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SOILS AND GEOLOGY STUDY
ROCKY MOUNTIAN CALVARY ELLICOTT CAMPUS
PARCEL NO. 34000-00-207
2150 NORTH ELLICOTT HIGHWAY
EL PASO COUNTY, COLORADO

Prepared for:

Rocky Mountain Calvary Church
4285 North Academy Boulevard
Colorado Springs, Colorado 80918

Attn: Robert Beech

March 19, 2024

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford, P.G.
Sr. Geologist

Reviewed by:

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Date: 03/19/24

Joseph C. Goode Jr., P.E.
President

LLL

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1 SUMMARY

Project Location

The project lies in portions of the NE¼ and NE¼ of Section 1, Township 14 South, Range 63 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located north of Ellicott Highway and Highway 94 approximately 12 miles east of the Colorado Springs city limits.

Project Description

The project will consist of the construction of a new church structure and associated site improvements to be located at 2150 N. Ellicott Highway in Ellicott, Colorado on a 2.76-acre property. The new structure will be serviced by an existing water well and a new on-site wastewater treatment system (OWTS).

Scope of Report

This report presents the results of our geologic evaluation and treatment of engineering geologic hazard study.

Land Use and Engineering Geology

This site was found to be suitable for the proposed development. Areas were encountered where the geologic conditions will impose constraints on development and land use. These include areas of artificial fill and expansive soils. Based on the proposed site plan, it appears that these areas will have some impacts on the development. These conditions will be discussed in greater detail in the report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site can be properly mitigated with site grading and engineering design. All recommendations are subject to the limitations discussed in the report.

2 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The project lies in portions of the NE¼ and NE¼ of Section 1, Township 14 South, Range 63 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located on Ellicott Highway north of Highway 94 approximately 12 miles east of the Colorado Springs city limits. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gently sloping to the southeast. No drainages were observed on the site, however, Black Squirrel Creek is located just north of the site. The site boundaries are indicated on the USGS Map, Figure 2. The site is generally free of vegetation in the parking areas with grasses and trees around the existing church building. Site photographs, taken March 4, 2024, are included in Appendix A.

The project is located at 2150 N. Ellicott Highway in Ellicott, Colorado on a 2.76-acre property. The project will consist of the construction of a new church building, parking lot, and detention pond along with other associated site improvements. The new structure will be serviced by an existing water well and a new on-site wastewater treatment system (OWTS). An existing church building with OWTS which is located on the eastern side the site will remain. The Site and Exploration Plan is presented in Figure 3.

3 SCOPE OF THE REPORT

The scope of the report includes a general geologic analysis utilizing published geologic data. Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions and their effects on the development of the property.

4 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance and measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the

Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on March 4, 2024.

A *Geotechnical and Pavement Design Report* was performed for the site by Entech dated February 16, 2024 (Reference 1, Appendix B), and a *OWTS Site Evaluation* dated March 6, 2024 (Reference 2, Appendix C) were conducted for the proposed development. Five (5) test borings were drilled and four (4) test pits excavated on the site to determine general soil and bedrock characteristics. The locations of the test borings and test pits are indicated on the Site and Exploration Plan, Figure 3. The Summary of Laboratory Testing Results and the Test Boring Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was performed on select samples of the soils to classify and determine the soils engineering characteristics. Laboratory tests included grain-size analysis, ASTM D-422, and Atterberg Limits, ASTM D-4318. Swell/Consolidation and FHA Swell Testing to evaluate expansion potential. Sulfate testing was performed on selected samples to evaluate potential for below grade concrete degradation due to sulfate attack. A Summary of Laboratory Test Results is included in Appendix B.

5 SOIL, GEOLOGY, AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 26¼ miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northerly direction (Reference 5). The rocks in the area of the site are sedimentary in nature and typically Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Formation of Tertiary to Cretaceous Age. Overlying this formation are stream terrace and artificial fill deposits. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 3), previously the Soil Conservation Service (Reference 4) has mapped two soil types on the site (Figure 4). In general, the soils classify as fine sandy loam. The soils are described as follows:

Soil Type	Description
28	Ellicott loamy coarse sand, 0 – 5% slopes
78	Sampson loam, 0 – 3% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to have moderate permeabilities. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have moderate erosion hazards.

5.3 Site Stratigraphy

The *Geologic Map of the Pueblo1ºx2º Quadrangle* showing the site is presented in (Figure 5, Reference 5). The Geology/Engineering Geology Map prepared for the site is presented in Figure 6. Two mappable units were identified on this site which are described as follows:

Qaf **Artificial Fill of Holocene Age:** These are man-placed fill deposits associated with a stockpile of material in the western portion of the site.

Ql **Louviers Alluvium of Pleistocene Age:** These deposits are light brown silty sands which can contain an abundance of gravels. They commonly occur as stream terrace deposits above the valley floors.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Pueblo1ºx2º Quadrangle* distributed by the United States Geological Survey in 1978 (Reference 5). The test borings and test pits were also used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

5.4 Soil Conditions

Subsurface conditions for the proposed project site consisted of expansive clays overlying native medium dense to dense silty to clayey sand to sand with silt encountered in all the test borings either from the existing ground surface and extending to the termination of the borings at 10 to 15 feet bgs or below the Type 2 clay at 4 feet and extending to 17 to 19 feet bgs. The very stiff to hard sandy clay was encountered in TB-1 and TB-2 at the surface or below 12 inches of road base (TB-1) and extended to 4 feet below ground surface. Sandstone bedrock, or very dense silty sand to sand with silt when classified as a soil (Soil Type 3), was encountered in borings TB-1 and TB-2 at depths ranging from 17 to 19 feet and extended to the termination of the borings (20 feet).

Swell/Consolidation testing on samples of the site clayey soils resulted in volume changes of 3.3% to 5.8%. The results indicate moderate to high expansion potentials. FHA swell testing on a sample of silty sand from TB-5 at 2 to 3 feet resulted in a swell pressure of 240 pounds per square foot (psf) indicating a low expansion potential.

5.5 Groundwater

Depth to groundwater was measured in each of the borings at the conclusion of drilling. Groundwater was not encountered in any of the test borings during, or subsequent to, drilling. These areas are discussed in the following section. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. It should be noted that in the sandy materials on-site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

Detailed mapping has been performed on this site to produce an Engineering Geology Map Figure 6. This map shows the location of various geologic conditions of which the developers should be cognizant during the planning, design and construction stages of the project. These hazards and the recommended mitigation techniques are as follows:

Artificial Fill – Constraint

These recent man-place deposits associated stockpiles of material located in the western portion of the site which will be removed during the development and grading of the site.

Mitigation: The fill on this site is considered controlled for construction purposes, however, may still require mitigation due to the expansive nature of the soils. Any uncontrolled fill encountered beneath foundations will require removal and recompaction at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Expansive Soils – Constraint

Expansive soils were encountered in the test borings drilled on site. The expansive soils encountered at or near foundation grade, can cause differential movement in structures. Mitigation will be required for the proposed construction.

Mitigation Expansive soils mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils or penetration. Fill should be placed at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. Overexcavation depths of 4 feet or penetration is recommended. Specific recommendations have been provided in the *Geotechnical and Pavement Design Report* (Reference 1, Appendix B).

Groundwater and Floodplain Areas

No drainages were observed on the site, and the site is not mapped within floodplain zones according to the FEMA Map No. 08041CO807G, (Figure 7, Reference 6). Black Squirrel Creek and associated floodplain are located north of the site. Groundwater was not encountered in the

test borings which were drilled to depths of 20 feet. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Exact floodplain locations and drainage studies are beyond the scope of this report.

Radon – Hazard

Radon levels for the area have been reported by the Colorado Geologic Survey in the open file, Report No. 91-4 (Reference 8). Average Radon levels for the 80808-zip code is 14.60 pCi/l. The following is a table of radon levels in this area:

Average Radon Levels for the 80808 Zip Code	
0 < 4 pCi/l	50.00%
4 < 10 pCi/l	0.00%
10 < 20 pCi/l	0.00%
> 20 pCi/l	50.00%

Mitigation:

The potential for high radon levels is present for the site. Build-up of radon gas can usually be mitigated by providing increased ventilation of basement and crawlspace and sealing joints. Specific requirements for mitigation should be based on site specific testing.

6.1 Relevance of Geologic Conditions to Land Use Planning

We understand that the development will consist construction of a new church building with a new parking lot and detention pond in the southern portion of the site and other associated site improvements. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The constraints affecting development will be those associated with the artificial fill, expansive soils, and potential for elevated radon levels. These constraints on site can be satisfactorily mitigated through proper engineering design and construction practices.

The upper materials expansive clay soils will require mitigation. The granular soils were encountered at medium dense states. Foundations anticipated for the site are standard spread footings in conjunction with overexcavation/penetration. Expansive soils mitigation will be necessary. Overexcavation of 4 to 6 feet and replacement with non-expansive soils at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation or penetration, which is common in the area. Floor slabs on expansive soils should be expected to

experience movement. Overexcavation and replacement has been successful in minimizing slab movements. Specific recommendations have been provided in the *Geotechnical and Pavement Design Report* (Reference 1, Appendix B).

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through proper design and construction or through avoidance. Investigation on each lot is recommended prior to construction.

7 ECONOMIC MINERAL RESOURCES

According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 9), the area is not mapped with any aggregate deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 10), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 11), the area of the site has been mapped as "Good" for industrial minerals. However, considering the clayey silty nature of the soils, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 11), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as "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-site (Reference 11).

The site has been mapped as "Fair" for oil and gas resources (Reference 11). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

8 EROSION CONTROL

The soil types observed on the site are mildly to highly susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed and vegetation re-established, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils become increasingly less susceptible to water erosion. For the typical soils observed on-site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap. In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

9 ROADWAY, EMBANKMENT, and STORMWATER DETENTION FACILITY RECOMMENDATIONS

In general, the site soils are suitable for the proposed roadways and embankments. Groundwater may be encountered in deeper cuts and along drainages and low areas. If excavations encroach on the groundwater level unstable soil conditions may be encountered. Excavation of saturated soils may be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary.

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Any areas to receive fill should have all topsoil, organic material or debris removed. Prior to fill placement Entech should observe the subgrade. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Cut or fill slopes should be not steeper 3:1. The subgrade should be scarified and moisture conditioned to within 0 to 4 percent of optimum moisture content and compacted to a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 4% of optimum moisture content prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if shallow groundwater conditions are encountered.

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 for sandy soils, and clay soils should be compacted to a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 4% of optimum moisture content. These materials should be placed at a moisture content conducive to compaction, usually 0 to ±2% of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction. Entech should approve any import materials prior to placing or hauling them to the site. Additional investigation will be required for pavement designs once roadway grading is completed and utilities are installed.

10 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on development and construction of the site. The majority of these conditions can be mitigated through proper engineering design and construction practices. The proposed development and use are consistent with anticipated geologic and engineering geologic conditions.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Individual investigations for building sites will be required prior to construction. Construction and design personnel should be made familiar with the contents of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems.

This report has been prepared for Rocky Mountain Calvary Church for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust that this report has provided you with all the information that you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

11 REFERENCES

1. Entech Engineering, Inc. Dated February 16, 2024. *Geotechnical and Pavement Design Report, Rocky Mountain Calvary Church, 2150 North Ellicott Highway, Ellicott, Colorado.* Entech Job No. 240015.
2. Entech Engineering, Inc. Dated March 6, 2024. *OWTS Site Evaluation, 2150 North Ellicott Highway, Ellicott, Colorado.* Entech Job No. 240015.
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7. Kirkman, Robert M. and Rogers, William P. 1981. *Earthquake Potential in Colorado*. Colorado Geological Survey. Bulletin 43.
8. Colorado Geological Survey. 1991. *Results of the 1987-88 EPA Supported Radon Study in Colorado*. Open-file Report 91-4.
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10. Schwochow, S.D.; Shroba, R.R. and Wicklein, P.C. 1974*. Atlas of Sand, Gravel, and Quarry Aggregate Resources, Colorado Front Range Counties*. Colorado Geological Survey. Special Publication 5-B.
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FIGURES

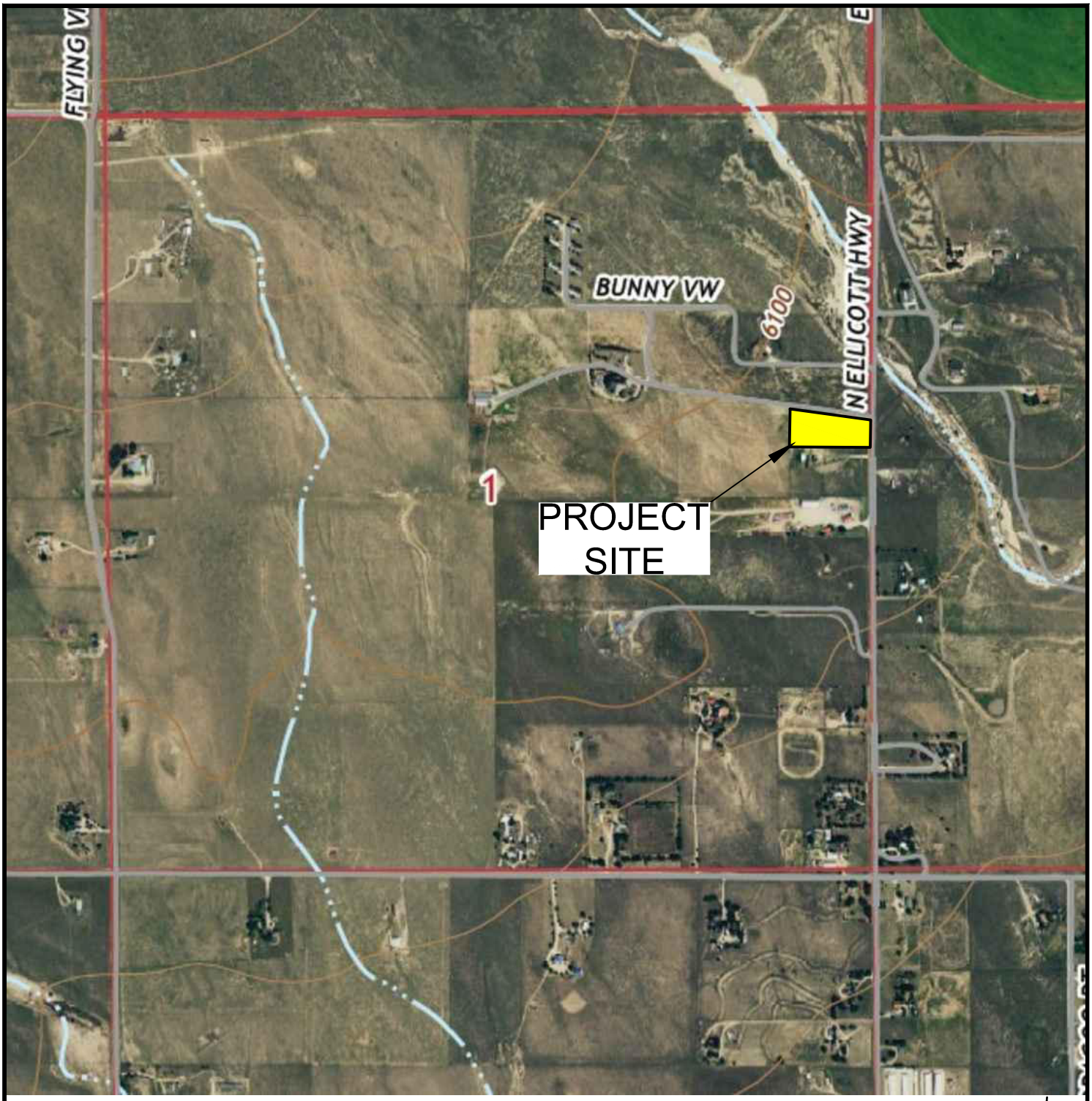
ENTECH ENGINEERING, INC.

VICINITY MAP

2150 N ELLICOTT HWY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 1



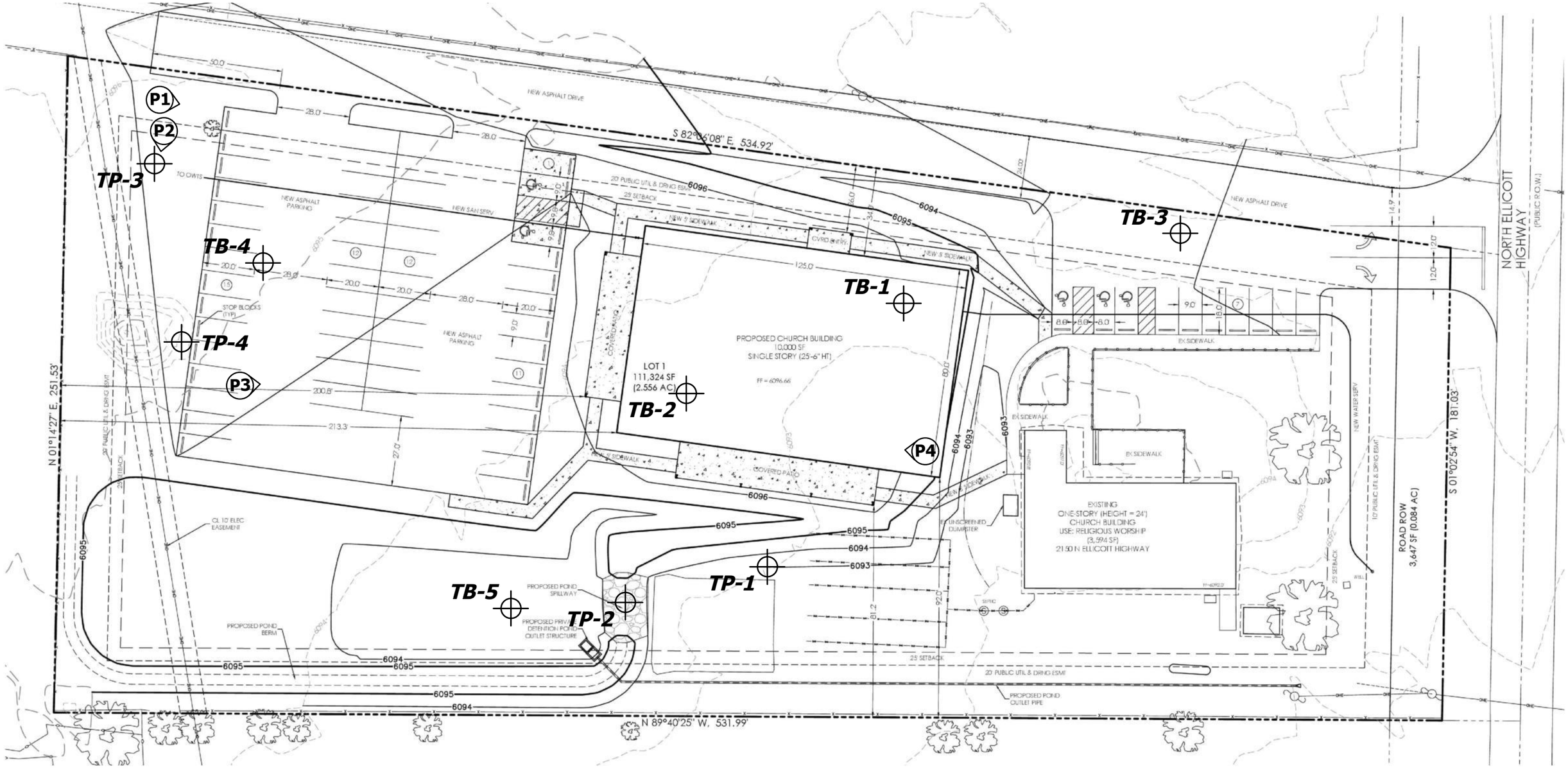
ENTECH ENGINEERING, INC.

USGS TOPOGRAPHY MAP

2150 N ELLICOTT HWY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 2



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- ⊕ - APPROXIMATE TEST BORING AND TEST PIT LOCATION AND NUMBER
- P2 - APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER

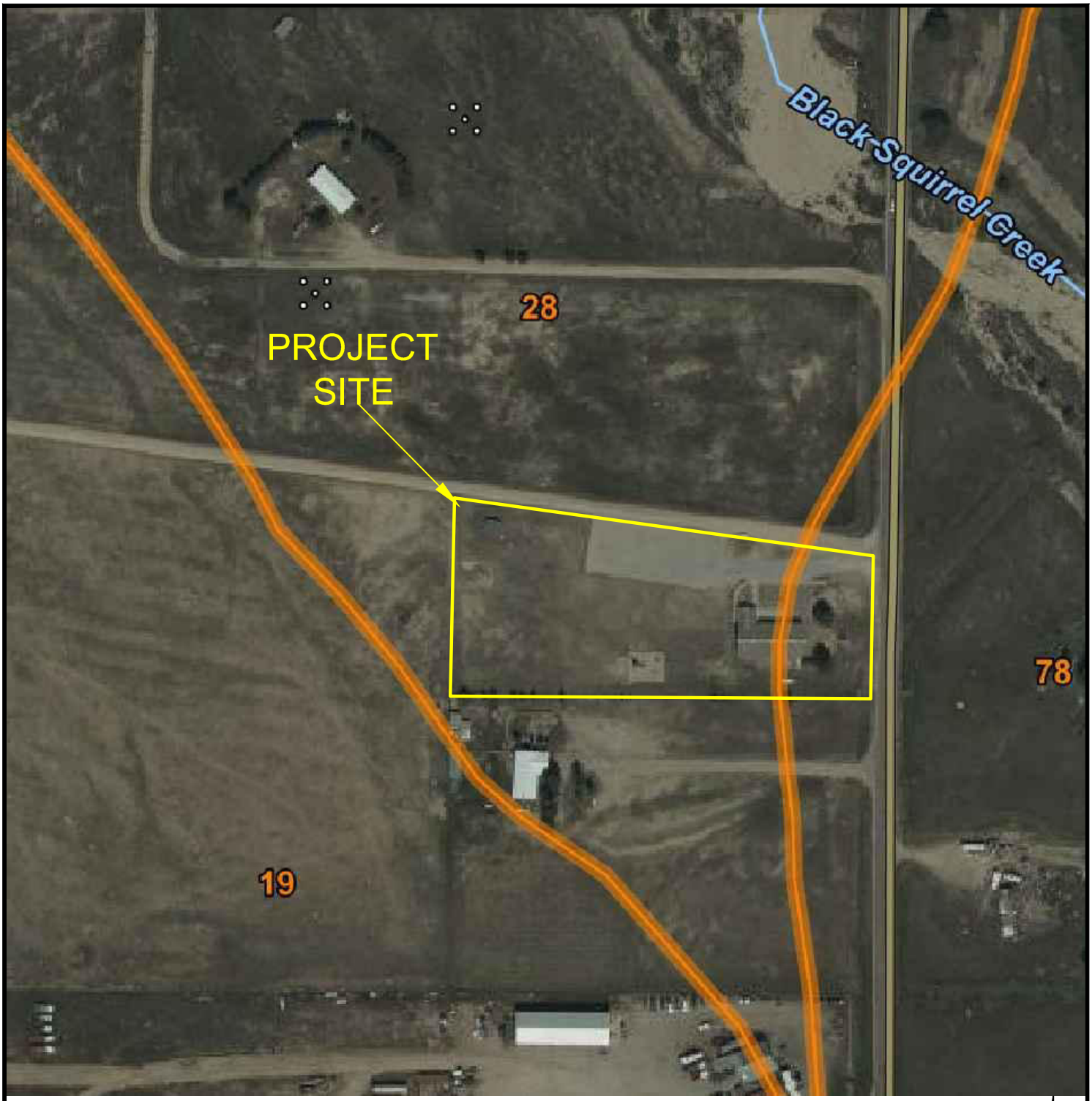
ENTECH ENGINEERING, INC.

SITE AND EXPLORATION PLAN

2150 N ELLICOTT HWY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 3



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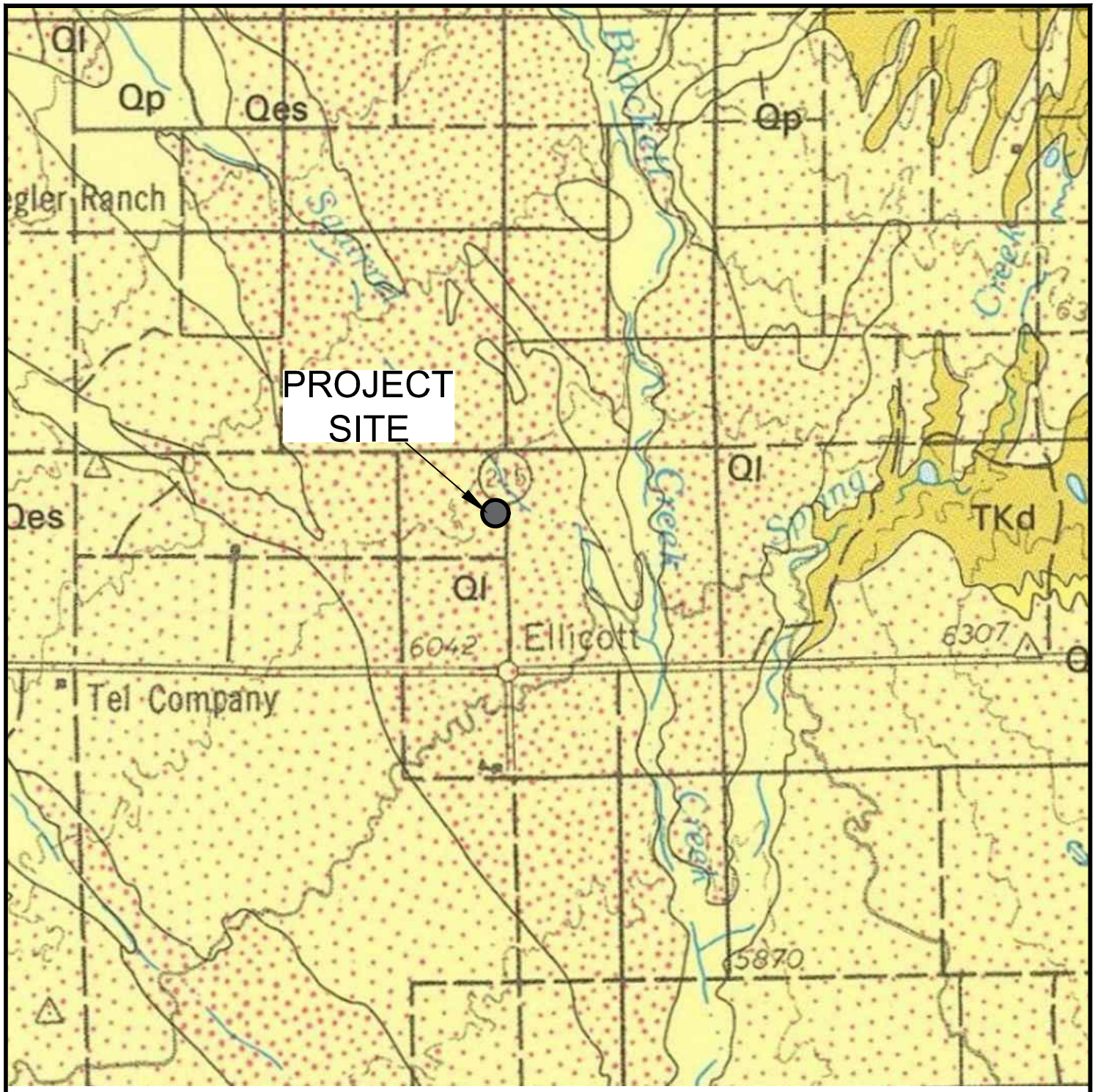
SOIL SURVEY MAP

2150 N ELLICOTT HWY
ROCKY MOUNTIAN CALVARY CHURCH

JOB NO.
240015

FIG. 4



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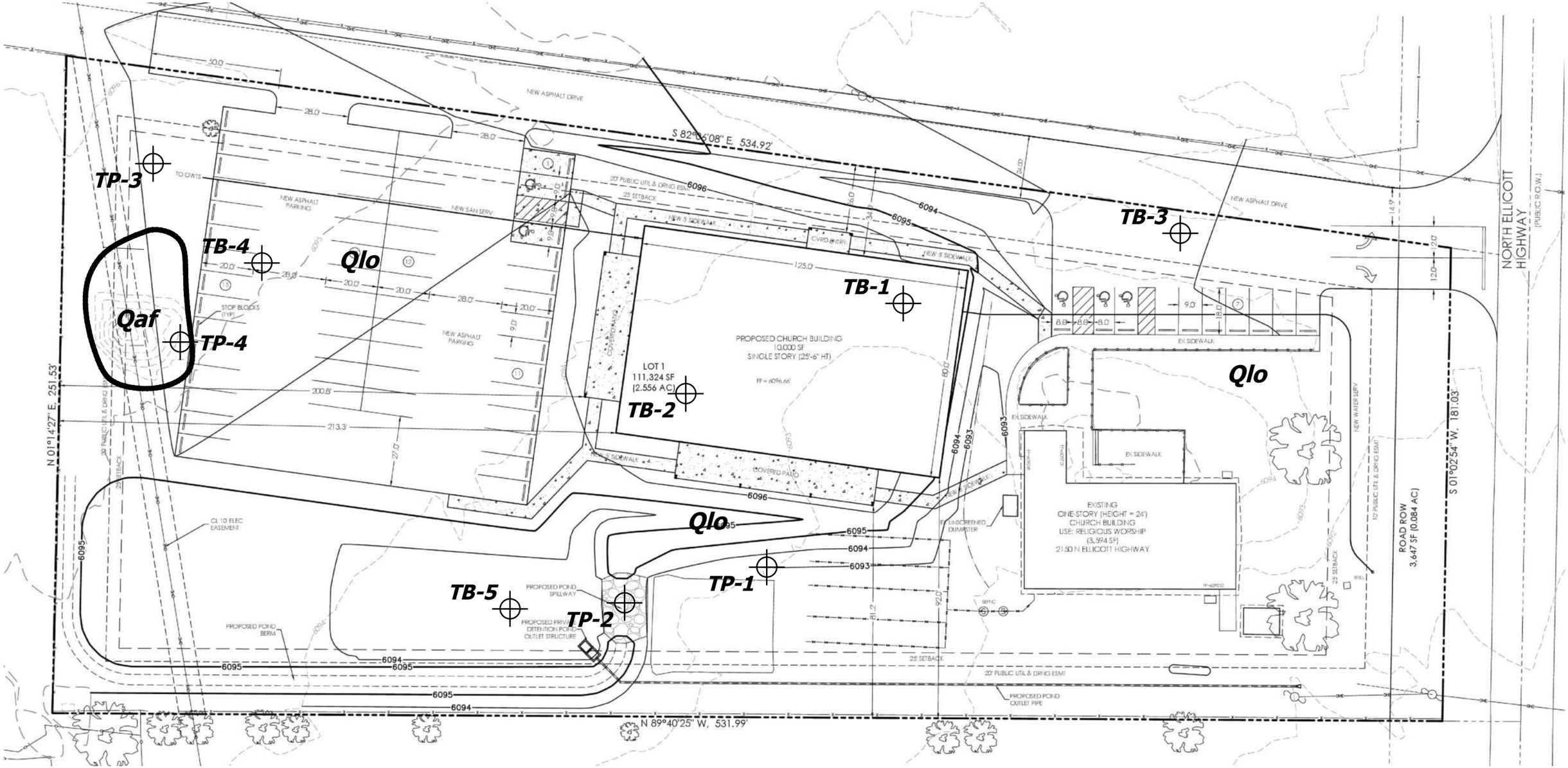
GEOLOGIC MAP OF THE PUEBLO 1°X2° QUADRANGLE

2150 N ELLICOTT HWY

ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. 5



Legend:

Qaf - Artificial Fill of Holocene Age:
man-placed fill deposits

Qlo - Louviers Alluvium of Quaternary Age:
stream terrace deposits

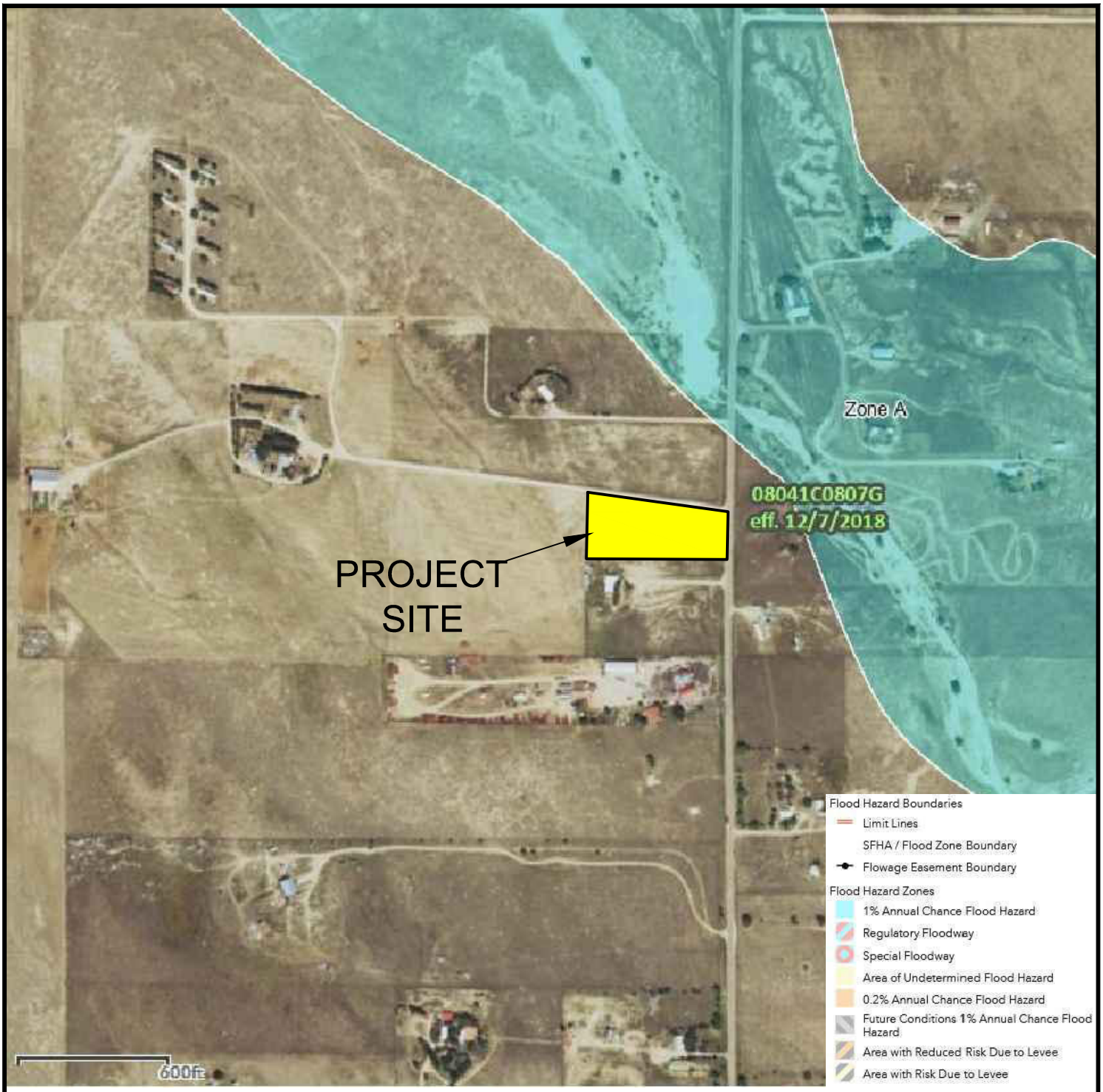
ENTECH ENGINEERING, INC.

GEOLOGY / ENGINEERING MAP

2150 N ELLICOTT HWY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 6



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FEMA FLOODPLAIN MAP

2150 N ELLICOTT HWY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 7

APPENDIX A: Site Photographs

1

Looking east from northwestern side of the site.

March 4, 2024

2

Looking south from the northwestern side of site.

March 4, 2024

Job No. 240015

3

Looking east from western side of the site.

March 4, 2024

4

Looking west from the central portion of site.

March 4, 2024

Job No. 240015

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APPENDIX B: Geotechnical Report and Pavement Design, dated February 16, 2024, Entech Job No. 240015

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GEOTECHNICAL AND PAVEMENT DESIGN REPORT
ROCKY MOUNTAIN CALVARY CHURCH
2150 NORTH ELLICOTT HIGHWAY
ELLICOTT, COLORADO

Prepared for:
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Attn: Robert Beech

February 16, 2024

Respectfully Submitted,

ENTECH ENGINEERING, INC.

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Entech Job No. 240015

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Figures

List of Appendices

1 Introduction

Entech Engineering Inc. (Entech) completed this geotechnical and pavement design report for a new church building and associated site improvements on north Ellicott Highway in Ellicott, Colorado. This report describes the subsurface exploration program conducted for the planned structures and pavement and provides recommendations for foundation design, pavement sections, and construction. Our services were completed for the Rocky Mountain Calvary Church in accordance with our geotechnical and pavement design service agreement, dated December 19, 2023. The contents of this report, including the geotechnical evaluation and recommendations, are subject to the limitations and assumptions presented in Section 8.

2 Project and Site Description

The project will consist of the construction of a new church structure and associated site improvements to be located at 2150 N. Ellicott Highway in Ellicott, Colorado. The location of the project site is shown on the Vicinity Map (Figure 1). Site improvements include an access lane and passenger vehicle parking lot to be paved with asphalt and a detention pond.

At the time of drilling, the property was occupied by an existing single-story church building with a gravel parking area. Vegetation consists of sparse native grasses with landscaped trees and bushes around the existing church. Building loads are expected to be light to moderate. The property is surrounded by large rural residential lots.

3 Subsurface Explorations and Laboratory Testing

Subsurface conditions at the project site were explored by five test borings, designated TB-1 through TB-5, drilled on January 18, 2024 at the approximate locations shown on the Site and Exploration Plan (Figure 2). Two of the borings were drilled within the footprint of the proposed church building. Two additional borings were drilled in the parking lot and access drive to provide pavement design recommendations, and one boring was drilled in the proposed detention pond location. The borings in the building footprints were drilled to depths of 20 feet below the existing ground surface (bgs), the borings drilled in the parking and drive areas were drilled to depths of 10 feet bgs, and the boring for the detention basin was drilled to a depth of 15 feet bgs. The drilling was performed using a truck-mounted, continuous flight auger drill rig supplied and operated by Entech. Descriptive boring logs providing the lithologies of the subsurface conditions encountered

during drilling are presented in Appendix A. Groundwater levels were measured in each of the open boreholes at the conclusion of drilling.

Soil and bedrock samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D1586) using a split-barrel California sampler. Results of the Standard Penetration Test (SPT) are included on the boring logs in terms of N-values expressed in blows per foot (bpf). Soil and bedrock samples recovered from the borings were visually classified and recorded on the boring logs. The soil and bedrock classifications were later verified utilizing laboratory testing and grouped by soil type. The soil and bedrock type numbers are included on the boring logs. It should be understood that the soil and bedrock descriptions shown on the boring logs may vary between boring locations and sample depths. It should also be noted that the lines of stratigraphic separation shown on the boring logs represent approximate boundaries between soil and bedrock types and the actual stratigraphic transitions may be more gradual or variable with location.

3.1 Geotechnical Index and Engineering Property Testing

Water content testing (ASTM D2216) was performed on the samples recovered from the borings and the results are shown on the boring logs. Grain-Size Analysis (ASTM D422) and Atterberg Limits testing (ASTM D4318) were performed on selected samples to assist in classifying the materials encountered in the borings. FHA Swell testing and one-dimensional swell or collapse testing (ASTM D4546) were performed to evaluate the expansive characteristics and collapse potential of the soil. Soluble sulfate testing was performed on select soil samples to evaluate the potential for below-grade degradation of concrete due to sulfate attack.

For pavement design, a Modified Proctor (ASTM D1557) and California Bearing Ratio (CBR) test (ASTM D1883) were completed on a bulk sample from the roadway subgrade. The Laboratory Testing Results are presented in Appendix B and summarized in Table B-1.

4 Subsurface Conditions

Two primary soil types and one bedrock type were encountered in the test borings drilled for the subsurface exploration program. Each soil and bedrock type was classified in accordance with the Unified Soil Classification System (USCS) and the American Association of State Highway and Transportation Officials (AASHTO) soil classification system using the laboratory testing results and the observations made during drilling.

4.1 Soil and Bedrock

Subsurface conditions for the proposed project site consisted of native medium dense to dense silty to clayey sand to sand with silt (Soil Type 1) encountered in all the test borings either from the existing ground surface and extending to the termination of the borings at 10 to 15 feet bgs or below the Type 2 clay at 4 feet and extending to 17 to 19 feet bgs. Very stiff to hard sandy clay (Soil Type 2) was encountered in TB-1 and TB-2 at the surface or below 12 inches of road base (TB-1) and extended to 4 feet below ground surface. Sandstone bedrock, or very dense silty sand to sand with silt when classified as a soil (Soil Type 3), was encountered in borings TB-1 and TB-2 at depths ranging from 17 to 19 feet and extended to the termination of the borings (20 feet). The AASHTO soil classifications of the subgrade Soil Type 1 was A-2-4, A-6, A-1-b, and A-4.

Swell or collapse testing on samples of the site clayey soils resulted in volume changes of 3.3% to 5.8%. The results indicate moderate to high expansion potentials. FHA swell testing on a sample of silty sand from TB-5 at 2 to 3 feet resulted in a swell pressure of 240 pounds per square foot (psf) indicating a low expansion potential.

4.2 Groundwater

Depth to groundwater was measured in each of the borings at the conclusion of drilling. Groundwater was not encountered in any of the test borings during, or subsequent to, drilling. It should be noted that groundwater levels could change due to seasonal variations, changes in land runoff characteristics, and future development of nearby areas.

5 Geotechnical Evaluation and Recommendations

The following discussion is based on the subsurface conditions encountered in the borings drilled in the planned lot for construction. If subsurface conditions different from those described herein are encountered during construction, or if the project elements change from those described, Entech Engineering, Inc. should be notified so that the evaluation and recommendations presented can be reviewed and revised if necessary.

As discussed in Section 2, we understand that the site will be developed with the construction of a new church structure. The proposed building is expected to have a shallow foundation.

5.1 Shallow Foundations

Due to the cohesive, expansive soils encountered on this site, a shallow foundation system would not be expected to perform adequately if it was to rest on the soils in their in-situ condition. To reduce the potential for swell related movement, the foundation subgrade should be overexcavated to underlying medium dense sands (anticipated depth of 4 feet) below foundation components and replaced with site or imported granular soils placed in accordance with Section 7.1.2 and 7.1.3.

Upon completion of proper subgrade preparation as described above and in Section 7.1.1, the proposed structure may be supported with a shallow spread footing foundation placed on the dense site soils or properly compacted granular fill. Refer to Exhibit 1 for the recommended allowable bearing capacity value. Shallow foundations shall not be placed on cohesive soil, uncontrolled fill, or bedrock. Refer to Sections 7.1.1 and 7.1.2 for further discussion. Actual bearing capacities and the need for overexcavation will be verified at the time of the open excavation observation (Section 7.9).

For design, continuous spread footings are recommended to have a minimum width of 16 inches, and individual column footings for main support beams should have minimum plan dimensions of 24 inches on each side in order to avoid punching failure into the supporting subgrade soils. Exterior footings should extend a minimum of 30 inches below the adjacent exterior site grade for frost protection.

Foundation walls should be designed to resist lateral pressures generated by the soils used for backfill. Recommended active equivalent fluid density parameters for the on-site cohesive soils or import granular fill are provided in Exhibit 1. Clay soils (more than 50% passing the No. 200 sieve) are not recommended for backfill against the walls unless properly moisture conditioned. It should be noted that the equivalent design parameters apply to level backfill conditions. If sloping backfill conditions exist, pressures will increase substantially depending on the conditions adjacent to the walls. Surcharge loading should also be considered in wall designs. Equivalent fluid pressures for sloping conditions should be determined on an individual basis.

Exhibit 1: Foundation Design Parameters

Design Parameter	Value
Allowable Bearing Capacity [1]	
Medium dense site sands or granular fill	2,400 psf
Lateral Earth Pressure Equivalent Fluid Density [2]	
Active Conditions - Site Cohesive Soil Backfill	50 pcf
Active Conditions - Granular Fill	40 pcf

pcf = pounds per cubic foot; psf = pounds per square foot

Notes:

1. Assumes a minimum embedment of 30 inches for frost protection.
2. Assumes level backfill conditions.

5.2 On-Grade Floor Slabs

On-grade floor slabs for the planned structures should be supported on moisture-conditioned, compacted, site granular soils, or imported granular fill prepared in accordance with Section 7.1.1. Any loose soils or uncontrolled fill encountered will require removal according to Section 7.1.1.

Grade-supported floor slabs should be separated from other building structural components and utility penetrations to allow for possible future vertical movement. Interior partition walls should be constructed in such a manner so as not to transfer slab movement into the overlying floor(s) and/or roof members, should slab movement occur. Control joints in grade-supported slabs are recommended at 10- to 15-foot perpendicular spacings to control cracking. If slab movement cannot be tolerated, a structural floor system should be used.

5.3 Seismic Site Classification

Based on the subsurface conditions encountered at the site, and in accordance with Section 1613 of the 2021 *International Building Code* (IBC), the site meets the conditions of Site Class D.

5.4 Surface and Subsurface Drainage

Positive surface drainage is recommended around the building's perimeter to minimize infiltration of surface water into the supporting foundation soils. A minimum ground surface slope of 5% in the first 10 feet adjacent to exterior foundation walls is recommended for unpaved areas. For paved areas and other impervious surfaces, a minimum slope of 2% is adequate. All roof drains

and gutter downspouts should be extended to discharge well beyond the building's foundation backfill zone or be connected to a storm sewer system.

To help minimize infiltration of water into the foundation zone, vegetative plantings placed close to foundation walls should be limited to those species having low watering requirements and irrigated grass should not be located within 5 feet of the foundation. Similarly, sprinklers are not recommended to discharge water within 5 feet of foundations. Irrigation near foundations should be limited to the minimum amount sufficient to maintain vegetation. Application of more irrigation water than necessary can increase the potential for slab and foundation movement.

Perimeter drains are recommended for usable space below grade (areas where the interior slab or bottom of the crawl space is below the exterior grade). A typical perimeter drain detail is shown in Figure 3.

6 Pavement Design Recommendations

Pavement design recommendations were made based on guidance from the *Pavement Design Criteria for El Paso County*. We understand that the access lane and passenger vehicle parking lot will be paved with asphalt.

6.1 Pavement Subgrade Conditions

Two test borings (TB-3 and TB-4) were drilled to a depth of approximately 10 feet in the parking lot and access road areas. The soils at the roadway subgrade depth consisted of silty to clayey sand and sand with silt. Soil Type 1 was used to evaluate the subgrade support characteristics of pavement based on laboratory testing. The Type 1 subgrade soils classified as A-2-4, A-6, A-1-b, and A-4 using the AASHTO classification system.

California Bearing Ratio (CBR) testing was performed on a representative bulk sample of the silty sand (Soil Type 1) from TB-4 to determine the support characteristics of the subgrade soils for the roadway sections. The results of the CBR testing are presented in Appendix B and summarized in Exhibit 1.

Exhibit 2: Pavement Subgrade Laboratory Summary

Design Parameter	Value
Soil Type	1 – Silty Sand
CBR at 95%	4.57
Design CBR	4.57
Liquid Limit	NV
Plasticity Index	NP
Percent Passing 200	31.1
AASHTO Classification	A-2-4
Group Index	0
Unified Soils Classification	SM

6.2 Swell Mitigation

El Paso County criteria requires mitigation of expansive soils for roadway subgrade that have a swell of 2% or greater with a 150 pound per square foot surcharge. Based on the swell testing, mitigation for expansive soils is recommended for this site. We recommend overexcavating to a depth of 18 inches and moisture conditioning in accordance with Section 7.2.1.

6.3 Traffic Loading

Traffic data is not available for the private parking lot and access road. Based on the Colorado Asphalt Pavement Association (CAPA), *Guideline for Design and Construction of Asphalt Parking Lots in Colorado* (2006), an 18-kip equivalent single axle loading (ESAL) of 100,000 is appropriate for moderate traffic levels which includes passenger cars and light trucks.

6.4 Pavement Designs

The pavement sections were determined utilizing the *El Paso County Pavement Design Criteria*, design ESAL, and the CBR testing. Design parameters used in the pavement analysis for the parking and access drives are presented in Exhibit 3.

Exhibit 3: Pavement Design Parameters

Design Parameter	Value
Reliability	75%
Standard Deviation	0.44
Serviceability Loss (Δ psi)	2.0
Design CBR	4.57
Resilient Modulus	6,855 psi
Structural Coefficients	
Hot Bituminous Pavement	0.44
Aggregate Basecourse	0.11

Pavement sections are presented below in Exhibit 4. Any additional grading may result in subgrade soils with different support characteristics. The following pavement sections should be re-evaluated if additional grading is performed.

Exhibit 4: Recommended Pavement Sections

Pavement Area	Design ESAL	Alternative
Access Drive and Parking Areas	100,000	1. 4.0 inches HMA over 4.0 inches ABC

ABC = Aggregate Base Course; ESAL = equivalent single axle loads; HMA = Hot Mix Asphalt

7 Construction Recommendations

7.1 Earthwork Recommendations for Structures

7.1.1 Subgrade Preparation

The foundation subgrade should be overexcavated to the underlying medium dense sands (anticipated at a depth of 4 feet). The overexcavated subgrade should then be scarified an additional 12 inches, moisture conditioned to +/- 2% of the optimum moisture, and recompacted in place (refer to Section 7.1.3). If uncontrolled fill, loose material, or other unsuitable subgrade materials are encountered at the base of the overexcavation, these materials should be overexcavated to underlying dense and unyielding subgrade. Granular fill can then be placed in 6-inch compacted lifts to the same specifications as described above. The final depth of overexcavation should be determined during the excavation observation. Overexcavations should extend laterally beyond planned footings a minimum distance equal to the depth below planned footings (e.g. a 3-foot overexcavation should extend 3 feet beyond the edge of the foundation).

Groundwater was not encountered in any of the test borings which were drilled to depths of 10 to 20 feet bgs. Fluctuation in groundwater levels can change due to seasonal variations and changes in land runoff characteristics. It is anticipated that groundwater is at sufficient depth on the site as to not affect the proposed building construction. Groundwater, if encountered near foundation grade, will likely create unstable subgrade conditions, and stabilization with shot rock and/or geogrid may be required.

7.1.2 Granular Fill

Granular fill placed beneath foundation components and floor slabs shall consist of non-expansive, granular soil, free of organic matter, unsuitable materials, debris, and cobbles larger than 3 inches in diameter. Entech should approve any site or imported granular material to be used within the foundation area.

7.1.3 Fill Placement and Compaction

Granular fill placed within the foundation area should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density (ASTM D1557) at +/-2% of optimum moisture content. Where site cohesive soils are used on site, they should be moisture conditioned to within 0 to +3% of their optimum moisture and recompacted in place to 95% of their maximum Standard Proctor Dry Density ASTM D698.

Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of 6 inches or less. Mechanical methods can be used for placement and compaction of fill; however, heavy equipment should be kept at a distance from foundation walls and below slab infrastructure to avoid overstressing. No water flooding techniques of any type should be used for compaction or placement of foundation or floor slab fill material.

Fill placement and compaction beneath and around foundations should be observed and tested by Entech during construction. Density tests should be performed frequently to verify compaction with the first density test performed at the overexcavated subgrade elevation and with additional testing once each 12 to 18 inches of granular fill has been placed.

7.2 Pavements

Pavement design recommendations provided herein are contingent on good construction practices, and poor construction techniques may result in poor performance. Our analyses

assumed that this project will be constructed according to the *El Paso County Pavement Design Criteria.*

7.2.1 Pavement Subgrade Preparation

Proper subgrade preparation is required for adequate pavement performance. Paving areas should be cleared of all deleterious materials including but not limited to existing pavements, utility poles, and fence poles. Surface vegetation should be removed by stripping, with the depth to be field determined.

We recommend that paving areas be moisture conditioned to a depth of 18 inches. After overexcavating 18 inches of the pavement subgrade, the final subgrade surface for pavement areas should be scarified an additional 8 inches, moisture conditioned to within 0 to +3% of its optimum moisture, and recompacted in place to 95% of its maximum Standard Proctor Dry Density ASTM D698. The overexcavated material can then be placed in 6-inch lifts to the same specifications as described above. The compacted surface below pavements should be proof-rolled with a fully loaded, tandem-axle, 10-yard dump truck or equivalent. Any areas that are delineated to be soft, loose, or yielding during proof-rolling should be removed and reconditioned or replaced.

7.2.2 Aggregate Base Course

Aggregate Base Course (ABC) materials shall conform to the *El Paso County Standard Specification Manual*, Section D-6. ABC materials should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density (ASTM D1557) at +/-2% of optimum moisture content.

7.3 Excavation Potential

Excavation of the site soils should be feasible with rubber-tired equipment.

7.4 Excavation Stability

Excavation sidewalls must be properly sloped, benched, and/or otherwise supported in order to maintain stable conditions. All excavation openings and work completed therein shall conform to OSHA Standards as put forward in CFR 29, Part 1926.650-652, (Subpart P).

7.5 Utility Trench Backfill

Trench backfill placement should be performed in accordance with El Paso County specifications. All excavation and excavation shoring/bracing should be performed in accordance with OSHA guidelines.

Fill placement and compaction in utility trenches should be observed and tested by Entech during construction. Fill should be placed in horizontal lifts having a compacted thickness of 6 inches or less and at a water content conducive to adequate compaction, within +/-2% of optimum water content. No water flooding techniques of any type should be used for compaction or placement of utility trench fill.

7.6 General Backfill

Any areas to receive general grading fill should have all topsoil, organic material, and debris removed. Fill must be properly benched into existing slopes in order to be adequately compacted. The fill-receiving surface should be scarified to a depth of 12 inches, moisture conditioned to +/-2% of the optimum water content, and compacted to a minimum of 95% of the ASTM D1557 maximum dry density or the ASTM D698 maximum dry density before the addition of new fill. Fill should be placed in thin lifts not to exceed 6 inches in thickness after compaction while maintaining at least 95% of the ASTM D1557 or ASTM D698 maximum dry density. Fill material should be free of vegetation and other unsuitable material and should not contain cobbles or fragments larger than 3 inches. Topsoil and strippings should be segregated from all other fill sources on the site. Fill placement and compaction beneath and around foundations, in utility trenches, or beneath roadways or other structural features of the project should be observed and tested by Entech during construction.

7.7 Concrete Degradation Due to Sulfate Attack

Sulfate solubility testing was conducted on several samples recovered from the test borings to evaluate the potential for sulfate attack on concrete placed below surface grade. The test results indicated 0.02 to less than 0.01% soluble sulfate (by weight). The test results indicate the sulfate component of the in-place soils presents a negligible exposure threat to concrete placed below the site grade.

Type IL or Type II cement is recommended for all concrete on this site. Care should be taken to prevent the accumulation or ponding of water in the foundation excavation prior to the placement of concrete. If standing water is present in the foundation excavation, it should be removed by

ditching to sumps and pumping the water away from the foundation area prior to concrete placement.

7.8 Winter Construction

In the event construction of the planned facility occurs during winter, foundations and subgrades should be protected from freezing conditions. Concrete should not be placed on frozen soil,and once concrete has been placed, it should not be allowed to freeze. Similarly, once exposed, the foundation subgrade should not be allowed to freeze. This may require covering the concrete with insulated blankets and adding heat to prohibit freezing. During site grading and subgrade preparation, care should be taken to eliminate the burial of snow, ice, or frozen material within the planned construction area.

7.9 Foundation Excavation and Construction Observation

Subgrade preparation for building foundations should be observed by Entech prior to construction of the footings and floor slabs in order to verify that (1) no anomalies are present, (2) materials similar to those described in this report have been encountered or placed, and (3) no soft spots, expansive or organic soil, or debris are present in the foundation area prior to concrete placement or backfilling. Entech should make final recommendations for overexcavation, if required, and foundation drainage at the time of excavation observation, if necessary.

In addition, Entech should observe and document the placement and compaction of utility bedding and trench backfill.

8 Closure

The subsurface investigation, geotechnical evaluation, and recommendations presented in this report are intended for use by Rocky Mountain Calvary Church with application to the planned new church building and associated site improvements located at 2150 N. Ellicott Highway in Ellicott, Colorado. In conducting the subsurface exploration program, laboratory testing, engineering evaluation, and reporting, Entech Engineering, Inc. endeavored to work in accordance with generally accepted professional geotechnical and geologic practices and principles consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality and under similar conditions. No other warranty, expressed or implied, is made. During final design and/or construction, if conditions are encountered that appear different from those described in this report, Entech

Engineering, Inc. requests to be notified so that the evaluation and recommendations presented herein can be reviewed and modified as appropriate.

If there are any questions regarding the information provided herein, or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.

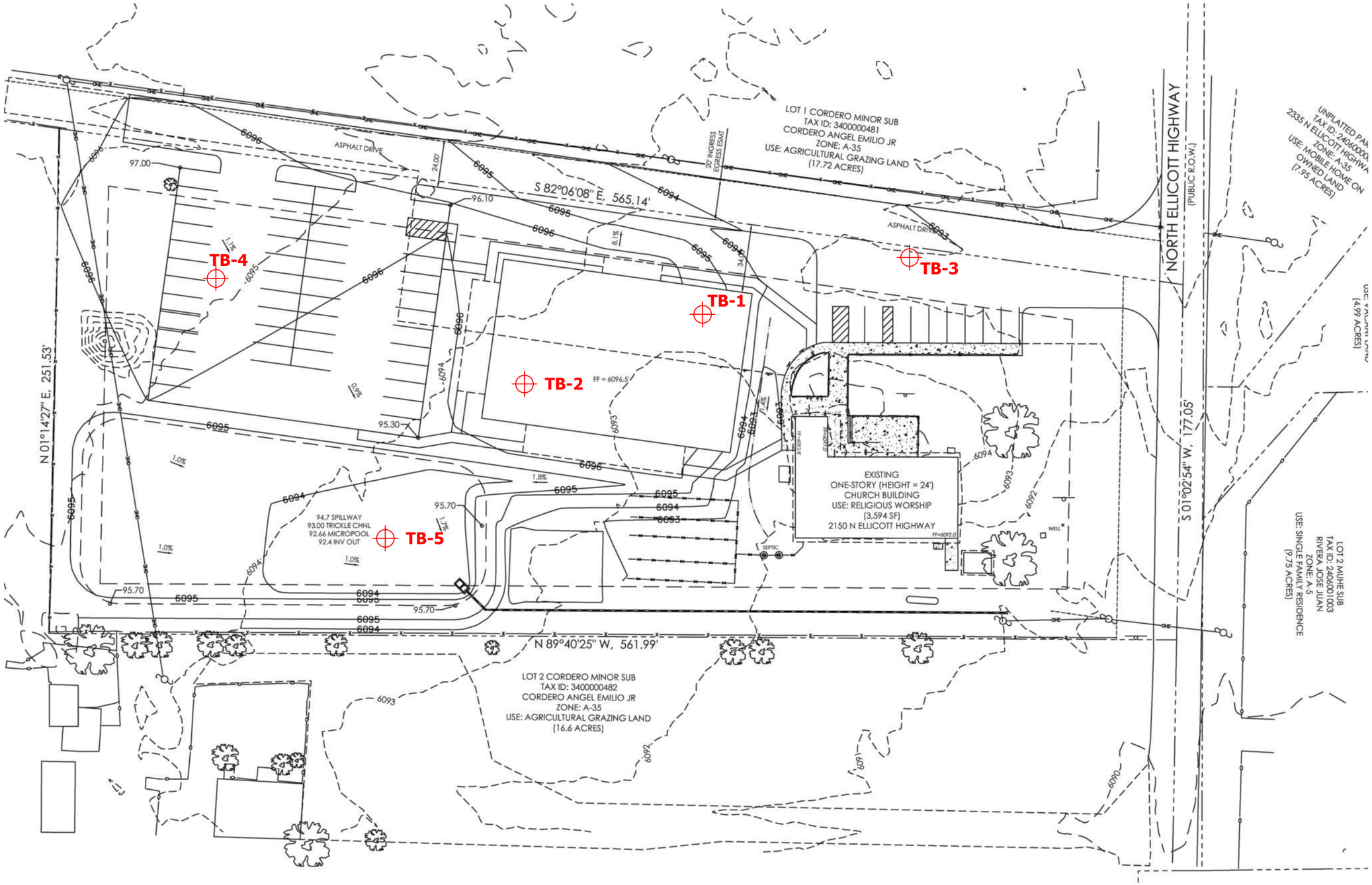
ENTECH ENGINEERING, INC.

VICINITY MAP

2150 NORTH ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 1



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

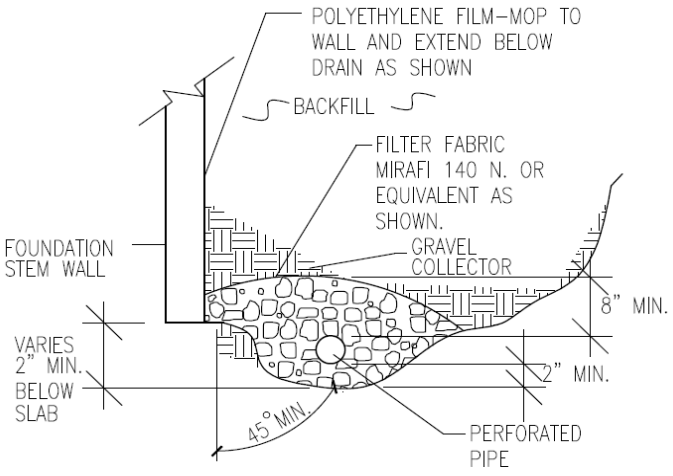
ENTECH ENGINEERING, INC.

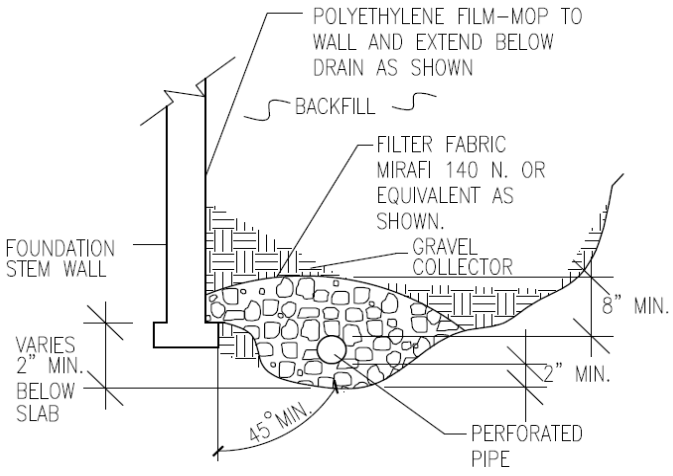
SITE AND EXPLORATION PLAN

2150 NORTH ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 2





NOTES:

–GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS–85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

–PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4–INCH DIAMETER IS MOST OFTEN USED.

–ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON–PERFORATED PIPE.

–FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

–MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

–DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

ENTECH ENGINEERING, INC.

PERIMETER DRAIN DETAIL

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. 3

APPENDIX A: Test Boring Logs

TABLE A-1

DEPTH TO BEDROCK

TEST BORING	DEPTH TO BEDROCK (ft.)
1	17.0
2	16.0
3	>10
4	>10
5	>15

TEST BORING 1 DATE DRILLED 1/18/2024						
REMARKS DRY TO 20', 1/18/24	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
12" BASE COURSE CLAY, SANDY, DARK BROWN, VERY STIFF, MOIST				29	11.2	2
SAND, SILTY, BROWN to TAN, MEDIUM DENSE to DENSE, DRY	5			18	2.3	1
	10			31	2.5	1
	15			25	2.1	1
SANDSTONE (VERY WEAK, OLIVE, HIGHLY WEATHERED (SAND, WITH SAND, VERY DENSE, MOIST)	20			50 11"	6.0	3

TEST BORING 2 DATE DRILLED 1/18/2024						
REMARKS DRY TO 20', 1/18/24	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
6" TOPSOIL CLAY, SANDY, DARK BROWN, HARD, MOIST				32	8.5	2
SAND, WITH SILT, BROWN to TAN, MEDIUM DENSE, DRY	5			15	0.8	1
	10			25	2.0	1
	15			28	1.9	1
SANDSTONE (VERY WEAK, OLIVE, HIGHLY WEATHERED (SAND, SILTY, VERY DENSE, DRY)	20			50 11"	2.9	3

ENTECH ENGINEERING, INC.

TEST BORING LOGS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. A-1

TEST BORING 3
DATE DRILLED 1/18/2024

REMARKS

DRY TO 10', 1/18/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			17	7.2	1	SAND, CLAYEY, DARK BROWN, MEDIUM DENSE, MOIST
5			34	2.0	1	SAND, WITH SILT, BROWN, DENSE to MEDIUM DENSE, DRY to MOIST
10			16	3.9	1	
15						
20						

TEST BORING 4
DATE DRILLED 1/18/2024

REMARKS

DRY TO 10', 1/18/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			26	3.2	1	SAND, SILTY, DARK BROWN to TAN, MEDIUM DENSE, MOIST to DRY
5			23	1.0	1	
10			23	3.0	1	
15						
20						

ENTECH ENGINEERING, INC.

TEST BORING LOGS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

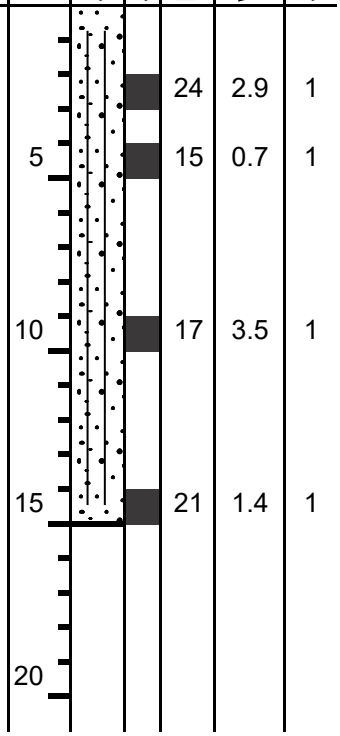
JOB NO. 240015

FIG. A-2

TEST BORING 5
DATE DRILLED 1/18/2024

REMARKS

DRY TO 15', 1/18/24



	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, DARK BROWN to TAN, MEDIUM DENSE, DRY to MOIST	24	2.9	1
	15	0.7	1
	17	3.5	1
	21	1.4	1

ENTECH ENGINEERING, INC.

TEST BORING LOGS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. A-3

APPENDIX B: Laboratory Test Results

ENTECH ENGINEERING, INC.

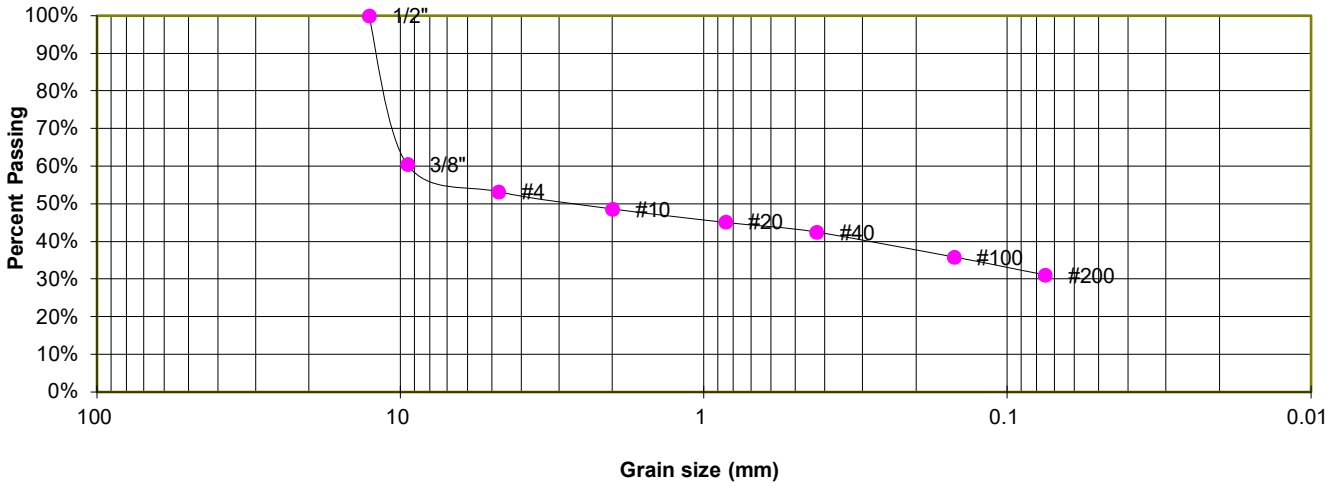
TABLE B-1
SUMMARY OF LABORATORY TEST RESULTS

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SULFATE (WT %)	AASHTO CLASS.	FHA SWELL (PSF)	SWELL/ CONSOL (%)	USCS	SOIL DESCRIPTION
1, CBR	4	0-3			31.1	NV	NP	NP		A-2-4			SM	SAND, SILTY
1	2	10			10.6	NV	NP	NP	<0.01				SW-SM	SAND, WITH SILT
1	3	1-2	11.0	110.3	41.0	33	20	13		A-6		3.3	SC	SAND, CLAYEY
1	3	10			8.0	NV	NP	NP		A-1-b			SW-SM	SAND, WITH SILT
1	4	1-2			38.0	22	18	4		A-4			SM	SAND, SILTY
1	5	2-3			34.7						240		SM	SAND, SILTY
1	5	10			18.6								SM	SAND, SILTY
2	1	2-3	16.2	103.5	60.9	45	22	23	<0.01			5.8	CL	CLAY, SANDY
3	1	20			7.4	NV	NP	NP	0.02				SW-SM	SANDSTONE (SAND, WITH SILT)

Project: 2150 N. Ellicott Highway
Client: Rocky Mountain Calvary Church
Job No: 240015

TEST BORING	4	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	0-3	SOIL TYPE	1, CBR

Sieve Analysis
Grain Size Distribution



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	60.5%
4	53.2%
10	48.7%
20	45.2%
40	42.5%
100	35.9%
200	31.1%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

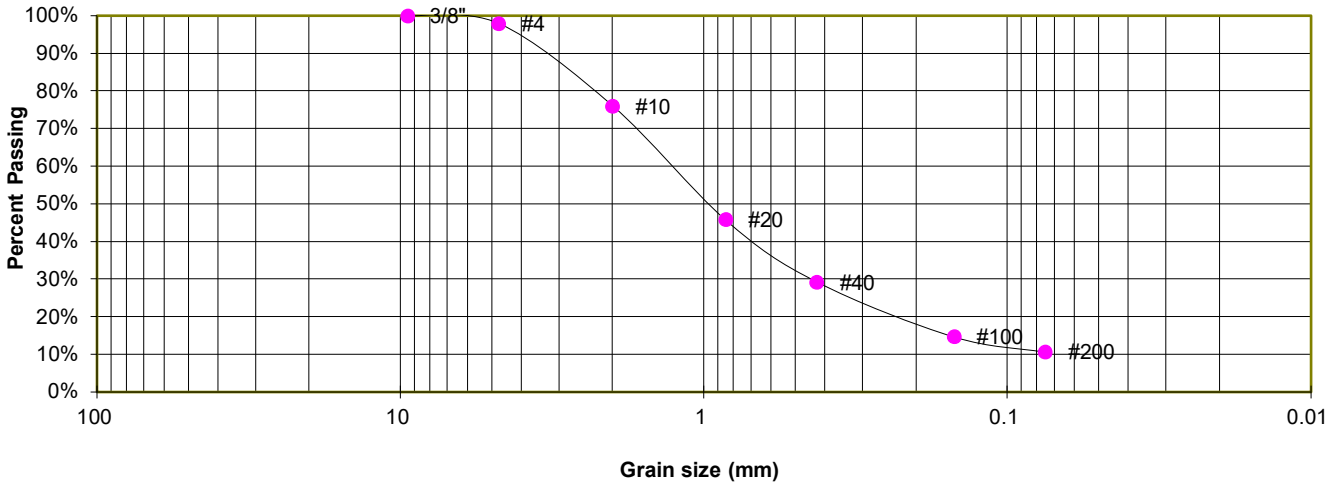
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-1

TEST BORING	2	SOIL DESCRIPTION	SAND, WITH SILT
DEPTH (FT)	10	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.0%
10	76.0%
20	45.8%
40	29.3%
100	14.7%
200	10.6%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM

ENTECH ENGINEERING, INC.

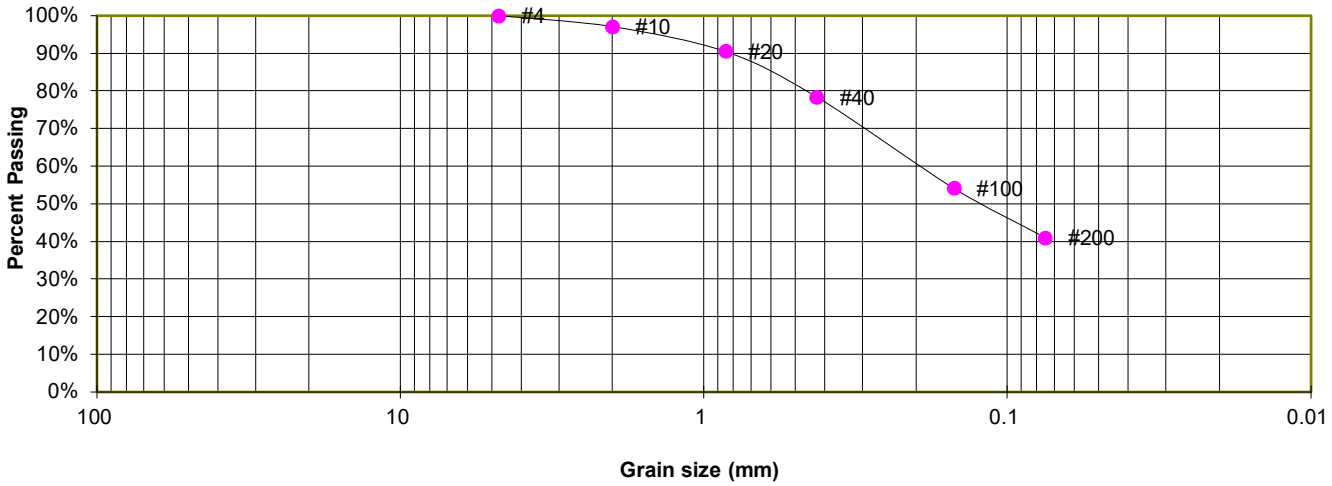
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-2

TEST BORING	3	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.1%
20	90.5%
40	78.4%
100	54.2%
200	41.0%

ATTERBERG LIMITS

Plastic Limit	20
Liquid Limit	33
Plastic Index	13

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	2

ENTECH ENGINEERING, INC.

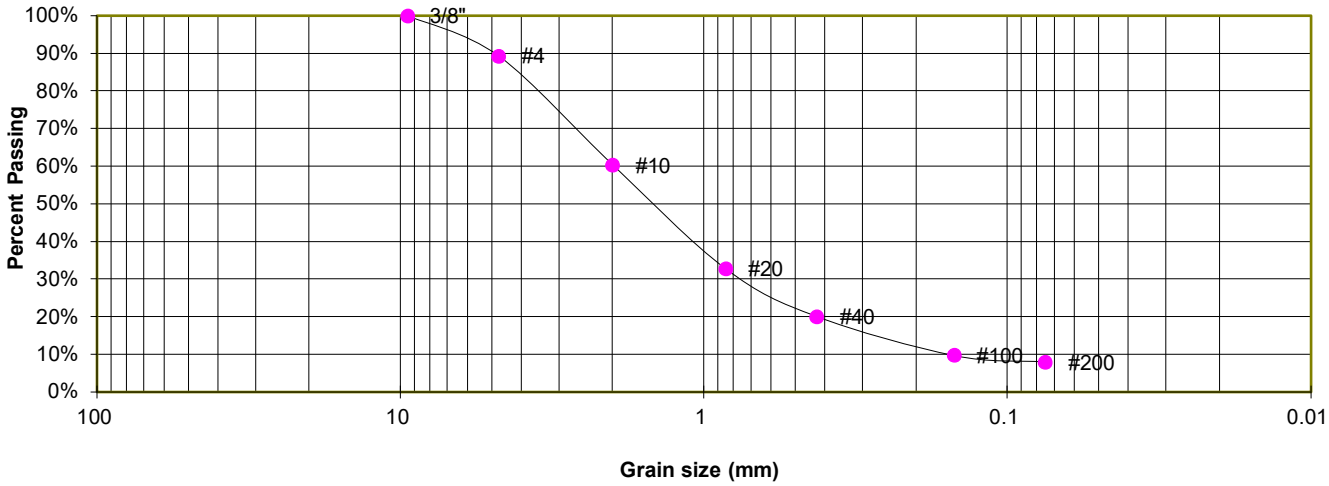
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-3

TEST BORING	3	SOIL DESCRIPTION	SAND, WITH SILT
DEPTH (FT)	10	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.3%
10	60.3%
20	32.8%
40	20.1%
100	9.8%
200	8.0%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM
AASHTO CLASSIFICATION: A-1-b
AASHTO GROUP INDEX: 0

ENTECH ENGINEERING, INC.

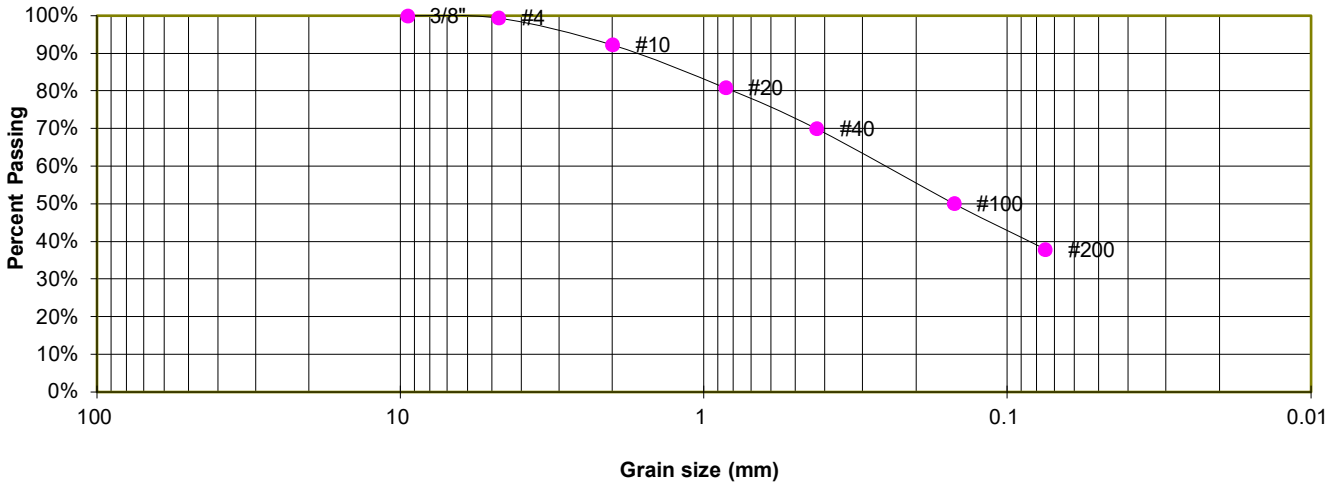
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-4

TEST BORING	4	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	92.2%
20	80.9%
40	70.0%
100	50.1%
200	38.0%

ATTERBERG LIMITS

Plastic Limit	18
Liquid Limit	22
Plastic Index	4

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

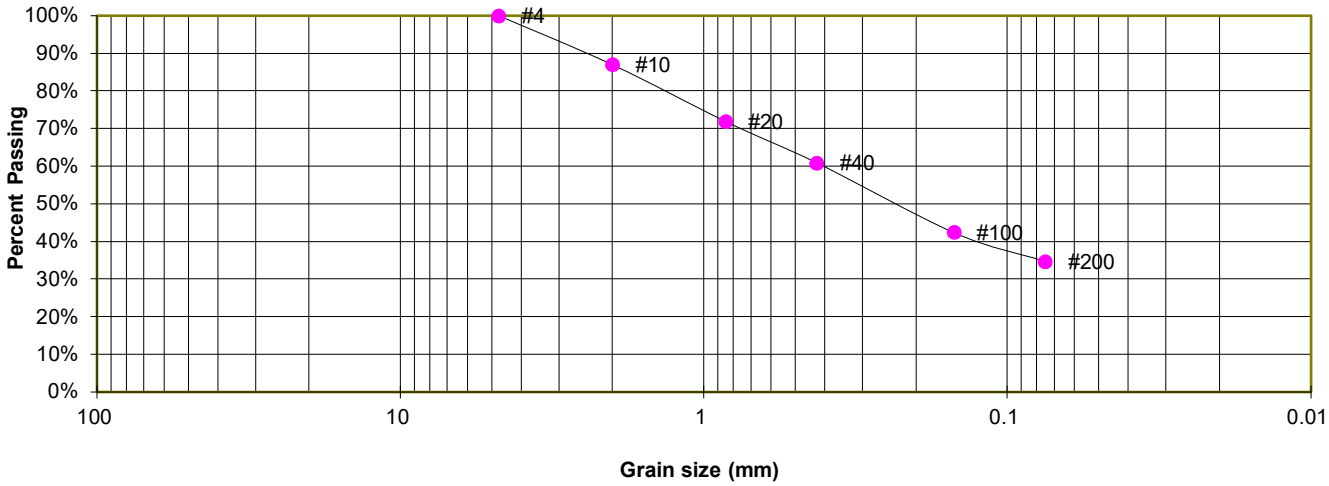
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-5

TEST BORING	5	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	2-3	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	87.0%
20	72.0%
40	60.9%
100	42.4%
200	34.7%

FHA SWELL

Moisture at start	8.7%
Moisture at finish	14.9%
Moisture increase	6.2%
Initial dry density (pcf)	111
Swell (psf)	240

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

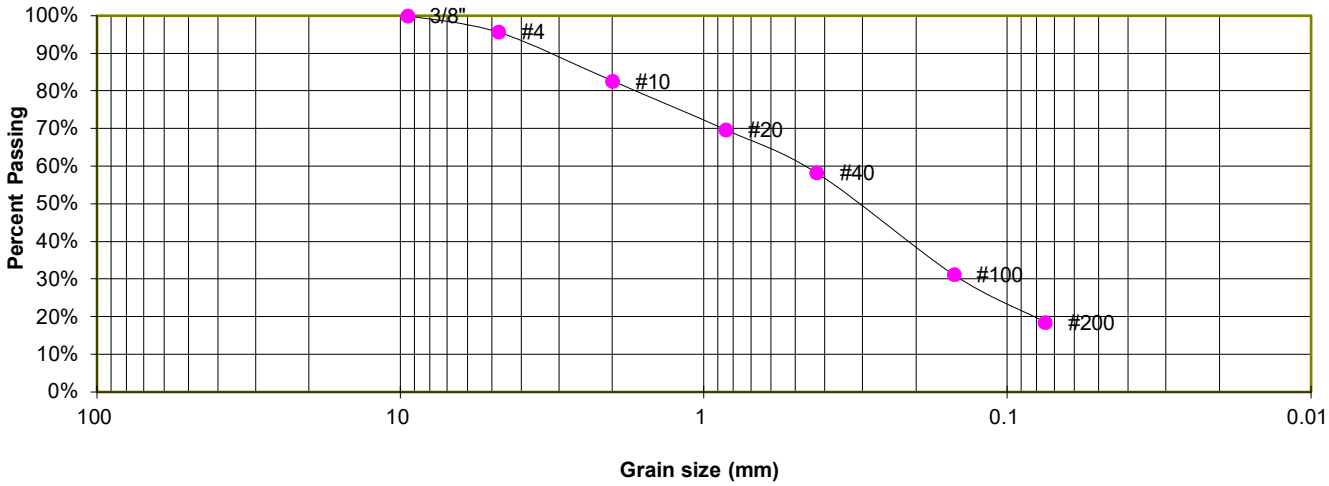
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-6

TEST BORING	5	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	10	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.7%
10	82.7%
20	69.7%
40	58.3%
100	31.2%
200	18.6%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

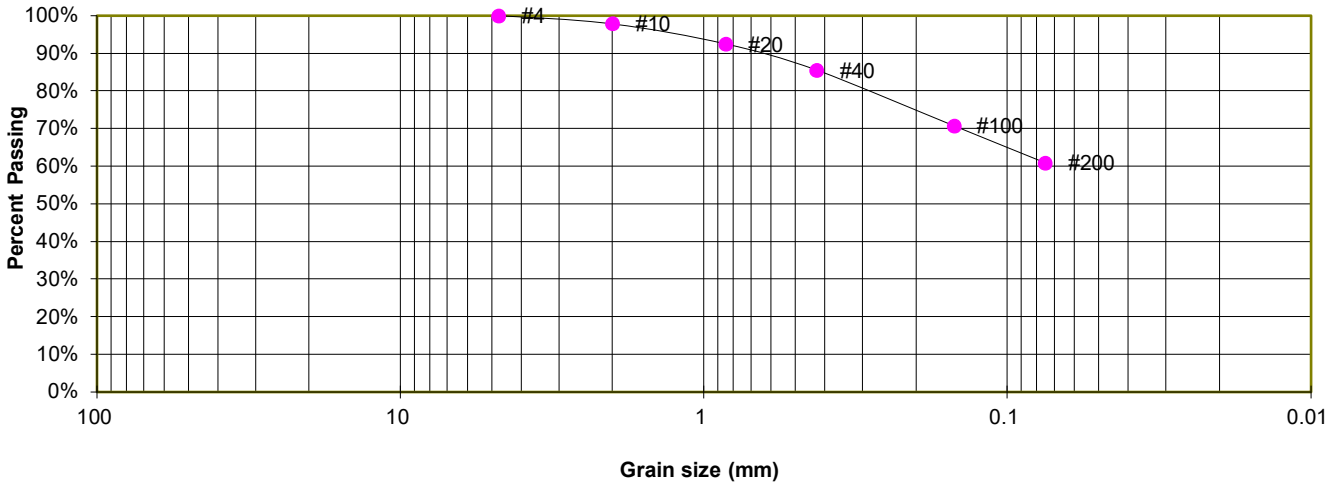
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-7

TEST BORING	1	SOIL DESCRIPTION	CLAY, SANDY
DEPTH (FT)	2-3	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	97.9%
20	92.5%
40	85.5%
100	70.8%
200	60.9%

ATTERBERG LIMITS

Plastic Limit	22
Liquid Limit	45
Plastic Index	23

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

ENTECH ENGINEERING, INC.

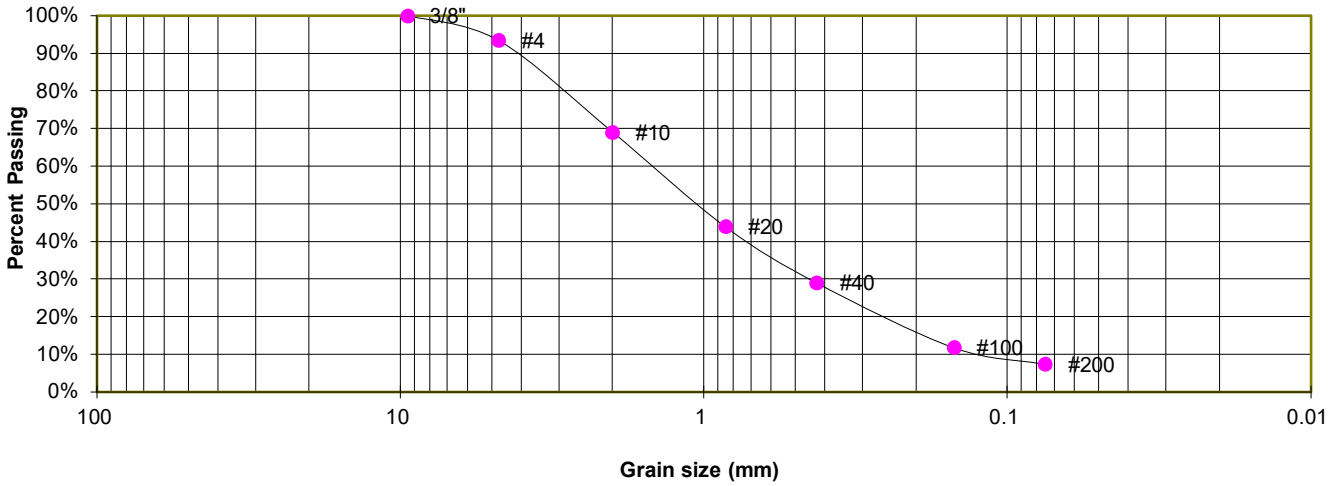
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-8

TEST BORING	1	SOIL DESCRIPTION	SANDSTONE (SAND, WITH SILT)
DEPTH (FT)	20	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.5%
10	69.1%
20	43.9%
40	29.0%
100	11.8%
200	7.4%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM

ENTECH ENGINEERING, INC.

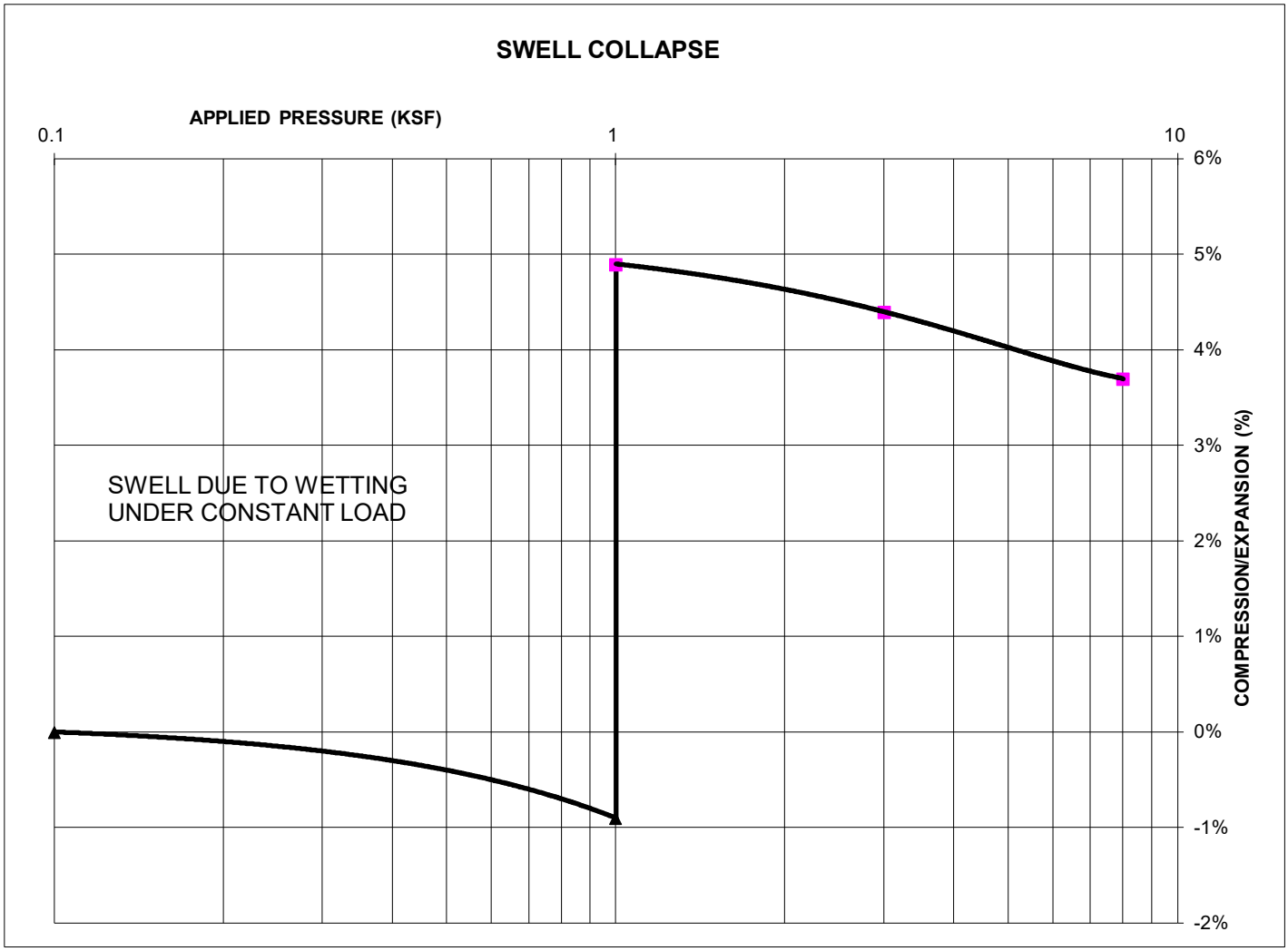
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-9

TEST BORING	1	SOIL DESCRIPTION	CLAY, SANDY
DEPTH (FT)	2-3	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 104
NATURAL MOISTURE CONTENT: 16.2%
SWELL/COLLAPSE (%): 5.8%

ENTECH ENGINEERING, INC.

SWELL TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-10

TEST BORING	3	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	1

SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 110
NATURAL MOISTURE CONTENT: 11.0%
SWELL/COLLAPSE (%): 3.3%

ENTECH ENGINEERING, INC.

SWELL TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

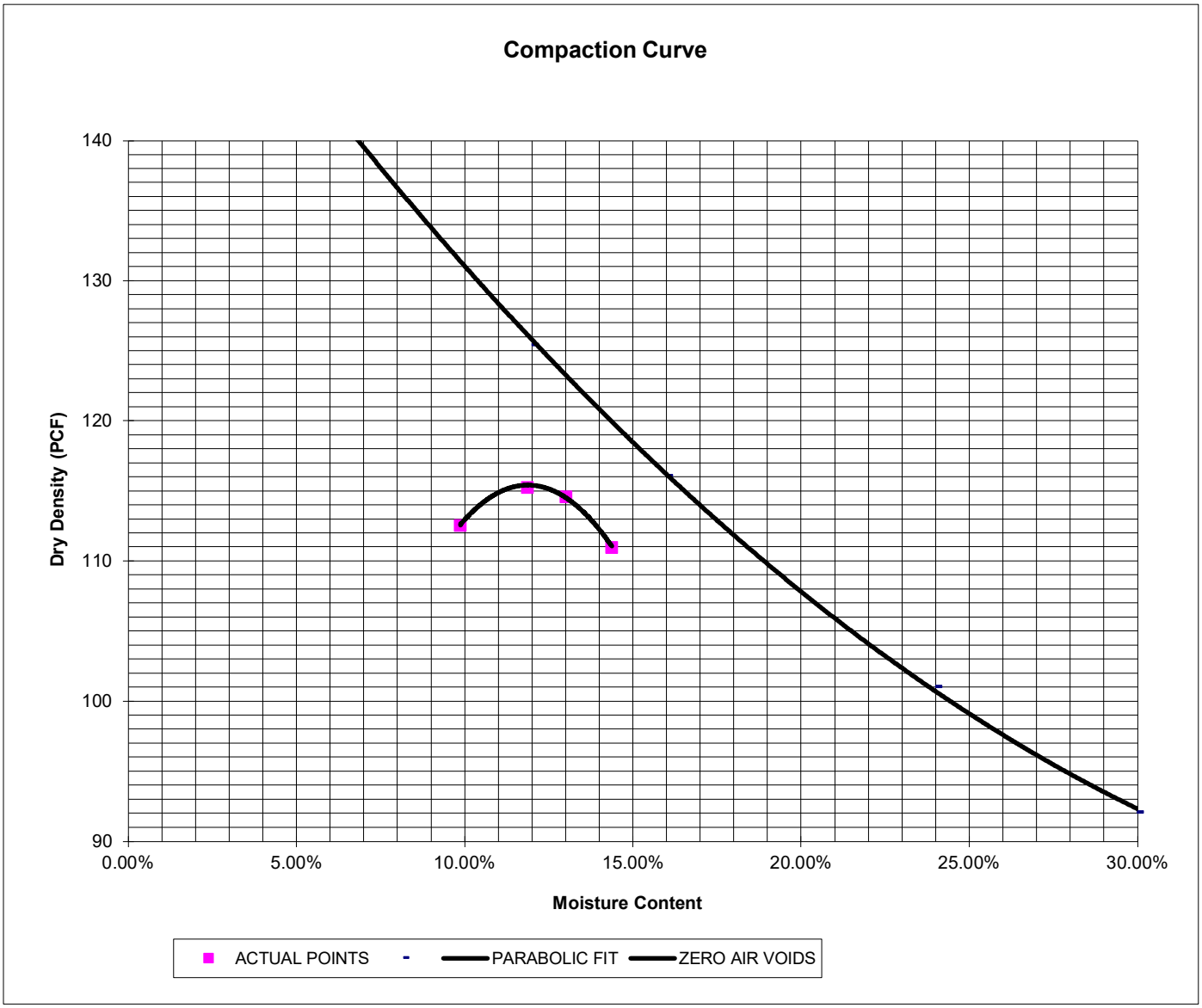
JOB NO. 240015

FIG. B-11

SAMPLE LOCATION TB-4 @ 0-3'	SOIL DESCRIPTION SAND, SILTY, BROWN
	SOIL TYPE 1

PROCTOR DATA

IDENTIFICATION:	SM
PROCTOR TEST #:	1
TEST BY:	DK
TEST DESIGNATION:	ASTM-1557-A
MAXIMUM DRY DENSITY (PCF):	115.4
OPTIMUM MOISTURE:	11.9



ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-12

SAMPLE LOCATION TB-4 @ 0-3' SOIL DESCRIPTION SAND, SILTY, BROWN
SOIL TYPE 1

CBR TEST LOAD DATA

Piston Diameter (cm): 4.958
Piston Area (in^2): 2.993

Penetration Depth (inches)	*10 BLOWS* Mold # 1 Load (lbs)	Stress (psi)	*25 BLOWS* Mold # 2 Load (lbs)	Stress (psi)	*56 BLOWS* Mold # 3 Load (lbs)	Stress (psi)
0.000	0	0.00	0	0.00	0	0.00
0.025	54	18.05	86	28.74	103	34.42
0.050	86	28.74	113	37.76	169	56.47
0.075	108	36.09	128	42.77	181	60.48
0.100	129	43.11	143	47.79	191	63.83
0.125	146	48.79	164	54.80	209	69.84
0.150	164	54.80	182	60.82	228	76.19
0.175	185	61.82	204	68.17	241	80.53
0.200	201	67.17	226	75.52	258	86.22
0.300	254	84.88	294	98.25	326	108.94
0.400	293	97.91	350	116.96	376	125.65
0.500	335	111.95	417	139.35	427	142.69

MOISTURE AND DENSITY DATA

	Mold # 1	Mold # 2	Mold # 3
Can #	117	352	357
Wt. Can	8.49	8	7.96
Wt. Can+Wet	271.98	321.21	303
Wt. Can+Dry	234.79	277.79	264.42
Wt. H20	37.19	43.42	38.58
Wt. Dry Soil	226.3	269.79	256.46
Moisture Content	16.43%	16.09%	15.04%
Wet Density (PCF)	121.4	123.7	127.0
Dry Density (PCF)	108.5	110.5	113.5
% Compaction	94%	96%	98%
CBR	4.31	4.78	6.38

PROCTOR DATA

Maximum Dry Density (pcf)	115.4
Optimum Moisture	11.9
90% of Max. Dry Density (pcf)	103.9
95% of Max. Dry Density (pcf)	109.6

CBR at 90% of Max. Density = 3.25	~ R VALUE 7.5
CBR at 95% of Max. Density = 4.57	~ R VALUE 10

ENTECH ENGINEERING, INC.

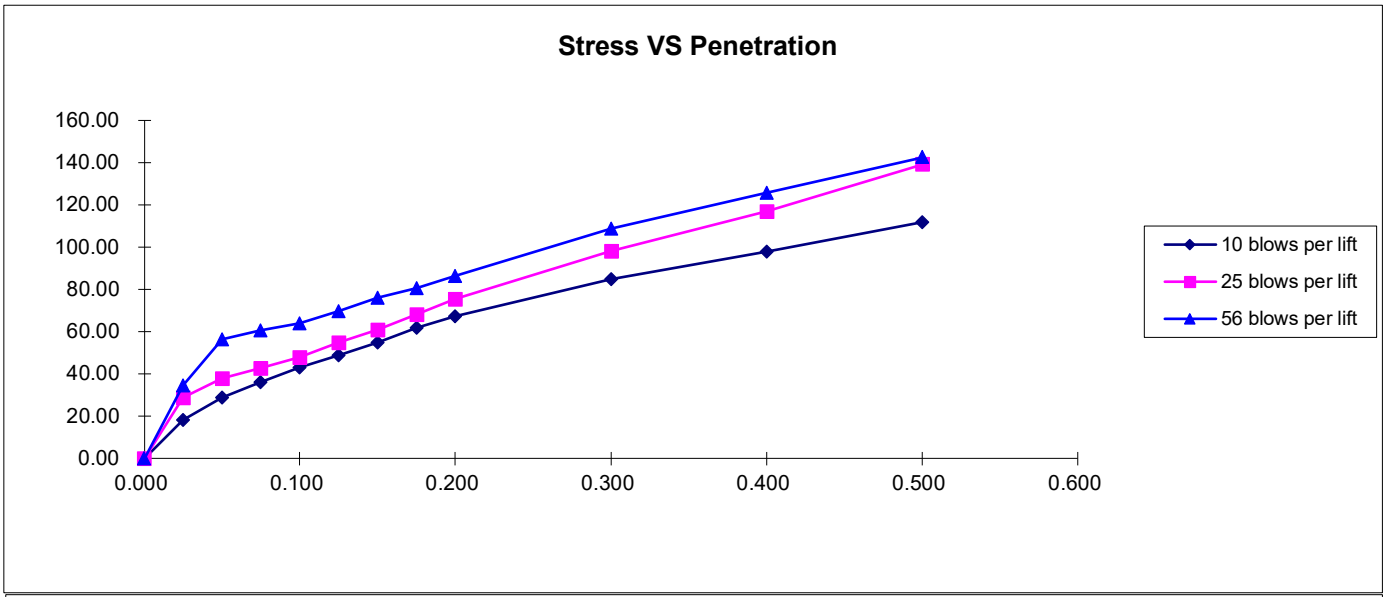
LABORATORY TEST RESULTS

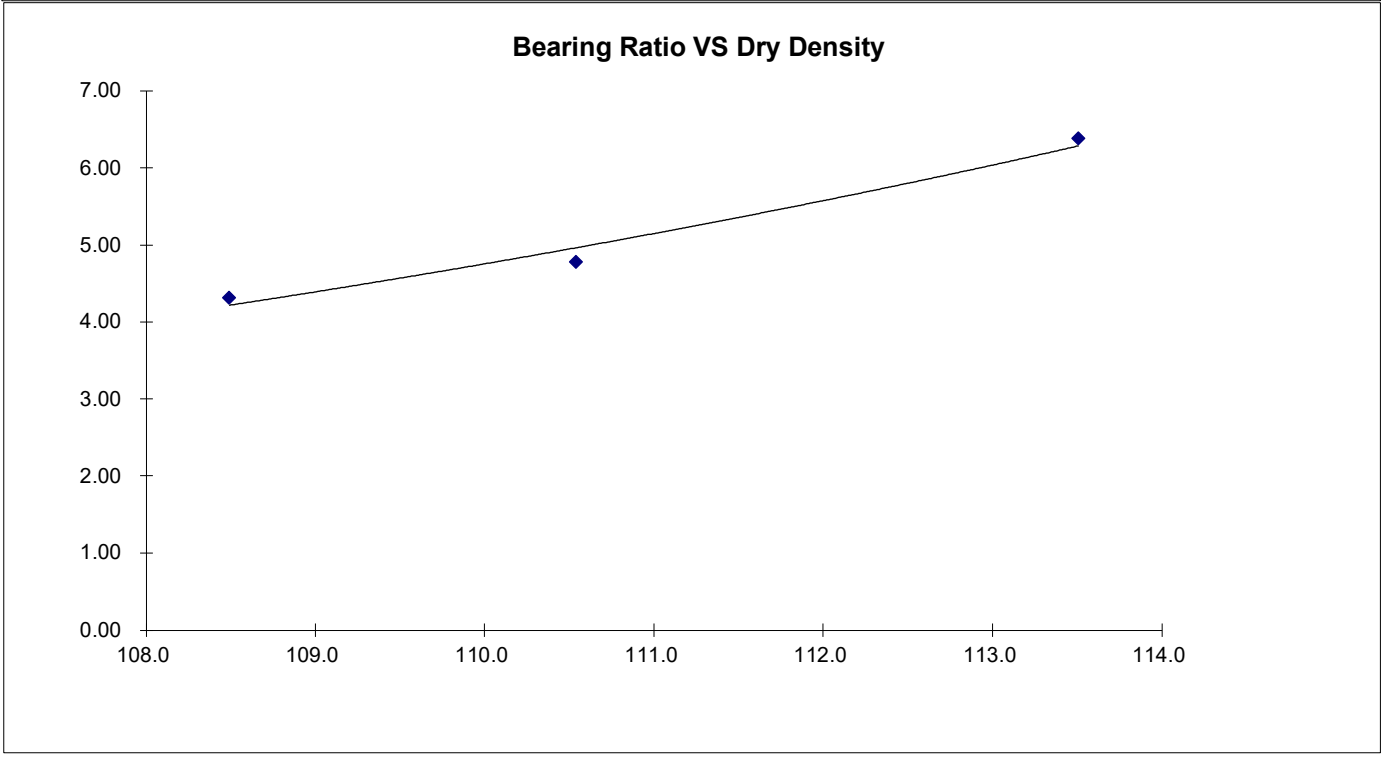
2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. B-13

SAMPLE LOCATION TB-4 @ 0-3'	SOIL DESCRIPTION SAND, SILTY, BROWN SOIL TYPE 1





ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. B-14

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location Rocky Mountain Calvary Church Parking and Access Drive

Job Number: 240015

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	100,000
Design CBR	CBR =	4.57
Standard Deviation	S_o =	0.44
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	75
Reliability (z-statistic)	Z_R =	-0.67
Soil Resilient Modulus	M_R =	6,855 psi

Required Structural Number (SN): → SN = 2.19

DESIGN EQUATIONS

Resilient Modulus

If using CBR:

M_R = (CBR) x 1,500

If using R-Value:

$M_R = 10^{[(S_1 + 18.72) / 6.24]}$ where: S_1 = [(R-value - 5) / 11.29] + 3

Required Structural Number

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Pavement Section Thickness

$SN^* = C_1D_1 + C_2D_2$ where:

C_1 = Strength Coefficient - HMA

C_2 = Strength Coefficient - ABC

D_1 = Depth of HMA (inches)

D_2 = Depth of ABC (inches)

RECOMMENED THICKNESSES

Layer	Material	Structural Layer	Thickness (D^*_i)	SN^*_i	SN
1	HMA	C_1 = 0.44	4.0 inches	1.760	-
2	ABC	C_2 = 0.11	4.0 inches	0.440	
			SN* =	2.200	2.19

Pavement SN > Required SN, Design is Acceptable

FIG. C-1

APPENDIX C: OWTS Site Evaluation, dated March 6, 2024, Entech Job No. 240015

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599

March 6, 2024

Rocky Mountain Calvary Church
4285 N. Academy Boulevard
Colorado Springs, CO 80918

Attn: Robert Beech

Re: OWTS Site Evaluation
2150 North Ellicott Highway
El Paso County, Colorado

Dear Mr. Beech:

As requested, personnel of Entech Engineering, Inc. have observed the excavation of four test pits in the areas of the proposed on-site wastewater treatment system (OWTS) absorption field location at the above referenced site. This letter presents the results of our testing.

The locations of the test pits are shown in Figure 1. The test pits were excavated on February 14, 2024, to approximate depths of 8 feet. Soils encountered in the test pits consisted of sandy clay with underlying sandy loam. The Test Pit Logs and Laboratory Test Results are shown in Figures 2 through 8. Bedrock was not encountered in the test pits. Redoximorphic features were encountered in Test Pit No. 3 at approximately 7.5 feet below grade.

Visual and tactile evaluation of the soils was performed. The limiting layer encountered in the test pits is the sandy clay, which classified as USDA Soil Type 4A. For design purposes a LTAR Value of 0.15 gallons per day per square foot is recommended for Treatment Level 1. A maximum LTAR Value of 0.60 gallons per day per square foot is recommended for Treatment Level 1, provided the sandy clay layer is fully penetrated throughout the soil treatment area. An engineer designed system is required for this site due to the Soil Type 4A and redoximorphic features encountered in the test pits. The absorption field should be installed in accordance with El Paso County Health Department regulations.

We trust that this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Christopher A. Wiese

Reviewed by:

COLORADO LICENSED
ROBERT PAUL JAQUET
58495
PROFESSIONAL ENGINEER
3/6/24

Robert P. Jaquet, P.E.

Robert Jaquet Digitally signed by Robert Jaquet
Date: 2024.03.06 14:03:52 -07'00'

RPJ/cw
Encl.
Entech Job No. 240015
AA projects/2024/240015 owts site eval

TP- APPROXIMATE TEST PIT LOCATION AND NUMBER

- **TP-1 38°51'40.19"N, 104°23'18.52"W**
- **TP-2 38°51'39.82"N, 104°23'19.29"W**
- **TP-3 38°51'41.57"N, 104°23'21.19"W**
- **TP-4 38°51'40.95"N, 104°23'21.07"W**

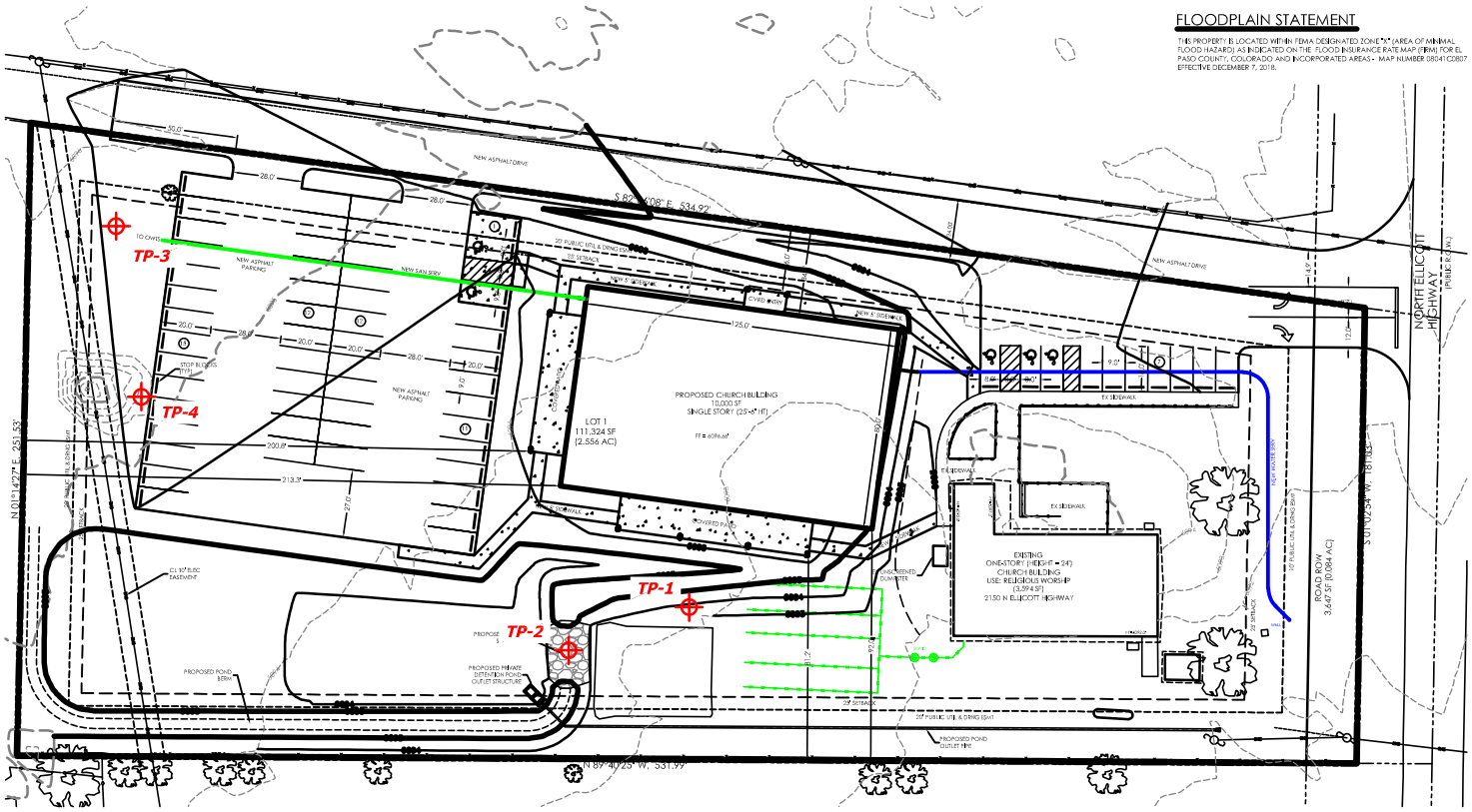
N

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599

TEST PIT LOCATION MAP

2150 NORTH ELLICOTT HIGHWAY
EL PASO COUNTY, COLORADO
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.: 240015
FIG NO.: 1



TP- APPROXIMATE TEST PIT LOCATION AND NUMBER

- TP-1 38°51'40.19"N, 104°23'18.52"W
- TP-2 38°51'39.82"N, 104°23'19.29"W
- TP-3 38°51'41.57"N, 104°23'21.19"W
- TP-4 38°51'40.95"N, 104°23'21.07"W

N

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599

TEST PIT LOCATION MAP

2150 NORTH ELLICOTT HIGHWAY
EL PASO COUNTY, COLORADO
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.: 240015

FIG NO.: 1a

TEST PIT 1
DATE EXCAVATED 2/14/2024

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, brown, moist	1					
	2					
sandy clay, fine to medium grained, dark brown, moist	3			ma	sl	4A
	4					
sandy loam, fine to coarse grained, brown, moist	5			g	s	2
	6					
	7					
	8					
	9					
	10					

TEST PIT 2
DATE EXCAVATED 2/14/2024

REMARKS	Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, brown, moist	1					
	2					
sandy clay, fine to medium grained, dark brown, moist	3			ma	sl	4A
	4					
sandy loam, fine to coarse grained, light brown, moist	5			g	s	2
	6					
	7					
	8					
	9					
	10					

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l
structureless - sl

ENTECH ENGINEERING, INC.

TEST PIT LOGS

2150 NORTH ELLICOTT HIGHWAY
EL PASO COUNTY, COLORADO
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO.
240015

FIG. 2

TEST PIT 3
DATE EXCAVATED 2/14/2024

REMARKS

redoximorphic features @ 7'-6"

Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, brown, moist					
sandy clay, fine to medium grained, dark brown, moist			ma	sl	4A
sandy loam, fine to coarse grained, light brown, moist			g	s	2
sandy clay, fine to medium grained, yellowish brown, moist ▼			g	s	4

TEST PIT 4
DATE EXCAVATED 2/14/2024

REMARKS

Depth (ft)	Symbol	Samples	Soil Structure Shape	Soil Structure Grade	Soil Type
topsoil, sandy clay loam, brown, moist					
sandy clay, fine to medium grained, dark brown, moist			ma	sl	4A
sandy loam, fine to coarse grained, light brown, moist			g	s	2

Soil Structure Shape
granular - gr
platy - pl
blocky - bl
prismatic - pr
single grain - sg
massive - ma

Soil Structure Grade
weak - w
moderate - m
strong - s
loose - l
structureless - sl

ENTECH ENGINEERING, INC.

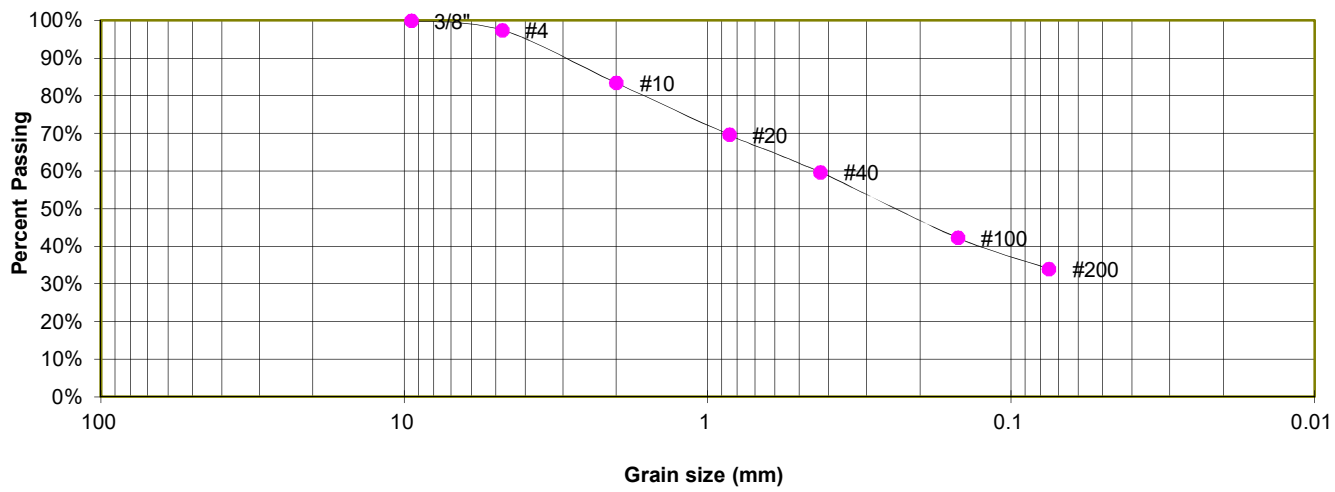
TEST PIT LOGS

2150 NORTH ELLICOTT HIGHWAY
EL PASO COUNTY, COLORADO
ROCKY MOUNTAIN CALVARY CHURCH

JOB NO. 240015

FIG. 3

TEST PIT	TP-1	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	2.5	SOIL TYPE	4A



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.4%
10	83.4%
20	69.6%
40	59.7%
100	42.3%
200	34.0%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SC

ENTECH ENGINEERING, INC.

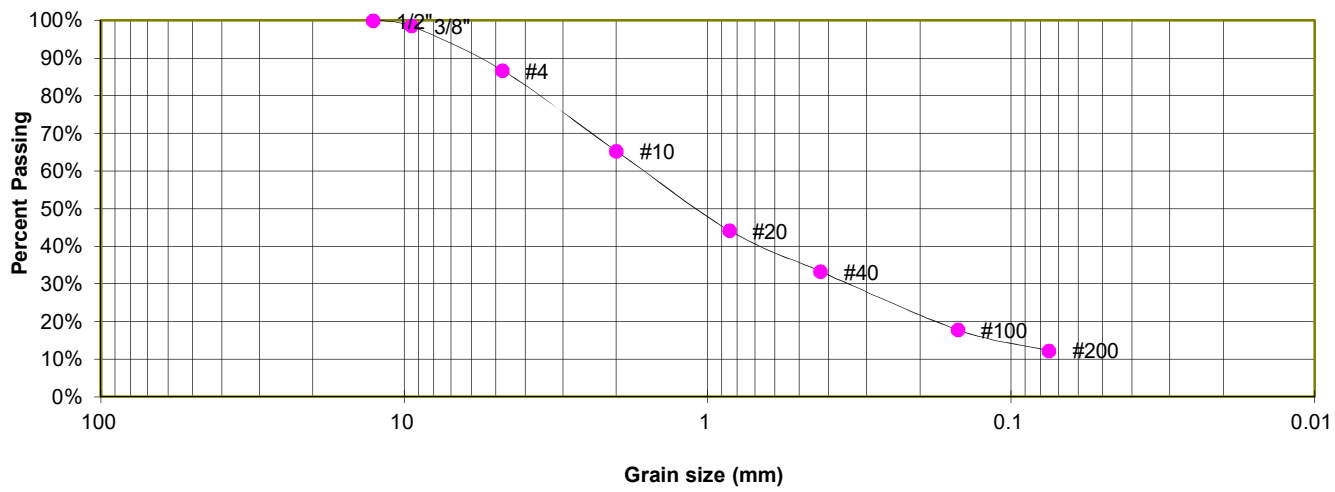
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY

JOB NO. 240015

FIG. 4

TEST PIT	TP-2	SOIL DESCRIPTION	SAND, SILTY
DEPTH (FT)	5.5	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.5%
4	86.7%
10	65.3%
20	44.2%
40	33.3%
100	17.8%
200	12.3%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SM

ENTECH ENGINEERING, INC.

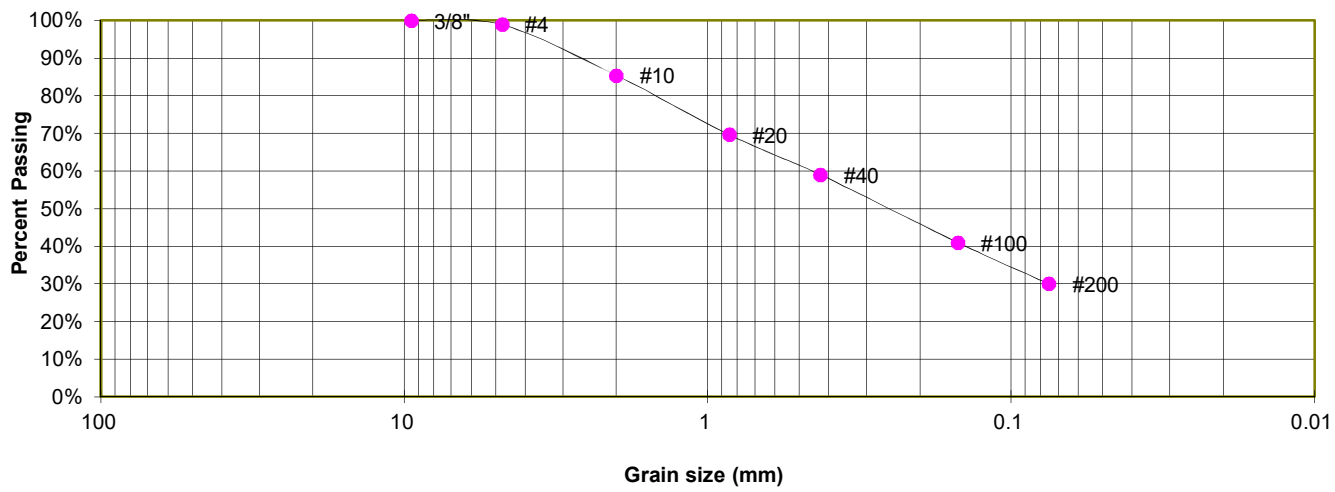
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY

JOB NO. 240015

FIG. 5

TEST PIT	TP-3	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	3	SOIL TYPE	4A



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.9%
10	85.4%
20	69.7%
40	59.0%
100	41.0%
200	30.0%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SC

ENTECH ENGINEERING, INC.

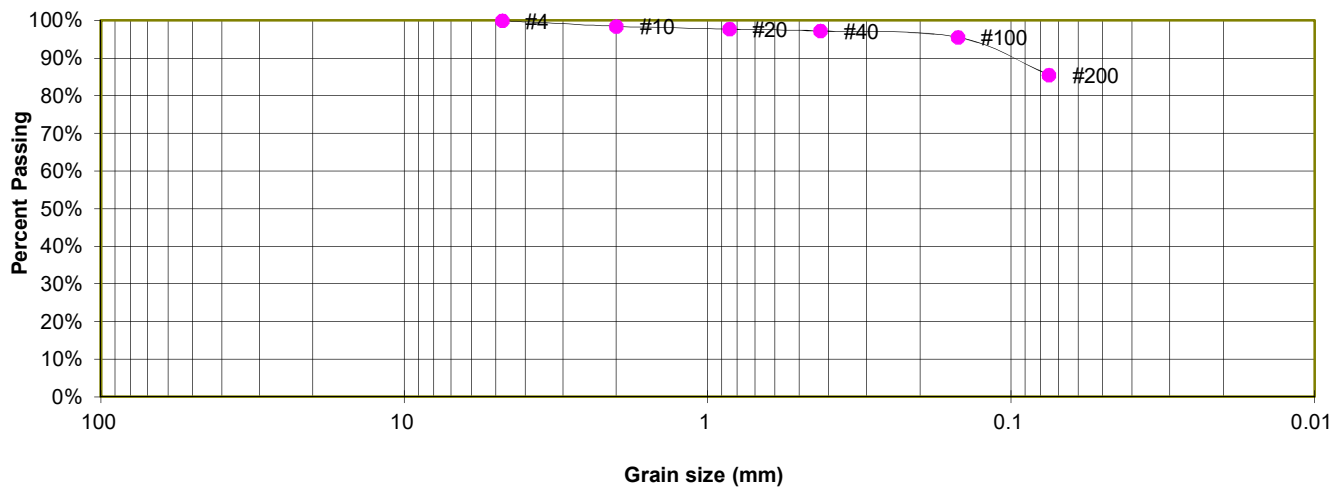
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY

JOB NO. 240015

FIG. 6

TEST PIT	TP-3	SOIL DESCRIPTION	CLAY, WITH SAND
DEPTH (FT)	7.5	SOIL TYPE	4



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.5%
20	97.7%
40	97.2%
100	95.6%
200	85.6%

SOIL CLASSIFICATION

USCS CLASSIFICATION: CL

ENTECH ENGINEERING, INC.

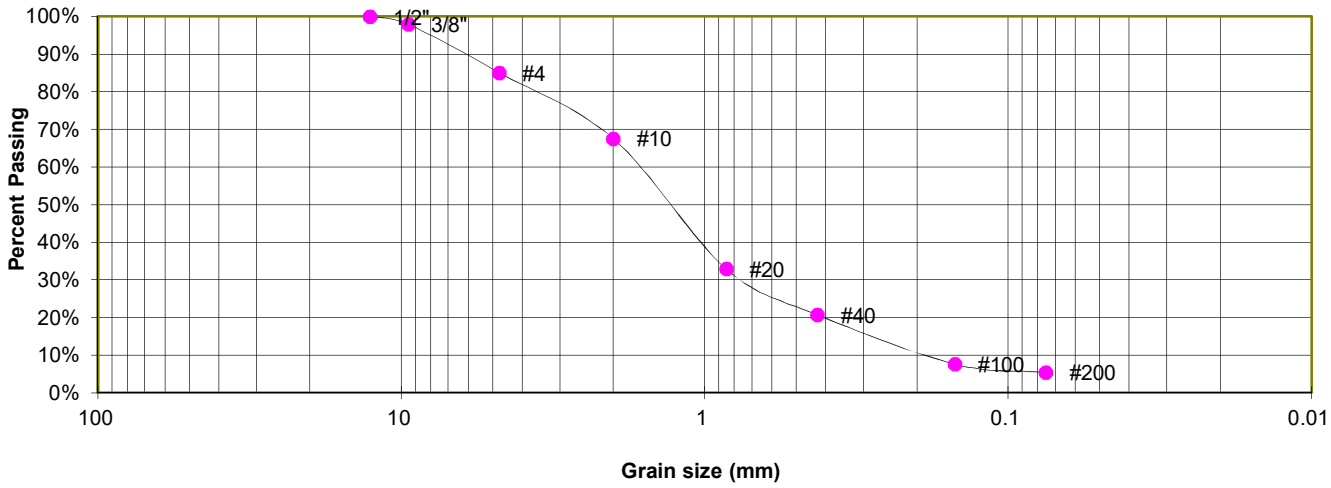
LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY

JOB NO. 240015

FIG. 7

TEST PIT	TP-4	SOIL DESCRIPTION	SAND, WITH SILT
DEPTH (FT)	6	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.0%
4	85.0%
10	67.6%
20	32.9%
40	20.7%
100	7.6%
200	5.4%

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

2150 N. ELLICOTT HIGHWAY
ROCKY MOUNTAIN CALVARY

JOB NO. 240015

FIG. 8

APPENDIX D: USDA Soil Survey

El Paso County Area, Colorado

28—Ellicott loamy coarse sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 3680
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Ellicott and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ellicott

Setting

Landform: Flood plains, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 4 inches: loamy coarse sand
C - 4 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R069XY031CO - Sandy Bottomland
Other vegetative classification: SANDY BOTTOMLAND (069AY031CO)
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquoll
Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils
Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

El Paso County Area, Colorado

78—Sampson loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 369s
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Sampson and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sampson

Setting

Landform: Depressions, alluvial fans, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 15 inches: loam
Bt - 15 to 34 inches: clay loam
Bk - 34 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R049XB202CO - Loamy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

APPENDIX E: El Paso County Health Department, Existing Septic Records

EL PASO COUNTY HEALTH DEPARTMENT
COLORADO SPRINGS, COLORADO

P dhl ae

SEWAGE DISPOSAL INSPECTION FORM

PERMIT NUMBER 4194

DATE SEPTEMBER 12, 1980

APPROVAL: YES ✓ NO ____ Tax # 3400000207 ENVIRONMENTALIST Allen Pierre

LOCATION 2150 N ELLICOTT HWY OCCUPANT ~~DONALD~~ & MARY SIMMONS (CHURCH)

LEGAL DESCRIPTION NE4, SEC 1-14-63 [2.76A NE¼ SEC. 1 T14S R63W]

TYPE OF CONSTRUCTION WOOD/STUCCO FRAME (CHURCH) NO. OF BEDROOMS N/A

SYSTEM INSTALLED BY DON SHUNK

COMMERCIAL MFG. YES SIZE 2000 GAL.

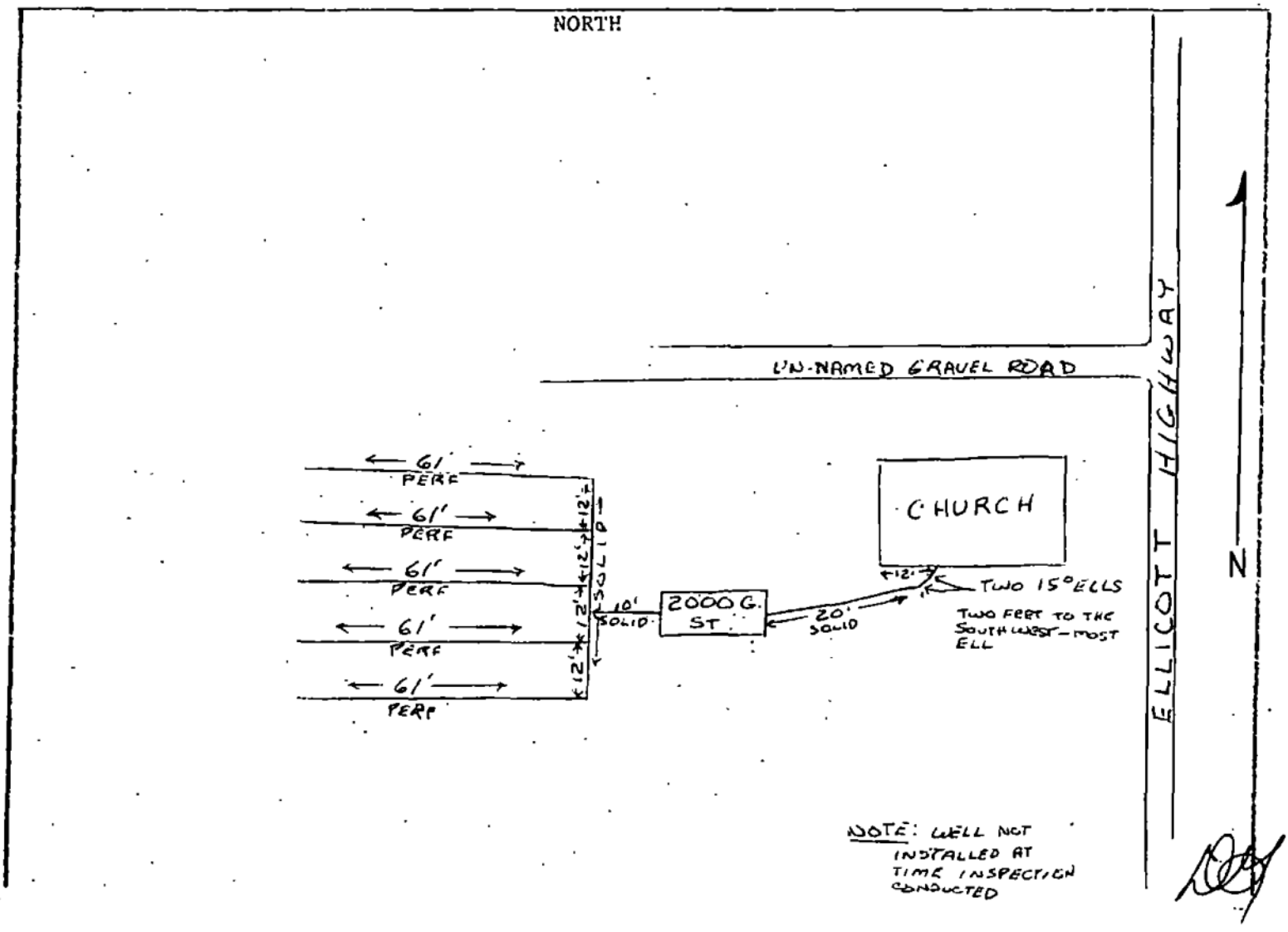
TYPE OF MATERIAL CONCRETE NO. COMPARTMENTS 3

WIDTH 6' LENGTH 11' DEPTH (total) 7' LIQ. CAP. 2000 GAL

DISPOSAL FIELD: BED OR (TRENCH) DEPTH 72" WIDTH 36" LENGTH 305 SQ. FT. 915

DISTANCE BETWEEN LINES 12' ROCK 1½ RR DEPTH 12" UNDER 6" OVER 2"

LEACHING PITS (NO.) ____ LINING MATERIAL ____ CAPACITY SQ. FT. ____



Acres 159.65

EL PASO COUNTY • COUNTY HEALTH DEPARTMENT

501 North Foote Avenue • Colorado Springs, Colorado • 578-3125

Permit 4194

Water Supply well

Receipt No.

PERMIT

TO CONSTRUCT, ALTER, REPAIR or MODIFY ANY INDIVIDUAL SEWAGE DISPOSAL SYSTEM

Issued To Donald & Mary Simmons Date 9-8-86

Address of Property 2150 Ellictot Highway Phone 683-2703

(Permit valid at this address only)

Sewage-Disposal System work to be performed by Phone

This Permit is issued in accordance with 25-10-106 Colorado Revised Statutes 1973, as amended. PERMIT EXPIRES upon completion-installation of sewage-disposal system or at the end of six (6) months from date of issue—whichever occurs first—(unless work is in progress). This permit is revokable if all stated requirements are not met.

—THIS PERMIT DOES NOT DENOTE APPROVAL OF ZONING AND ACREAGE REQUIREMENTS—

$150.00
PERMIT FEE (NOT REFUNDABLE)

Glenn Rumbaugh, M.D.
DIRECTOR, COUNTY HEALTH DEPARTMENT

9-8-87
DATE OF EXPIRATION

Danny (i). Dardon
ENVIRONMENTALIST

NOTE: LEAVE ENTIRE SEWAGE-DISPOSAL SYSTEM UNCOVERED FOR FINAL INSPECTION. 48 HOUR ADVANCE NOTICE REQUIRED.

SEPTIC TANK:	TRENCH SYSTEM:	BED SYSTEM:	SEEPAGE PIT SYSTEM:
2000 gallons	total square feet 459 153 ft. of trench 36 inches wide ____ ft. of trench ____ inches wide	(at least two trenches) total square feet	total square feet ____ rings or ____ diam x ____ w/d

NOTES: Keep well 100 feet from trenches and 50 feet from septic tank.

The Health Office shall assume no responsibility in case of failure or inadequacy of a sewage-disposal system, beyond consulting in good faith with the property owner or representative. Free access to the property shall be authorized at reasonable times for the purpose of making such inspections as are necessary to determine compliance with requirements of this law.

El Paso County Health Department
501 North Foote Avenue
Colorado Springs, CO 80909-4598
(303) 578-3125

Allen

APPLICATION FOR A PERMIT TO CONSTRUCT, REMODEL, OR INSTALL A SEWAGE DISPOSAL SYSTEM

NAME OF OWNER Donald & Mary Simmons HOME PHONE 683-2703 WORK PHONE

ADDRESS OF PROPERTY Rt 2, 2850 Ellicott Hwy DATE Aug. 19, 1986

LEGAL DESCRIPTION OF PROPERTY NE4 Sec 1-14-63 2-

TAX SCHEDULE NUMBER 3400-00-104 SYSTEM CONTRACTOR PHONE

OWNER'S ADDRESS IF DIFFERENT same

TYPE OF HOUSE CONSTRUCTION Church SOURCE AND TYPE OF WATER SUPPLY

SIZE OF LOT 159.65 MAXIMUM POTENTIAL NUMBER OF BEDROOMS BASEMENT (yes or no)

PERCOLATION TEST RESULTS ATTACHED (yes or no)

A plot plan and accompanying information are essential; it may be drawn on the back of this application or be attached. Please include by measured distance the location of wells including neighbors' wells, springs, water supply lines, cisterns, buildings, proposed structures, property lines, property dimensions, subsoil drains, lakes, ponds, water courses, streams, and dry gulches. Please show the location of the proposed septic system by directions and distances from actual and/or proposed dwellings, structures, or fixed reference objects. Give complete directions to the property from major highways.

Applicant acknowledges that the completeness of the application is conditional upon such further mandatory and additional tests and reports as may be required by the department to be made and furnished by the applicant for purposes of evaluation of the application; and issuance of the permit is subject to such terms and conditions as deemed necessary to ensure compliance with rules and regulations adopted under Article 10, Title 25, C.R.S. 1973 as amended. The undersigned hereby certifies that all statements made, information and reports submitted by the applicant are or will be represented to be true and correct to the best of my knowlege and belief and are designed to be relied on by the El Paso County Health Dept. in evaluating the same for purposes of issuing the permit applied for herein. I further understand that any falsification or misrepresentation may result in the denial of the application or revocation of any permit granted based upon said application and in legal action for perjury as provided by law.

SIGNATURE Donald M Simmons
Mary Simmons

NEED 153 LINEAR FEET OF TRENCHES (AT LEAST TWO) 36" WIDE

HEALTH DEPARTMENT USE ONLY

PERMIT NUMBER 4194 RECEIPT NUMBER 6384 DATE TO LAND USE DEPARTMENT 8/20/86

ABSORPTION AREA 459 sq ft. TANK CAPACITY 2000 GAL DATE OF SITE INSPECTION 8/22/86

REMARKS: Keep well 100' from trenches and 50' from septic tank.

APPLICATION IS APPROVED (X) DENIED ( ) DATE 8/22/86 ENVIRONMENTALIST Allen Sires, EHS

Alley ~~[illegible]~~ Perc only part to all appli.?

E

T-C EXCAVATING, INC.
Chester Hamacher
6430 Burrows Rd. Tel.: 495-2379
Colorado Springs, Colorado 80908

2202 Ellicott Hwy
Tax #

SOIL PERCOLATION DATA SHEET
#3400000207
09/12/1986
E
09-12-1986

2150 N ELLICOTT Hwy

Date: May 20, 1986

Client: Don Simmons Address: Rt 2 2202 Ellicott Hwy

City: Calhan State: CO Zip Code: 80808 Tele.: 683-2703

County: El Paso Location of Test: 2202 Ellicott Hwy

No. Acres: 5 Water Supply: Well

PERCOLATION RATE MEASUREMENT RESULTS

	Hole Depth	DEPTH TO WATER				Last Drop	Min. per Inch
		Time: 4:00	Time: 4:15	Time: 4:30	Time: 4:4[illegible]		
#1	36"	20 1/2	23 1/4	25 15/16	28 9/16	2 5/8"	5.71
#2	36"	19 15/16	22 9/16	25 3/16	27 3/4	2 9/16"	5.85
#3	36"	20 1/16	23	25 7/8	28 11/16	2 13/16"	5.33

Avg. 6

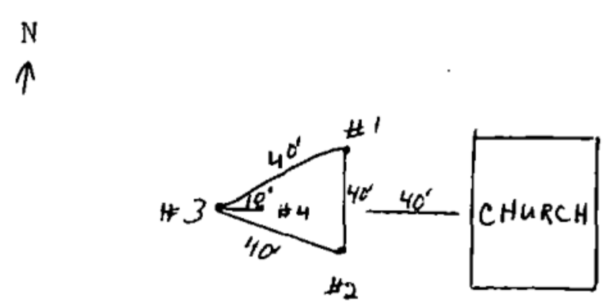
PROFILE

#4	Depth	Soil Description
	0 - 4"	Top soil
	4" - 4'	Fine sand w/tr clay
	4' - 8'	Sand, gravel

Ground Water: None

Bedrock: None

Grade of Site: flat



REMARKS: Approved – Keep field 100' from well

JOHN E. WENDT
REGISTERED
[illegible]
PROFESSIONAL ENGINEER
STATE OF COLORADO