab prior to the placement of concrete.

4. All concrete placed must be cured properly as recommended by the American Concrete Institute **(ACI 360R-10)**. 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 almost any soil contains at least a small amount of swell/consolidation potential, slabs may 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 subgrade, possibly causing it to expand/consolidate. Also, if the slab is placed with concrete too wet, expansion/consolidation 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.

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.

A Better Soil Solution, Inc. does not assure that the contractor and/or homeowner will comply with the recommendations provided in this report. A Better Soil Solution, Inc. provides recommendations only and does not supervise, direct or control the implementation of the recommendations.

Failure to follow the recommendation provided by A Better Soil Solution, Inc. and follow observation requirements may jeopardize the construction project and A Better Soil Solution, Inc. shall be absolved from any and all responsibility for any damages arising from the failure to obtain proper site observation and follow recommendations.

COLD TEMPERATURE CONSIDERATIONS

1. Concrete shall not be placed upon wet or 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. Ponding of water should be avoided in the excavation area.

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 foot zone is not possible on the upslope side 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 from being directed in the wrong direction. All downspouts shall have extensions that will remove runoff to the outside of the backfilled areas. 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 the likelihood of floor slab and foundation movement.

All exterior grading and location of downspouts and their performance shall be inspected by A Better Soil Solution, Inc. **The native Clayey Sand (SC) material is not suitable and shall not be used as backfill material around the perimeter of the foundation.** If on-site soils are not suitable for the backfill, the backfill material shall consist of clean non-cohesive granular soils or road base material as described previously. Imported material is to be approved by A Better Soil Solution, Inc. prior to placement. **We recommend imported granular backfill with a maximum unit weight of 45 pounds per cubic foot**. It is the responsibility of the contractor to schedule all inspections**.**

SUBSURFACE DRAINAGE

Perimeter drains are required around all walls of the habitable or usable area portion of the structure that are below finished grade including all common wall(s) adjacent to the basement. Crawlspaces, slab on grade, and walkout areas need not be drained unless specified at the time of the Open Hole Observation. Perimeter drains may be required during the open hole due to high moisture or grade that slopes toward the excavation. The final determination of the necessity for perimeter drains will be made at the time of the Open Hole Observation. An Exterior Drain Detail is provided in this report. Drains should daylight away from the structure or discharge to a sump pump. Even if drains are not required, areas below grade may experience moisture problems if unusual conditions are present in the future.

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, pads, and/or piers 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 structure, 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 A Better Soil Solution, Inc. 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 **A Better Soil Solution, Inc.** 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.**

COMPACTION TESTING (added cost)

A Better Soil Solution, Inc. shall perform compaction testing on any replaced material. Soil shall be compacted in maximum 6-inch lifts. Testing shall be performed at intervals not to exceed 24 inches (or as required by the design engineer). Modified Proctor Density must be provided to A Better Soil Solution, Inc. prior to compaction testing, see below.

The owner, or a representative of the construction, shall contact A Better Soil Solution, Inc. a **minimum of 24 hours prior to the time the compaction test is requested. The failure to properly compact and/or obtain proper compaction testing may result in this Soils Report being declared null and void.**

MODIFIED PROCTOR DENSITY TESTING (added cost)

Modified Proctor Density test must be provided to A Better Soil Solution, Inc. prior to compaction testing. If a Proctor cannot be provided, a Modified Proctor Density test must be completed prior to compaction testing. Two 5-gallon valid samples of the soil to be used, must be provided for testing, at least 2 weeks prior to the placement and compaction of the material.

The failure to provide this data may result in this Soils Report being declared null and void.

FINAL OBSERVATIONS (added cost)

The owner, or a representative of the construction company, shall contact A Better Soil Solution, Inc. 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 A Better Soil Solution, Inc. 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. **The failure to obtain this inspection may result in this Soils Report being declared null and void.**

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, A Better Soil Solution, Inc. makes no other warranty, express or implied, as to the findings, data, specifications, or professional advice rendered hereunder. **Due to circumstances outside of A Better Soil Solution, Inc.'s control, including improper construction, failure to follow recommendations, and unforeseen events, the Limits of Liability extend only to fees rendered for the professional services provided.**

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 A Better Soil Solution, Inc. in order that supplemental recommendations can be provided, if so required.

This report excludes possible environmental issues, geologic hazards, flooding, or any other natural or man-made hazards that affect this site. These are outside the scope of work, for this report.

APPENDIX

Solid Stem Auger (STA) Log TH-1

Project Info.
Project :11810 Stapleton Dr
Client :Hunjan Gas Stations LLC
Location :Peyton, CO
Job No.:23-0022

Borehole Info.
Depth:15 (ft) Elevation:
GWL:- (ft) Latitude:38.970510
Drill Date:1/12/23 Longitude:-104.605493
Logged By:AB+NB Method:Solid Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	w (%)	Particle Analysis Test: Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Atterberg Limits: LL (%)	PL (%)	PI (%)	Remarks & Comments
0						**Topsoil**	0									
1						**Poorly Graded Silty Sand** *Fine-Coarse Grained* *Low-Moderate Density* *Low-Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Very Pale Brown in Color*	1								
2							2									
3							3									
4		U	* 16	SP-SM A-4(0)			4	5	0.7	87.5	11.8					
5						**Silty Sand** *Fine-Coarse Grained* *Moderate Density* *Moderate-High Moisture Content* *Low Clay Content* *Low Plasticity* *Very Pale Brown in Color*	5								
6							6									
7							7									
8							8									
9		U	* 25	SM A-4(0)			9	15.1	1.9	68.9	29.2					
10							10									
11							11									
12						**Silty Sand** *Fine-Coarse Grained* *High Density* *Moderate-High Moisture Content* *Low Clay Content* *Low Plasticity* *Very Pale Brown in Color*	12								
13							13									
14			* 44				14									
15		U		SM A-4(0)		End of Log @ 15 (ft)	15	13.5	4	71.4	24.6					

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NP : Non Plastic
- w : Moisture Content

Solid Stem Auger (STA) Log TH-2

Project Info.
Project :11810 Stapleton Dr
Client :Hunjan Gas Stations LLC
Location :Peyton, CO
Job No.:23-0022

Borehole Info.
Depth:15 (ft) Elevation:
GWL:- (ft) Latitude:38.970471
Drill Date:1/12/23 Longitude:-104.605169
Logged By:AB+NB Method:Solid Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	w (%)	Particle Analysis Test: Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Atterberg Limits: LL (%)	PL (%)	PI (%)	Remarks & Comments
0						**Topsoil**	0									
1						**Well Graded Silty Sand** *Fine-Coarse Grained* *Moderate-High Density* *Low-Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Brown in Color*	1									
2		U	* 39	SW-SM A-1-b(0)			2	7	12.6	80.8	6.6					
3							3									
4							4									
5						**Poorly Graded Silty Sand** *Fine-Coarse Grained* *Moderate Density* *Low-Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Very Pale Brown in Color*	5									
6							6									
7		U	* 23	SP-SM A-1-b(0)			7	6.9	4.4	85	10.6					
8							8									
9							9									
10							10									
11						**Silty Sand** *Fine-Coarse Grained* *Moderate Density* *Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Pinkish Gray in Color*	11									
12		U	* 28	SM A-1-b(0)			12	12.9	10.6	75.6	13.8					
13							13									
14							14									
15						End of Log @ 15 (ft)	15									

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- U SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NP : Non Plastic
- w : Moisture Content

Solid Stem Auger (STA) Log TH-3

Project Info.
Project :11810 Stapleton Dr
Client :Hunjan Gas Stations LLC
Location :Peyton, CO
Job No.:23-0022

Borehole Info.
Depth:15 (ft) Elevation:
GWL:- (ft) Latitude:38.970131
Drill Date:1/12/23 Longitude:-104.605118
Logged By:AB+NB Method:Solid Stem Auger

Company Info.
A Better Soil Solution

Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	w (%)	Particle Analysis Test: Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Atterberg Limits: LL (%)	PL (%)	PI (%)	Remarks & Comments
0						**Topsoil**	0									
1						**Silty Sand** *Fine-Coarse Grained* *Low-Moderate Density* *Low-Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Pinkish Gray in Color*	1								
2							2									
3							3									
4		SPT	* 16	SM A-1-b(0)			4	5.8	3.2	82.4	14.4					
5						**Well Graded Silty Sand** *Fine-Coarse Grained* *Moderate Density* *Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Pinkish Gray in Color*	5								
6							6									
7							7									
8							8									
9		SPT	* 24	SW-SM A-1-b(0)			9	13	9.6	81.2	9.2					
10						**Silty Sand** *Fine-Coarse Grained* *Very High Density* *Low-Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Pinkish Gray in Color*	10								
11							11									
12							12									
13							13									
14		SPT	* (90)	SM A-1-b(0)			14	7.6	4.6	77.4	18					
15						End of Log @ 15 (ft)	15									

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NP : Non Plastic
- w : Moisture Content

Solid Stem Auger (STA) Log TH-4

Project Info.
Project :11810 Stapleton Dr
Client :Hunjan Gas Stations LLC
Location :Peyton, CO
Job No.:23-0022

Borehole Info.
Depth:15 (ft) Elevation:
GWL:- (ft) Latitude:38.970128
Drill Date:1/12/23 Longitude:-104.605502
Logged By:AB+NB Method:Solid Stem Auger

Company Info.
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Depth (ft)	GWL (ft)	Sample Type	Field Tests (* SPT)	USCS / AASHTO	Symbol	Lithology Description	Depth (ft)	w (%)	Particle Analysis Test: Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Atterberg Limits: LL (%)	PL (%)	PI (%)	Remarks & Comments
0						**Topsoil**	0									
1						**Silty Sand** *Fine-Coarse Grained* *Very High Density* *Low-Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Pinkish Gray in Color*	1								
2		U	* (60)	SM			2	5.9	1.6	65.5	32.9		-	NP	NP	
3							3									
4							4									
5							5									
6						**Silty Sand** *Fine-Coarse Grained* *Moderate-High Density* *Moderate Moisture Content* *Low Clay Content* *Low Plasticity* *Pinkish Gray in Color*	6								
7		U	* 33	SM A-1-b(0)			7	10	11.6	71.8	16.7					
8							8									
9							9									
10							10									
11						**Clayey Sand** *Fine-Coarse Grained* *Very High Density* *Moderate Moisture Content* *Low-Moderate Clay Content* *Low Plasticity* *Light Gray in Color*	11								
12		U	* 50	SC A-2-6(2)			12	13.9	0.4	64.7	35		34.2	14.4	19.8	Redox Encountered at 12 Ft
13							13									
14							14									
15						End of Log @ 15 (ft)	15									

Sample Types
- ● Disturbed
- + Undisturbed
- □ Shelby / U4
- ■ Core Cutter
- U SPT Sample
- Water Sample
- ▽ Groundwater Level

Abreviations
- LL : Liquid Limit
- PL : Plastic Limit
- PI : Plastic Index
- NP : Non Plastic
- w : Moisture Content

Site Map

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Coordinates

Bore Hole	Latitude	Longitude
TH-1	38.970510	-104.605493
TH-2	38.970471	-104.605169
TH-3	38.970131	-104.605118
TH-4	38.970128	-104.605502

Particle Analysis Test

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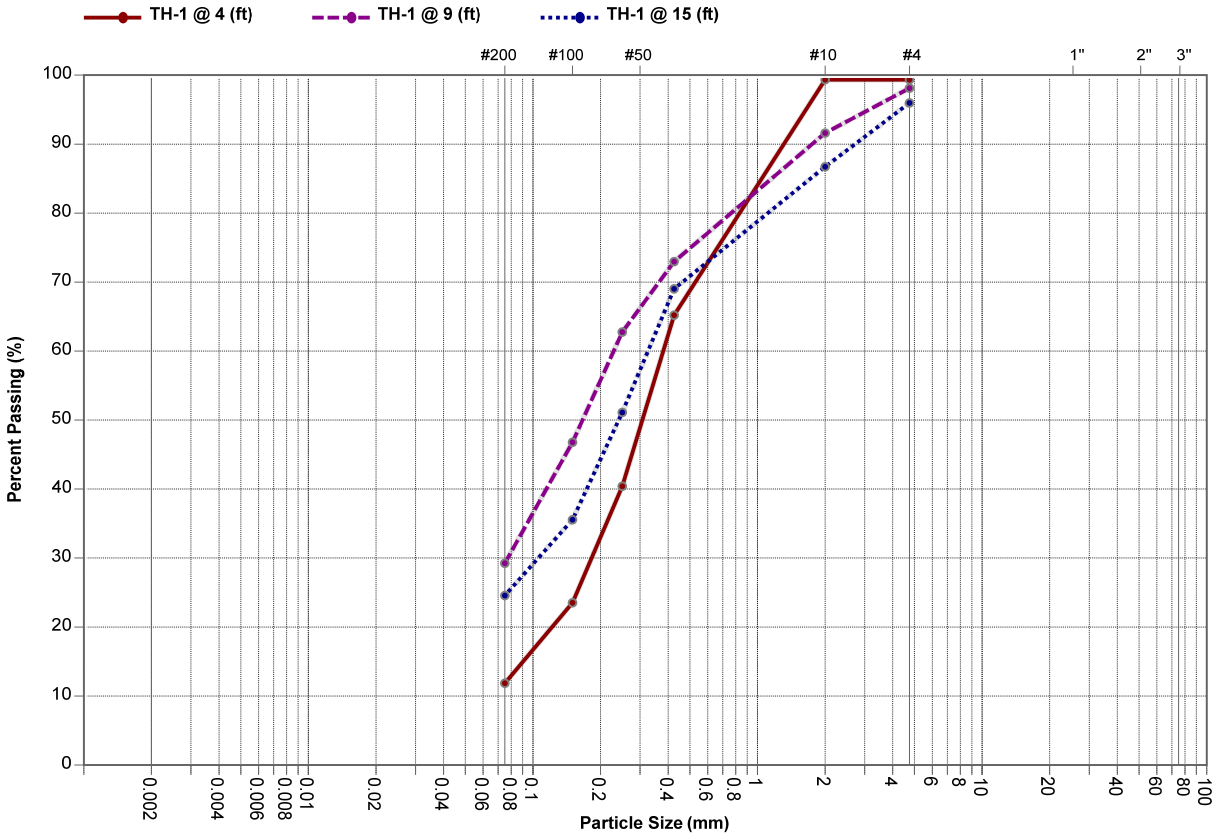
ASTM D6913



Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobble
11.8		87.5	0.7	-
29.2		68.9	1.9	-
24.6		71.4	4	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-1	4	-	0.182	0.307	0.38	87.168	-	-	-	N/A	SP-SM	A-2-6|2|
TH-1	9	-	0.077	0.166	0.229	25.891	-	-	-	N/A	SM	A-2-6|2|
TH-1	15	-	0.106	0.241	0.325	34.572	-	-	-	N/A	SM	A-2-6|2|

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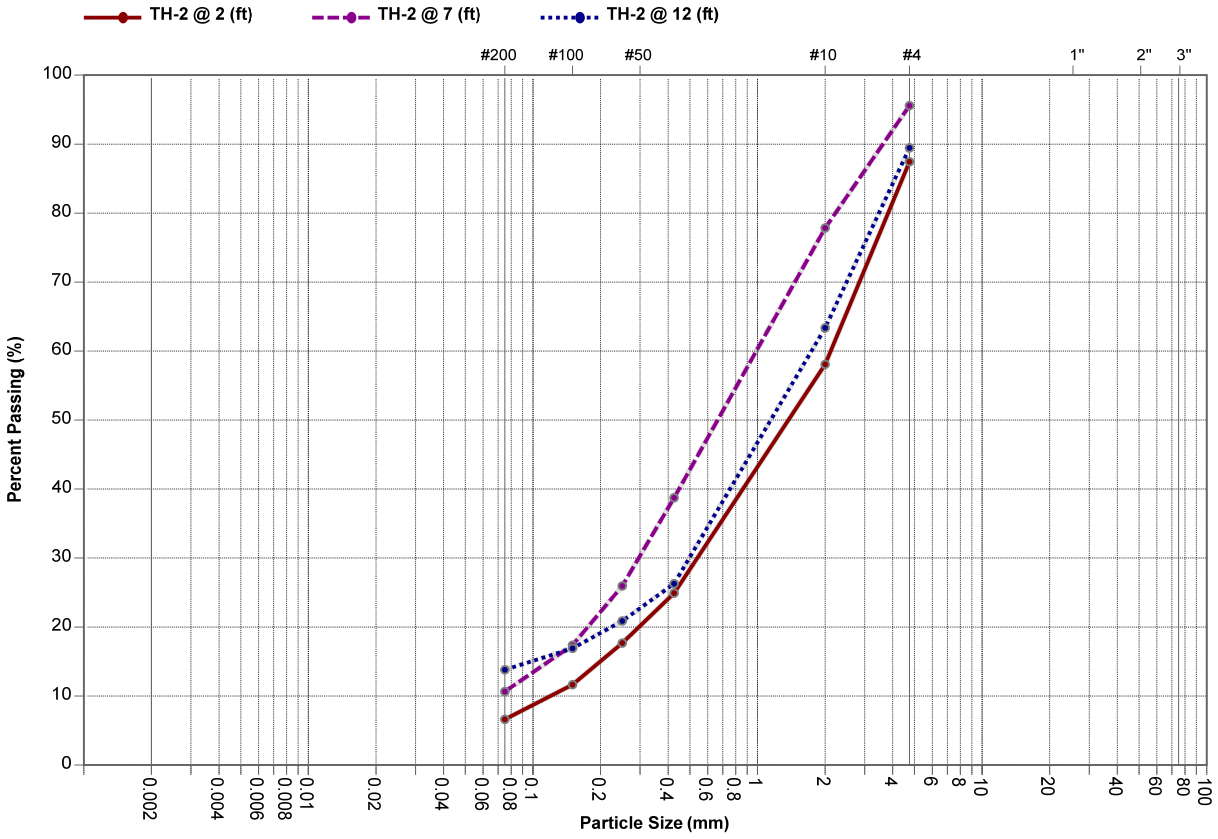

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobble
6.6		80.8	12.6	-
10.6		85	4.4	-
13.8		75.6	10.6	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-2	2	0.12	0.539	1.372	2.117	1.144	17.642	-	-	N/A	SW-SM	A-1-b(0)
TH-2	7	-	0.296	0.664	0.987	88.77	-	-	-	N/A	SP-SM	A-1-b(0)
TH-2	12	-	0.496	1.145	1.738	141.551	-	-	-	N/A	SM	A-1-b(0)

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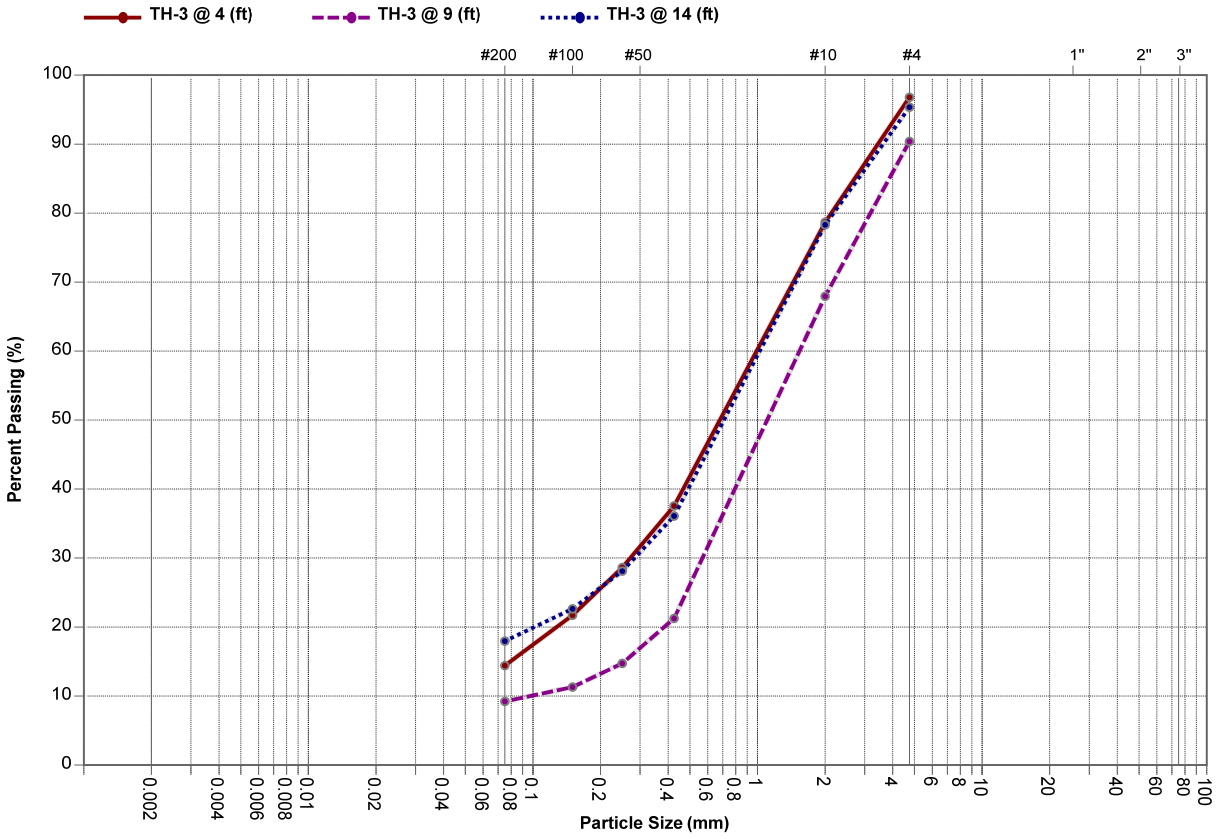

Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobble
14.4		82.4	3.2	-
9.2		81.2	9.6	-
18		77.4	4.6	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-3	4	-	0.272	0.679	0.99	74.731	-	-	-	N/A	SM	A-1-b(0)
TH-3	9	0.098	0.568	1.103	1.537	2.142	15.684	-	-	N/A	SW-SM	A-1-b(0)
TH-3	14	-	0.284	0.708	1.022	78.92	-	-	-	N/A	SM	A-1-b(0)

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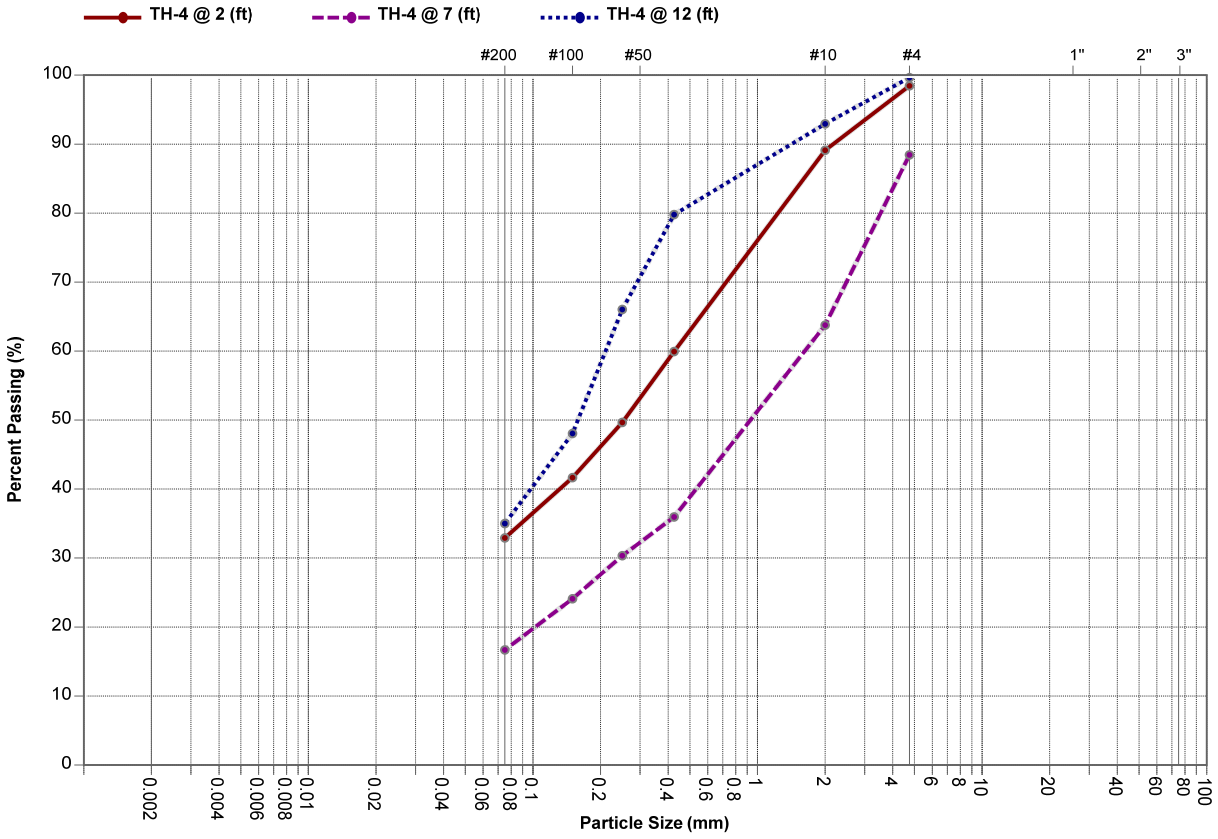


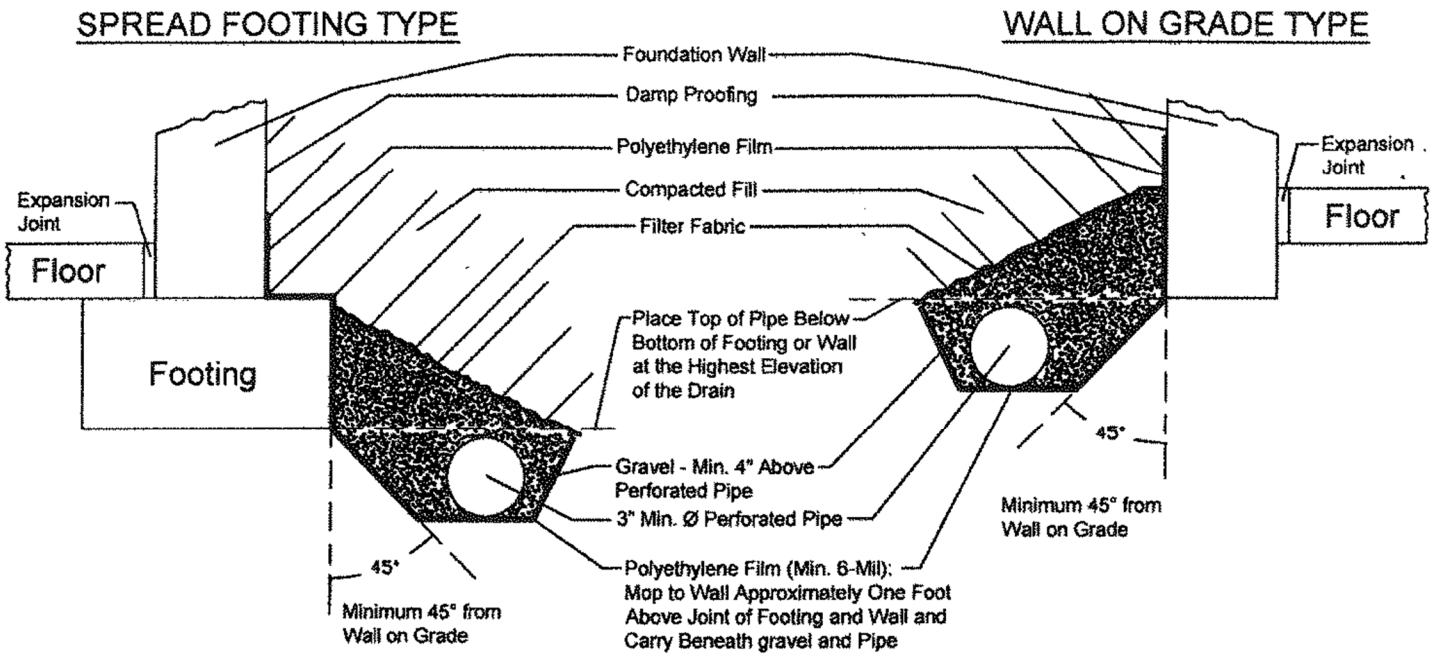
Particle Distribution (%)

Clay	Silt	Sand	Gravel	Cobble
32.9		65.5	1.6	-
16.7		71.8	11.6	-
35		64.7	0.4	-

Classification

Borehole	Sample Depth (ft)	D10 (mm)	D30 (mm)	D50 (mm)	D60 (mm)	Cc	Cu	LL (%)	PI (%)	Disp. (%)	USCS	AASHTO
TH-4	2	-	-	0.255	0.427	-	-	-	-	N/A	SM	A-1-b|0|0
TH-4	7	-	0.243	0.929	1.622	36.405	-	-	-	N/A	SM	A-1-b(0)
TH-4	12	-	-	0.159	0.211	-	-	34.2	19.8	N/A	SC	A-2-6(2)

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.