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**SOIL, GEOLOGY, AND GEOLOGIC HAZARD STUDY  
WINSOME SUBDIVISION – FILING NO. 2  
A PORTION OF PARCEL NO. 51000-00-493  
17480 MERIDIAN ROAD NORTH  
EL PASO COUNTY, COLORADO**

Prepared for

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Respectfully Submitted,

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LLL/nc

Encl.

Entech Job No. 202508  
AAprojects/2020/202508 countysoil/geo/ww

PCD Fil No. SF-2115

**TABLE OF CONTENTS**

1.0 SUMMARY ..... 1  
2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION ..... 2  
3.0 SCOPE OF THE REPORT ..... 3  
4.0 FIELD INVESTIGATION ..... 3  
5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY ..... 4  
    5.1 General Geology ..... 4  
    5.2 Soil Conservation Survey ..... 4  
    5.3 Site Stratigraphy ..... 5  
    5.4 Soil Conditions ..... 6  
    5.5 Groundwater ..... 6  
6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS ..... 7  
    6.1 Relevance of Geologic Conditions to Land Use Planning ..... 9  
7.0 ECONOMIC MINERAL RESOURCES ..... 11  
8.0 EROSION CONTROL ..... 12  
9.0 EMBANKMENT CONSTRUCTION RECOMMENDATIONS ..... 13  
10.0 CLOSURE ..... 13  
BIBLIOGRAPHY ..... 15

**TABLES**

- Table 1: Summary of Laboratory Test Results
- Table 2: Summary of Tactile Test Pits Results

**FIGURES**

- Figure 1: Vicinity Map
- Figure 2: USGS Map
- Figure 3: Site Plan/Testing Location Map
- Figure 4: Soil Survey Map
- Figure 5: Eastonville Quadrangle Geology Map
- Figure 6: Geology Map/Engineering Geology
- Figure 7: Floodplain Map
- Figure 8: Typical Perimeter Drain Details

- APPENDIX A: Site Photographs
- APPENDIX B: Test Boring Logs
- APPENDIX C: Laboratory Test Results
- APPENDIX D: Laboratory Testing Summary, Test Boring - Entech Job No. 181495
- APPENDIX E: Soil Survey Descriptions

## **1.0 SUMMARY**

### ***Project Location***

The project site lies in portions of the NE $\frac{1}{4}$ , SE $\frac{1}{4}$ , and SW $\frac{1}{4}$  of Section 24 and a portion of the W $\frac{1}{2}$  of Section 19, Township 11 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in the northeastern portion of El Paso County, Colorado. The site is located approximately 12 miles east of Monument, Colorado, northwest of Hodgen Road and Meridian Road North.

### ***Project Description***

Total acreage involved in Filing No. 2 of the project is approximately 254 acres. The proposed site development consists of Sixty-one single-family rural residential lots, one commercial lot are proposed, and a full spectrum detention pond (Pond 5) in the northwestern portion of the site. The development will utilize individual wells and on-site wastewater treatment systems.

### ***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 some constraints on development and land use. These include areas of potentially expansive soils, potentially seasonal shallow groundwater, and seasonal shallow groundwater areas. Based on the proposed development plan, it appears that these areas will have some impact 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 are either avoided or properly mitigated. All recommendations are subject to the limitations discussed in the report.

## **2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION**

The site is located in portions of the NE $\frac{1}{4}$ , SE $\frac{1}{4}$ , and SW $\frac{1}{4}$  of Section 24 and a portion of the W $\frac{1}{2}$  of Section 19, Township 11 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in the northeastern portion of El Paso County, Colorado. The site is located approximately 12 miles east of Monument, Colorado, northwest of Hodgen Road and Meridian Road North. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site consists of rolling hills that vary from gradually to moderately sloping generally to the northwest, with moderately steep slopes located along portions of the drainages on site. West Kiowa Creek bisects the site and is located to the northwest and north of phase one of the proposed subdivision. A tributary to West Kiowa Creek is located in the eastern portion of Winsome Subdivision Filing No. 1. The drainages on site flow in a northerly and northeasterly directions through the central portion of the site. Water was observed in the West Kiowa Creek drainage, and other drainages located across the site were dry at the time of this investigation. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. The site contains primarily field grasses and weeds. Site photographs, taken December 4 and 9, 2020, are included in Appendix A.

Total acreage involved in the proposed development is approximately 254 acres. Sixty-one single-family rural residential lots, one commercial lot are proposed, and a full spectrum detention pond (Pond 5) in the northwestern portion of the site. The proposed residential lots vary in sizes from approximately 2.5 to 5.5 acres. The area will be serviced by individual wells and on-site wastewater treatment systems. The proposed Site Plan/Testing Location Map is presented in Figure 3.

The site was previously investigated as part of a Preliminary Soils, Geology, Geologic Hazard and Wastewater Study, Entech Job No. 181459 (Reference 1). Five (5) test borings, and ten (10) tactile test pits were performed on the site to determine general suitability of the site for the use of on-site wastewater treatment systems. The previous report/investigation was used as part of this investigation. More specifically previous Test Boring Nos. (TB-2, TB-4, and TB-5) and Test Pit Nos. (TP-4, TP-5 and TP-6) were used as part of the Winsome Subdivision Filing No. 2 investigation.

### **3.0 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.

### **4.0 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 Geology/Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on December 4 and 9, 2020.

Previous Test Boring Nos. (TB-2, TB-4, and TB-5) were used as part of the Winsome Subdivision Filing No. 2 investigation. Four (4) test borings, and ten (10) tactile test pits were performed on the site to determine general suitability of the site for the use of on-site wastewater treatment systems. The locations of the test borings, and test pits are indicated on the Site Plan/Testing Location Map, Figure 3. The Test Boring and Test Pit Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

Laboratory testing was also performed on some 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. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1. A Summary of Laboratory Test Results, Test Boring Logs from the previous investigation are included in Appendix D.

## 5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

### 5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province, north of the Palmer Divide. Approximately 16 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 northwesterly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Tertiary to Upper Cretaceous in age. The bedrock underlying the site consists of the Dawson Arkose Formation. Overlying this formation are unconsolidated deposits of residual soils, man-made, and alluvial soils of the Quaternary Age. The residual soils are produced by the in-situ action of weathering of the bedrock on site. The alluvial soils were deposited by water in the major drainage on the site and as stream terrace deposits. Man-made soils exist as erosion berms. 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 2), previously the Soil Conservation Service (Reference 3) has mapped five soil types on the site (Figure 4). In general, they vary from loam, loamy sands, and sandy loam. The soils are described as follows:

<u>Type</u>	<u>Description</u>
25	Elbeth Sandy Loam, 3 to 8% slopes
67	Peyton Sandy Loam, 5-9% slopes
68	Peyton-Pring Complex, 3-8% slopes
71	Pring Coarse Sandy Loam, 3 to 8% slopes
92	Tomah-Crowfoot Loamy Sands, 3 to 8% slopes

Complete descriptions of each soil type are presented in Appendix D. The soils have generally been described to typically have slow to rapid permeabilities. The majority of the soils have moderate permeabilities. Limitations described for the soils include shrink-swell potential on Soil Type Nos. 25. Roads may need to be designed to minimize frost-heave potential. 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 Eastonville Quadrangle Geology Map showing the site is presented in Figure 5 (Reference 4). The Geology Map prepared for the site is presented in Figure 6. Four mappable units were identified on this site which are described as follows:

- Qp Piney Creek Alluvium (Alluvium One and Two) of Early Holocene Age:** These materials consist of low stream-terrace deposits above the current stream channel. The materials typically consist of silty to well graded sand.
  
- Qb Broadway Alluvium (Alluvium Three) of Late Pleistocene Age:** These materials consist of middle steam terrace deposits. The materials typically consist of silty to clayey gravelly sands.
  
- Qsw Sheetwash Deposits of Holocene to Late Pleistocene Age:** These materials consist of silty to clayey sands with some cobbles and boulders. The material was deposited by the action of sheetwash and gravity.
  
- Qc/Tkd Colluvium of Quaternary Age overlying Dawson Formation of Tertiary to Cretaceous Age:** The Dawson Formation typically consists of arkosic sandstone with interbedded fine-grained sandstone, siltstone and claystone. Overlying this formation is a variable layer of residual soil. The residual soils were derived from the in-situ weathering of the bedrock materials on-site. These soils consisted of silty to clayey sands, sandy clays and sandy silts.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Eastonville Quadrangle* distributed by the Colorado Geological Survey in 2012 (Reference 4), and the *Geologic Map of the Denver 1<sup>o</sup> x 2<sup>o</sup> Quadrangle*, distributed by the US Geological Survey in 1981 (Reference 5). The Test Pits and Profile Holes 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**

The soils encountered in the Test Borings can be grouped into three general soil and rock types. The Test Boring soils were classified using the Unified Soil Classification System (USCS). The soils encountered in the Test Pits can be grouped into three general soil types. The test pit soils were classified using the USDA Textural Soil Classification.

Soil Type 1 is a slightly silty to silty sand (SM-SW, SM). This material was encountered in all of the test borings. The sand was encountered at the existing surface and extended to depths ranging from 1 to 19 feet, and to the termination of Test Boring No. 3 from the previous investigation (20 feet). These soils were encountered at loose to dense states and at dry to moist conditions. Samples tested had 7 to 26 percent of the soil sized particles passing the No. 200 Sieve. Atterberg Limits Testing resulted in the sand being non-plastic.

Soil Type 2 is a silty to clayey sandstone (SM, SM-SW, SC). This material was encountered in all of the recent test borings, and Test Boring No. 4 from the previous investigation. The sandstone was encountered at dense to very dense states and moist conditions. Samples tested had 10 to 29 percent of the soil sized particles passing the No. 200 sieve. Highly expansive clayey sandstone and claystone are commonly interbedded in the sandstone in the area.

Soil Type 3 is a sandy claystone (CL). This material was encountered Test Boring No. 1 at 14 feet bgs and extended to the termination of the boring (20 feet). The claystone was encountered at hard consistencies and moist conditions. Samples tested had 74 percent of the soil sized particles passing the No. 200 sieve. Swell/Consolidation Testing resulted in a volume change of 0.9 percent, indicating a low to moderate expansion potential, and a consolidation of 0.1 percent.

The Test Boring Logs are presented in Appendix B. Laboratory Test Results are presented in Appendix C. A Summary of Laboratory Test Results is presented in Table 1. Laboratory Testing summary table, and Test Boring Logs from the original Soil Geology Study, Job No. 181495 are presented in Appendix D.

### **5.5 Groundwater**

Groundwater was encountered in Test Boring Nos. 1 and 4 at 18 and 17 feet respectively. Groundwater was not encountered in the remaining test borings which were drilled to 12 to 20 feet. Areas of seasonal and potentially seasonal shallow groundwater have been mapped in low-lying areas and in the drainages on-site. 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.

## **6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS**

As mentioned previously, detailed mapping has been performed on this site to produce an Geology/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**

These are man-made fill deposits associated with erosion berms on-site.

**Mitigation:** The small erosion berms can easily be removed or penetrated by foundations. Should any uncontrolled fill be encountered beneath foundations, removal and recompaction at 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 will be required.

Loose or Collapsible Soils

Loose soils were encountered in one of the test borings. Any loose or collapsible soils encountered beneath foundations or floor slabs will require mitigation.

Mitigation: Any loose or collapsible soils encountered beneath foundations or floor slabs should be overexcavated 2 to 3 feet, moisture-conditioned and recompacted. The soils should be recompacted to 95 percent of the soils maximum Modified Proctor Dry Density ASTM D-1557 at  $\pm 2$  percent of optimum moisture content. The reconditioned soils on this site should be observed and tested to verify adequate compaction. Areas requiring recompaction should be determined during the excavation observation.

Expansive Soils

Expansive soils were encountered in the test borings drilled on-site. Expansive claystone is commonly encountered within the Dawson Formation. These occurrences are typically sporadic; therefore, none have been indicated on the maps. These expansive soils, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and mitigated on an individual basis.

Mitigation: Should expansive soils be encountered beneath the foundation; mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation 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, which is common in the area. Another alternative in areas of highly expansive soils is the use of drilled pier foundation systems. Typical minimum pier depths are on the order of 25 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Floodplain and Drainage Areas

Portions of the site associated with the West Kiowa Creek drainage are mapped within a floodplain zone according to the FEMA Map No. 08041CO350G, dated December 7, 2018 (Figure 7,

Reference 6). Water was observed flowing in West Kiowa Creek; however, water was not observed in the drainages located within Filing No. 2. The floodplain areas have been designated as open space/drainage easements and/or can be avoided by construction and is located outside of Filing No. 2 of the development. Additionally, areas of seasonal and potentially seasonal shallow groundwater were observed across the site. In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. These areas lie within low-lying areas along the drainage in the central and eastern portions of Filing No. 2 and in the low-lying areas and minor drainages across the site. Water was not observed in any of the minor drainages at the time of our site investigation. These areas can likely be avoided or properly mitigated by development. The floodplain should be avoided by construction unless site-specific floodplain determination and drainage studies are performed. The potential exists for high groundwater levels during high moisture periods and should structures encroach on these areas the following precautions should be followed.

Mitigation: Foundations must have a minimum 30-inch depth for frost protection. In areas where high subsurface moisture conditions are anticipated periodically, subsurface perimeter drains are recommended to help prevent the intrusion of water into areas below grade. Typical drain details are presented in Figure 8. Some of the minor drainage swales can be avoided or regraded. The main drainage that bisects the site is designated as open space and will be avoided. Any grading in these areas should be done to direct surface flow around construction to avoid areas of ponded water. Finished floors must be located at least one foot above floodplain levels. Specific drainage studies and exact floodplain locations are beyond the scope of this report.

### ***6.1 Relevance of Geologic Conditions to Land Use Planning***

The development will consist of rural residential lots. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the drainages on site that can be avoided or properly mitigated during construction on each lot. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices or avoidance.

The upper materials are typically at medium dense to dense states. Areas of loose soils were encountered that may require recompaction. The medium dense to dense granular soils encountered in the upper soil profiles of the test borings and test pits should provide good support for foundations. Loose soils, if encountered beneath foundations or slabs, will require removal of the upper 2 to 3 feet of loose material and recompaction. Expansive soils, although sporadic, were encountered. Shallow bedrock was encountered in portions of the site. Expansive clayey sandstone and claystone are common in the Dawson Formation, and may require mitigation.

Foundations anticipated for the site are standard spread footings being on granular site soils or sandstone. Overexcavation in areas of expansive soils or loose soils may be required. Areas of artificial fill, if encountered beneath foundations will require penetration or recompaction. Areas containing arkosic sandstone will have high allowable bearing conditions. Expansive layers may also be encountered in the soil and bedrock on this site. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development.

Areas of seasonal shallow groundwater and potentially seasonal shallow groundwater were encountered on site. Additionally, areas northeast of the site have been mapped in a floodplain zone associated with West Kiowa Creek. The floodplain area is in the designated open space area and is located outside of Filing No. 2. The site is not mapped in the floodplain zone (Figure 7, Reference 7). The floodplain areas have been designated as open space/drainage easements and/or can be avoided by construction and is located outside of Filing No. 2 of the development. Additionally, areas of seasonal and potentially seasonal shallow groundwater were observed across the site. In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and frost heave potential. These areas lie within low-lying areas along the drainage in the central and eastern portions of Filing No. 2 and in the low-lying areas and minor drainages across the site. Water was not observed in any of the minor drainages at the time of our site investigation. Due to the size of the lots and the proposed development, the majority of these areas can be avoided by construction on the lots. Regrading can also mitigate some minor drainage swales on some of the lots. Structures should not block drainages. Any site grading should be done in such a manner as to not create areas of ponded water around structures or septic fields. Finished floor levels must be a minimum of one foot above the floodplain level. Septic

fields should not be located in drainage areas due to the potential for periodic high groundwater conditions. Specific floodplain locations and drainage studies are beyond the scope of this report.

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.

## **7.0 ECONOMIC MINERAL RESOURCES**

Some of the sandy materials on-site could be considered a low-grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 7), the area is mapped with floodplain, valley fill and upland deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 8), areas of the site are mapped with upland and floodplain deposits: sand and probable aggregate resource (U3, U4 and F4). According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 9), the area of the site has been mapped as “Good” for industrial minerals. However, considering the abundance of similar materials through the region and the close proximity to developed land, 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 9), 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 the site (Reference 9).

The site has been mapped as “Fair” for oil and gas resources (Reference 9). 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.

## **8.0 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 and weathered bedrock materials 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.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to revegetate successfully. Therefore, recommendations pertaining to

the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

## **9.0 EMBANKMENT CONSTRUCTION RECOMMENDATIONS**

In general, the site soils are suitable for the proposed embankments. Groundwater may be encountered in cuts for the proposed detention ponds across the site. If excavations encroach on the groundwater level unstable soil conditions may be encountered.

Any areas to receive fill should have all topsoil, organic material or debris removed. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1 or flatter on the upstream faces or 2.5:1 or flatter on the downstream face. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557, 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. These materials should be placed at a moisture content conducive to compaction, usually 0 to  $\pm 2\%$  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.

## **10.0 CLOSURE**

It is our opinion that the existing geologic engineering and geologic conditions will impose some minor constraints on development and construction of the site. The majority of these conditions can be avoided by construction. Others can be mitigated through proper engineering design and construction practices. The proposed development and use is 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 and septic systems 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 Winsome, LLC 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.

## **BIBLIOGRAPHY**

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## TABLES

**TABLE 1**  
**SUMMARY OF LABORATORY TEST RESULTS**

CLIENT WINSOME, LLC  
 PROJECT HODGEN AND MERIDIAN  
 JOB NO. 202508

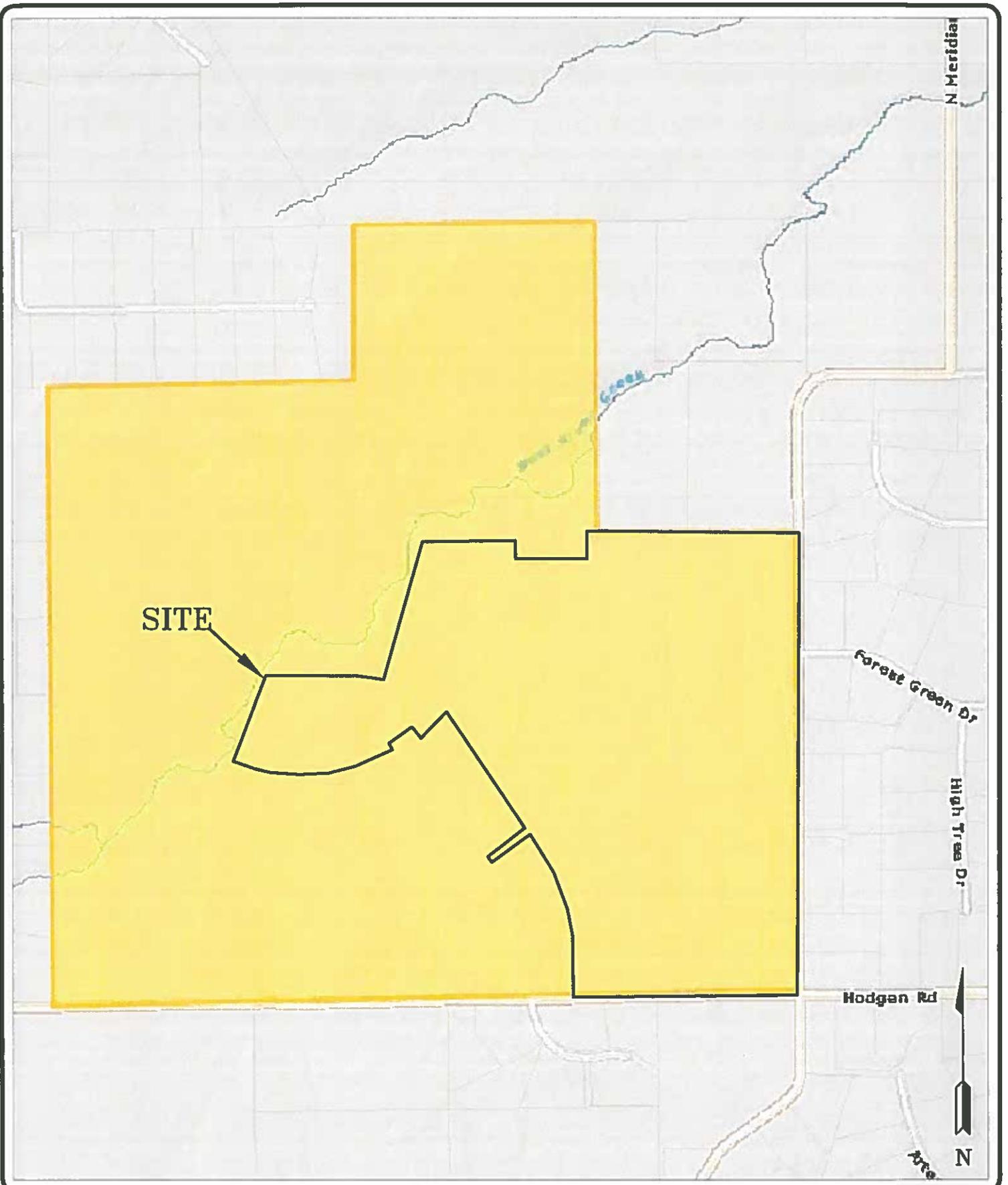
SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			12.5						SM	SAND, SILTY
1	4	5			15.9						SM	SAND, SILTY
2	1	15			23.9	NV	NP				SM	SANDSTONE, SILTY
2	3	2-3			29.0	NV	NP				SM	SANDSTONE, SILTY
3	2	5			89.1				850		CL	CLAYSTONE, SANDY
3	4	20	21.8	106.8	53.3	29	13			-0.1	CL	CLAYSTONE, VERY SANDY

**Table 2: Summary Test Boring Results**

<b>Test Boring No.</b>	<b>Depth to Bedrock (ft.)</b>	<b>Depth to Seasonally Occurring Groundwater (ft.)</b>
1	1	18
2	4	>10
3	1	>20
4	1	17
2*	>20	>20
4*	16	>20
5*	>20	>20

\*- Preliminary Soils, Geology, and Wastewater Study prepared by Entech Job No. 181459

## FIGURES



SITE

N Meridian

Forest Green Dr

High Tree Dr

Hodgen Rd

N



**ENTECH**  
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 505 ELKTON DRIVE  
 COLORADO SPRINGS, CO. 80907 (719) 531-5299

VICINITY MAP  
 WINSOME SUBDIVISION - FILING NO. 2  
 HODGEN ROAD & MERIDIAN ROAD  
 EL PASO COUNTY, CO.  
 FOR: WINSOME, LLC

DRAWN:  
 LLL

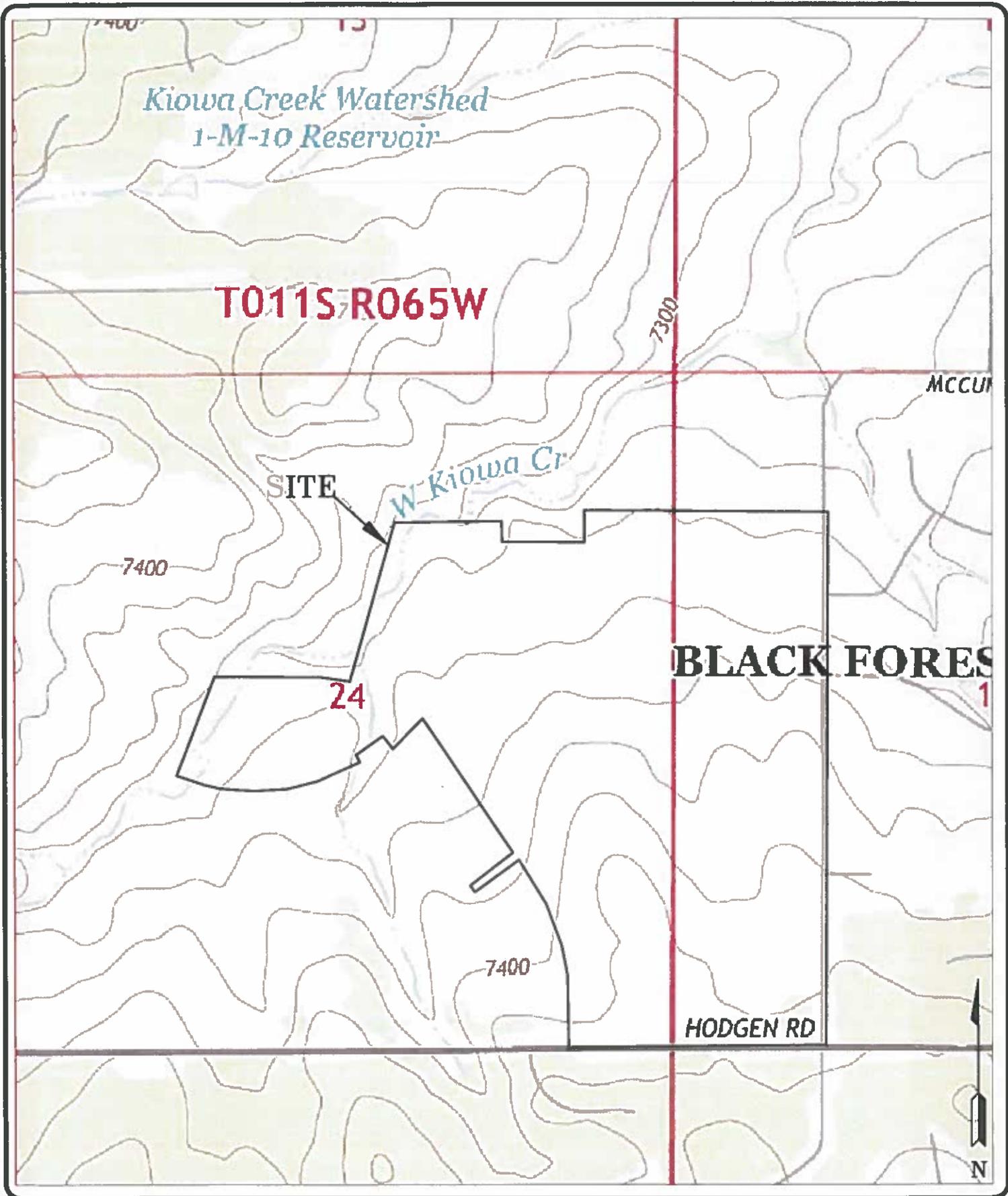
DATE:  
 1/18/21

CHECKED:

DATE:

JOB NO.:  
 202508

FIG NO.:  
 1



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

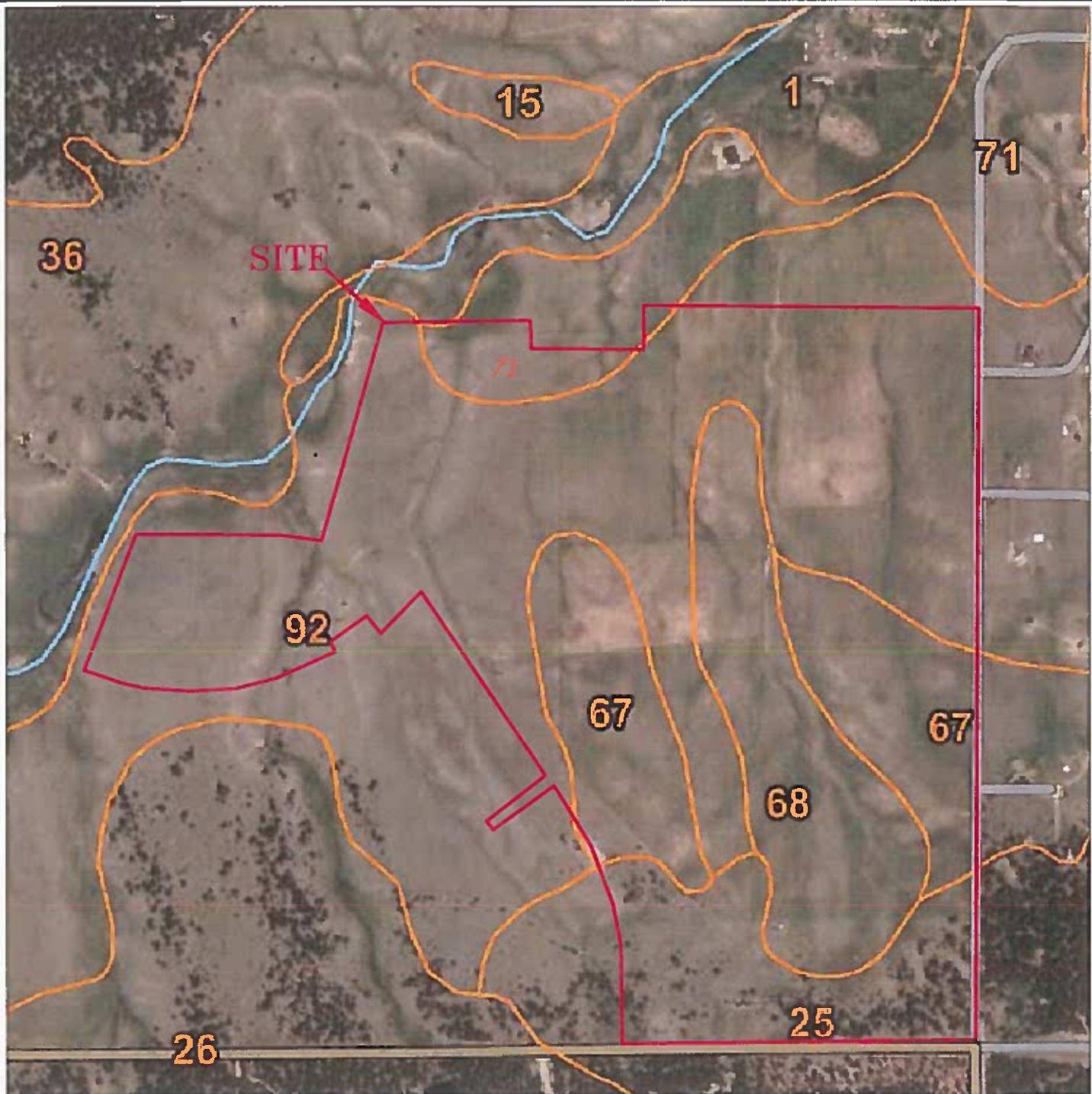
USGS MAP  
 WINSOME RANCH SUBDIVISION - FILING NO. 2  
 HODGEN ROAD & MERIDIAN ROAD  
 EL PASO COUNTY, CO.  
 FOR: WINSOME, LLC

DRAWN: LLL	DATE: 1/18/21	CHECKED:	DATE:
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JOB NO.:  
 202508

FIG NO.:  
 2





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

**SOIL SURVEY MAP**  
**WINSOME SUBDIVISION - FILING NO. 2**  
**HODGEN ROAD & MERIDIAN ROAD**  
**EL PASO COUNTY, CO.**  
**FOR: WINSOME, LLC**

DRAWN:  
 LLL

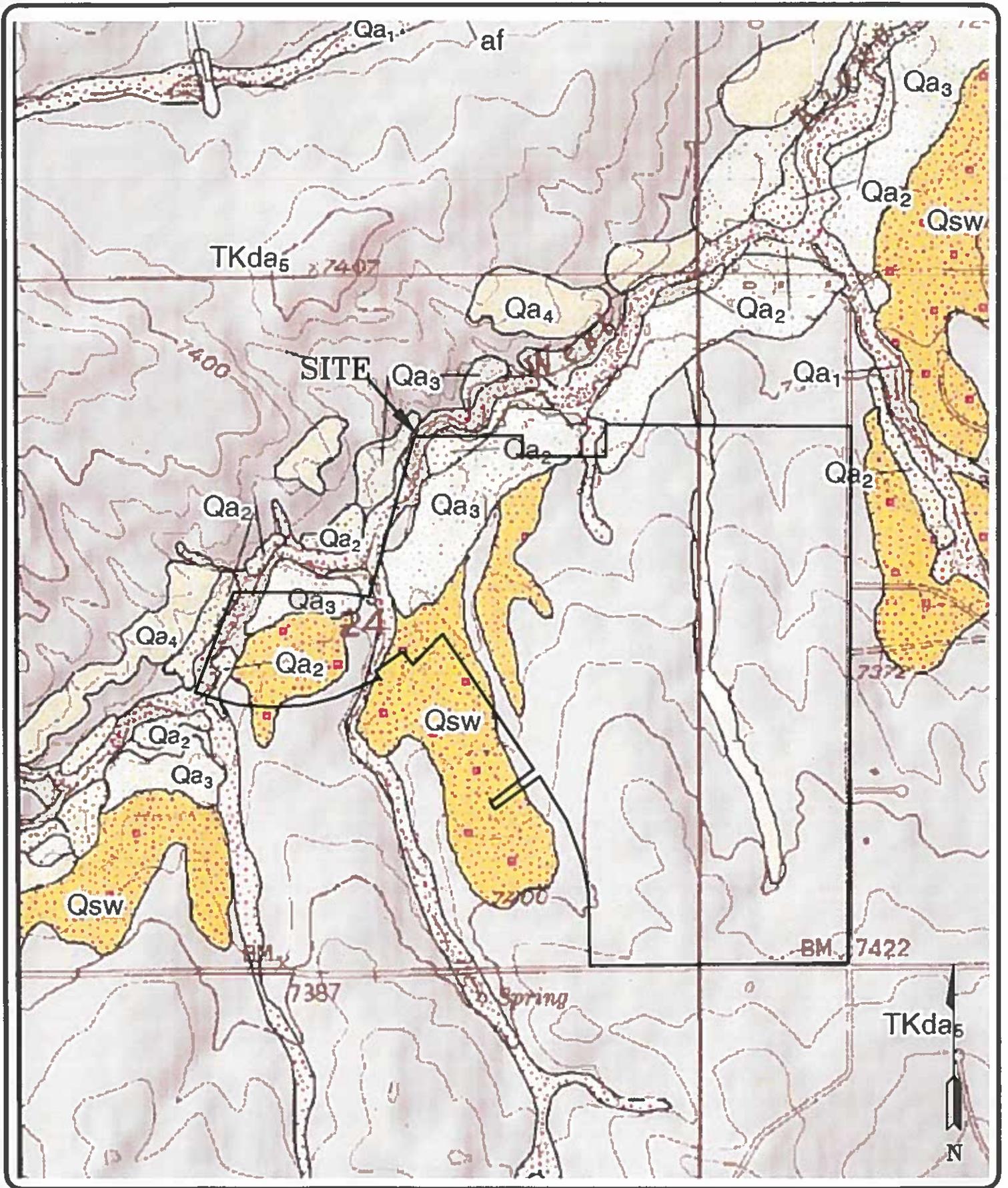
DATE:  
 1/18/21

CHECKED:

DATE:

JOB NO.:  
 202508

FIG NO.:  
 4



**ENTECH**  
**ENGINEERING, INC.**  
 585 CLAYTON DRIVE  
 COLORADO SPRINGS, CO. 80907 (719) 531-5299

**EASTONVILLE QUADRANGLE GEOLOGIC MAP**  
**WINSOME SUBDIVISION - FILING NO. 2**  
**HODGEN ROAD & MERIDIAN ROAD**  
**EL PASO COUNTY, CO.**  
**FOR: WINSOME, LLC**

DRAWN:  
 LLL

DATE:  
 1/18/21

CHECKED:

DATE:

JOB NO.:  
 202508

FIG NO.:  
 5



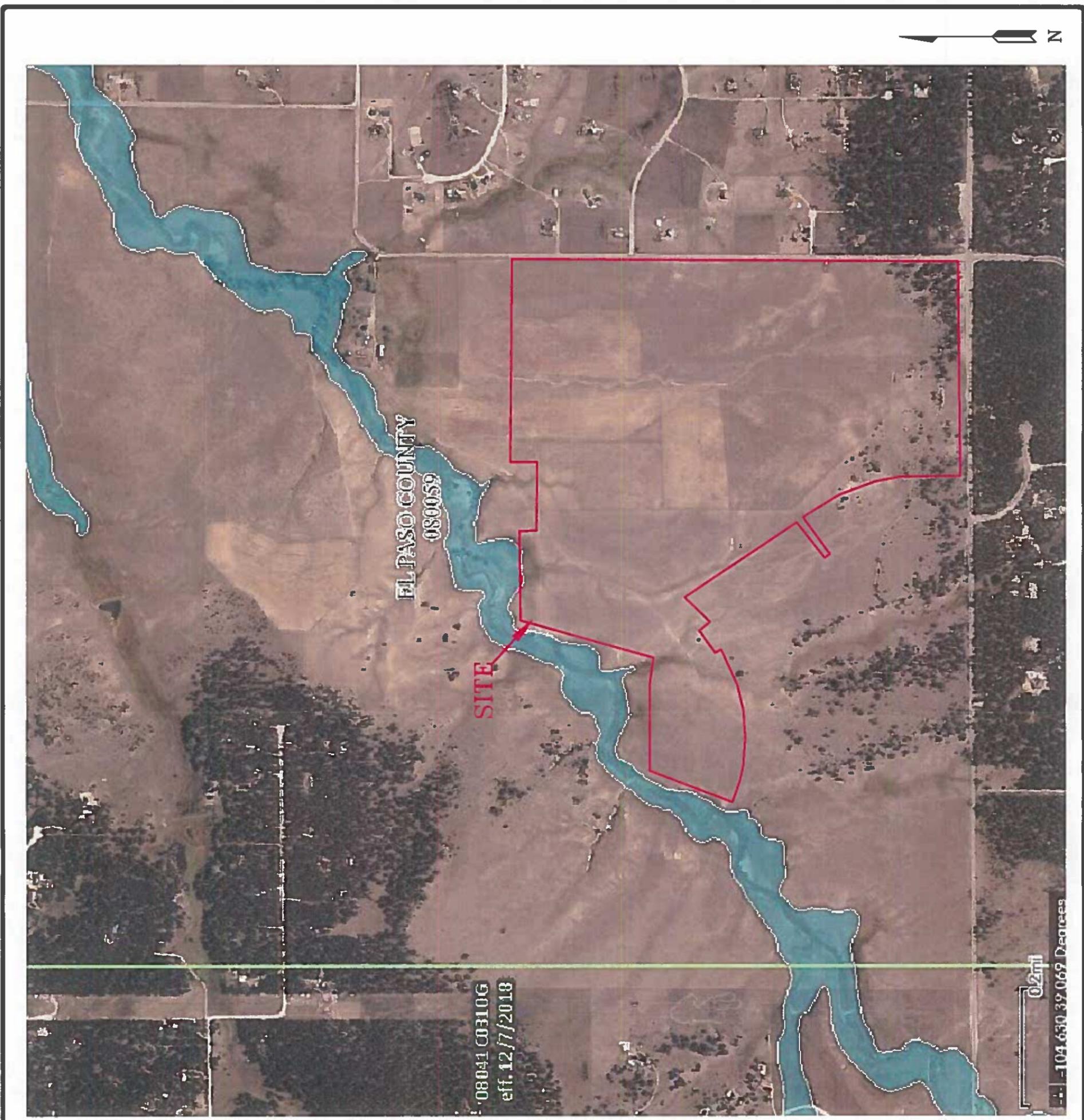
REVISION	BY

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



**FLOODPLAIN MAP**  
WINSOME SUBDIVISION - FILING NO. 2  
HODGEN ROAD & MERIDIAN ROAD,  
EL PASO COUNTY, CO.  
FOR: WINSOME, LLC

DATE	1/18/21
BY	AS SOUL
CHECKED	AS BROWN
JOB NO.	202509
PROJECT	WINSOME, LLC



### LEGEND

**SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AD, AR, AO, V, and VE. The Base Flood Elevation is the mean-water surface elevation of the 1% annual chance flood.

**ZONE A** No Base Flood Elevations determined.

**ZONE AE** Base Flood Elevations determined.

**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decommissioned. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE AP9** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain area that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**

**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

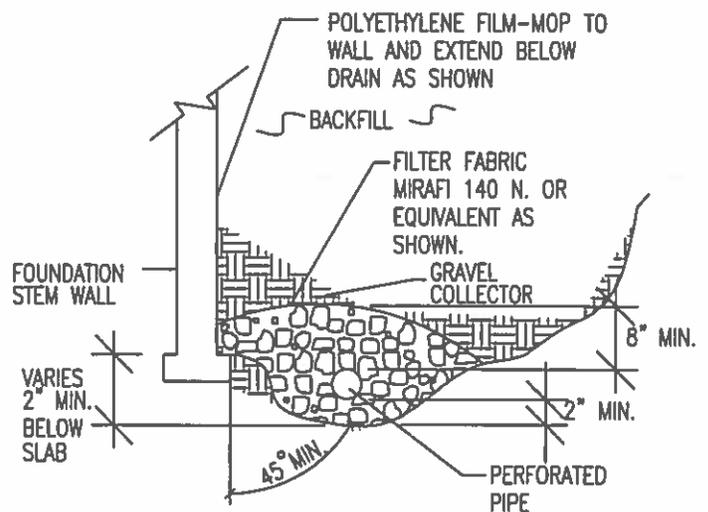
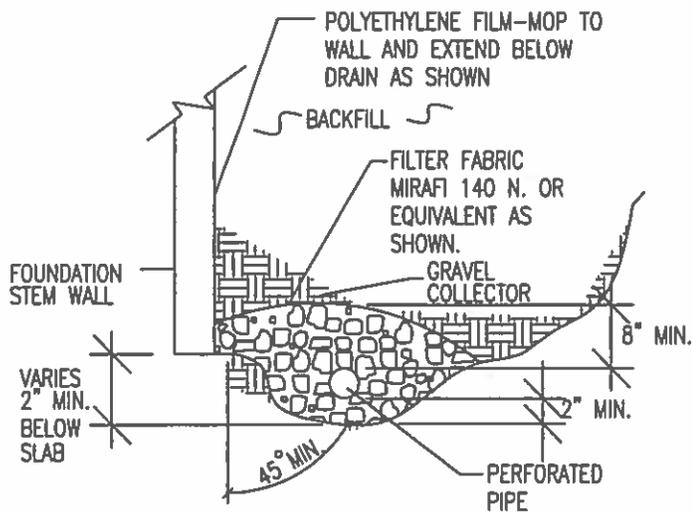
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas

1% annual chance floodplain boundary  
Floodway boundary  
Zone D boundary  
CBRS and OPA boundary  
Boundary dividing Special Flood Hazard Area Zones and boundaries dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.  
Base Flood Elevation line and value; elevation in feet  
Base Flood Elevation value where uniform within some elevation in feet  
Cross section line  
Transect line  
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere  
1000-meter Universal Transverse Mercator grid tick values, zone 4  
5000-foot grid tick values: (NAD State Plane coordinate system, zone 3 (FIPSZONE 5103), Transverse Mercator projection)  
Bench mark (see explanation in Notes to Users section of this FIRB panel)  
Coastal Mile marker

MAP REPOSITORY  
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP  
November 20, 2000

EFFECTIVE DATES OF REVISIONS TO THIS PANEL  
September 30, 2004 - to change Special Flood Hazard Areas, to update map format, to reflect revised shoreline and to incorporate previously issued Letters of Map Revision.



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.



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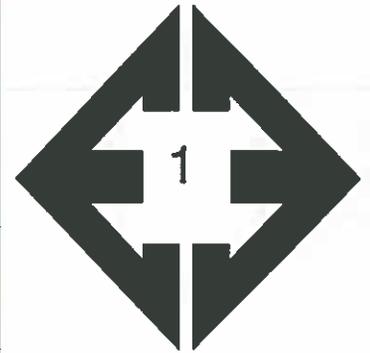
*PERIMETER DRAIN DETAIL*

<i>PERIMETER DRAIN DETAIL</i>			
DRAWN:	DATE:	DESIGNED:	CHECKED:

JOB NO.:  
**202.508**  
 PIC NO.:  
**8**

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## **APPENDIX A: Site Photographs**



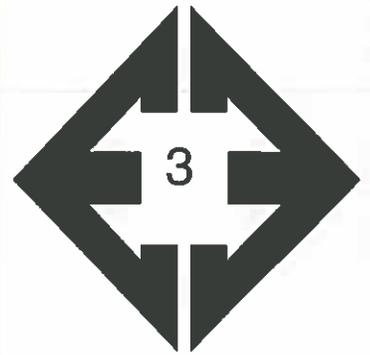
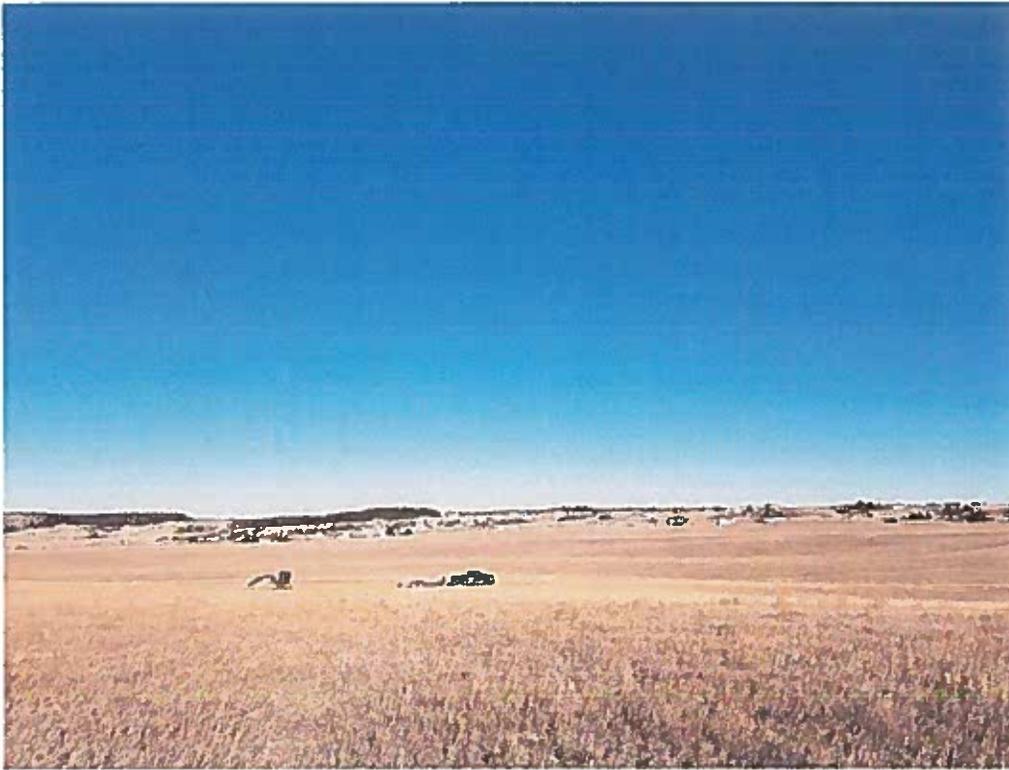
**Looking south from the northwestern portion of Filing No. 2.**

December 4, 2020



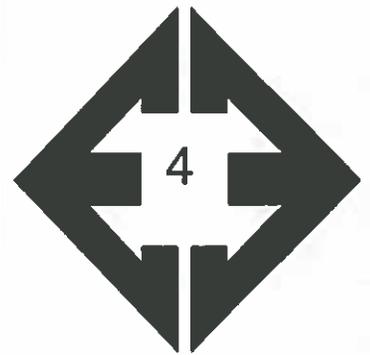
**Looking east from the southwestern portion of Filing No. 2.**

December 4, 2020



**Looking north from the  
central portion of  
Filing No. 2.**

December 9, 2020



**Looking northeast  
from the central  
portion of Filing No. 2.**

December 9, 2020



**Looking south from  
the western side of  
Filing No. 2.**

December 9, 2020



**Looking north from the  
western side of Filing  
No. 2.**

December 9, 2020

## **APPENDIX B: Test Boring Logs**

TEST BORING NO. 1  
 DATE DRILLED 12/21/2020  
 Job # 202508

TEST BORING NO. 2  
 DATE DRILLED 12/21/2020  
 CLIENT WINSOME, LLC  
 LOCATION HODGEN AND MERIDIAN

REMARKS

WATER @ 18', 12/21/20

6" TOPSOIL, SAND, SILTY, TAN  
 SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					1
11"			50	2.0	3
10"			50	8.6	3
10"			50	9.3	3
7"			50	8.6	3
6"			50	14.9	3



REMARKS

DRY TO 12', 12/21/20

6" TOPSOIL, SAND, SILTY, FINE  
 TO COARSE GRAINED, TAN,  
 VERY DENSE, DRY

CLAYSTONE, SANDY, TAN,  
 HARD, MOIST

SANDSTONE, SILTY, FINE TO  
 COARSE GRAINED, TAN, VERY  
 DENSE, MOIST

\* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0					1
5			50	2.3	1
10"			50	12.6	3
9"			50	4.2	2
*			*	3.4	2



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:  
 LLL

DATE  
 1/13/21

JOB NO.:  
 202508

FIG NO.:  
 B-1

TEST BORING NO. 3  
 DATE DRILLED 12/22/2020  
 Job # 202508

TEST BORING NO. 4  
 DATE DRILLED 12/22/2020  
 CLIENT WINSOME, LLC  
 LOCATION HODGEN AND MERIDIAN

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 12/22/20							WATER @ 17', 12/22/20						
6" TOPSOIL, SAND, SILTY, TAN SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST	0-6"	+		50	2.1	1	6" TOPSOIL, SAND, SILTY, TAN SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, DRY TO WET	0-6"	+		50	2.0	1
	6-9"			9"		2		6-10"			50	2.0	2
	9-10"			50	3.7	2		10-11"			50	2.9	2
	10-15"			47		2		15-17"			50	7.4	2
	15-20"			50	7.9	2	CLAYSTONE, VERY SANDY, BROWN, FIRM, WET	17-20"			50	7.4	2
				50	6.3	2		20-22"			9	22.3	3



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505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE

CHECKED:

LLL

DATE:

1/13/21

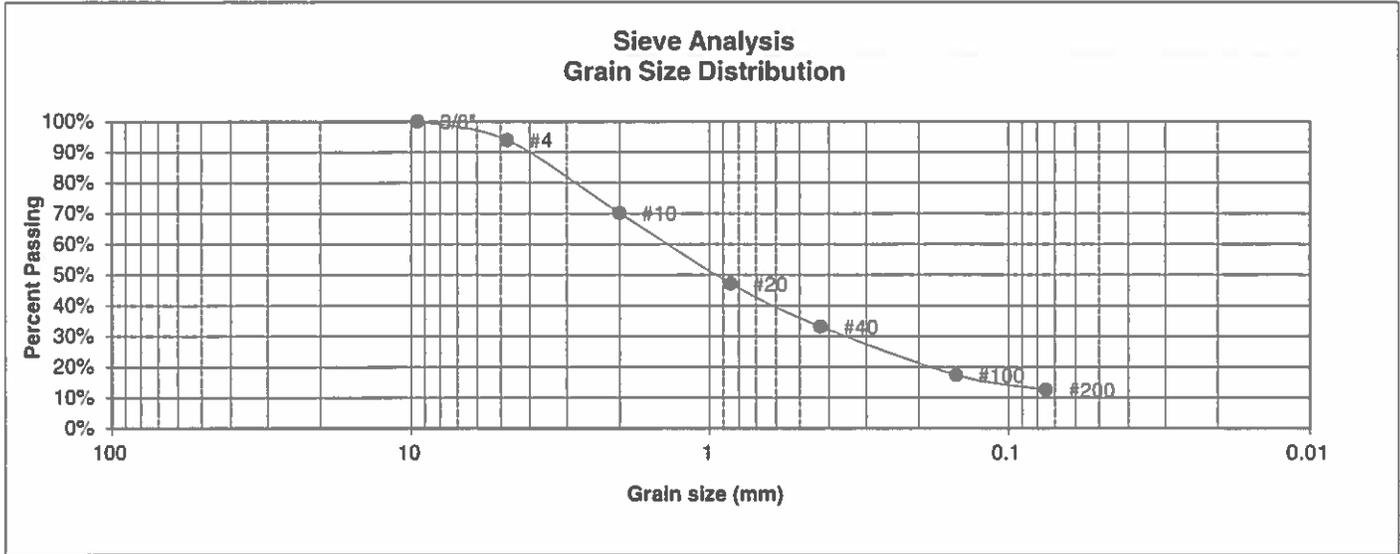
JOB NO.  
 202508

FIG NO.:

B-2

## **APPENDIX C: Laboratory Test Results**

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	WINSOME, LLC
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	HODGEN AND MERIDIAN
<b>TEST BORING #</b>	1	<b>JOB NO.</b>	202508
<b>DEPTH (FT)</b>	2-3	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.9%
10	70.1%
20	47.1%
40	33.1%
100	17.3%
200	12.5%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

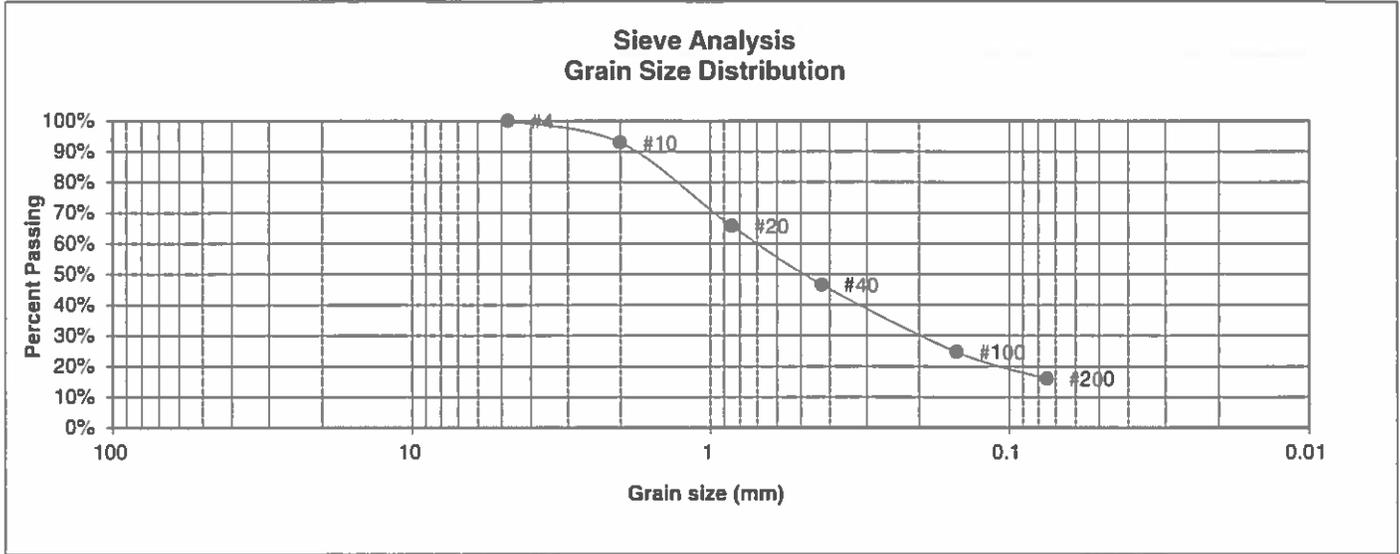
**LABORATORY TEST  
RESULTS**

DRAWN	DATE	CHECKED: LLC	DATE: 1/13/21
-------	------	-----------------	------------------

JOB NO:  
202508

FIG NO:  
C-1

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	WINSOME, LLC
<b>SOIL TYPE #</b>	1	<b>PROJECT</b>	HODGEN AND MERIDIAN
<b>TEST BORING #</b>	4	<b>JOB NO.</b>	202508
<b>DEPTH (FT)</b>	5	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	92.9%
20	65.7%
40	46.6%
100	24.7%
200	15.9%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

**Swell**  
 Moisture at start  
 Moisture at finish  
 Moisture increase  
 Initial dry density (pcf)  
 Swell (psf)



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505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

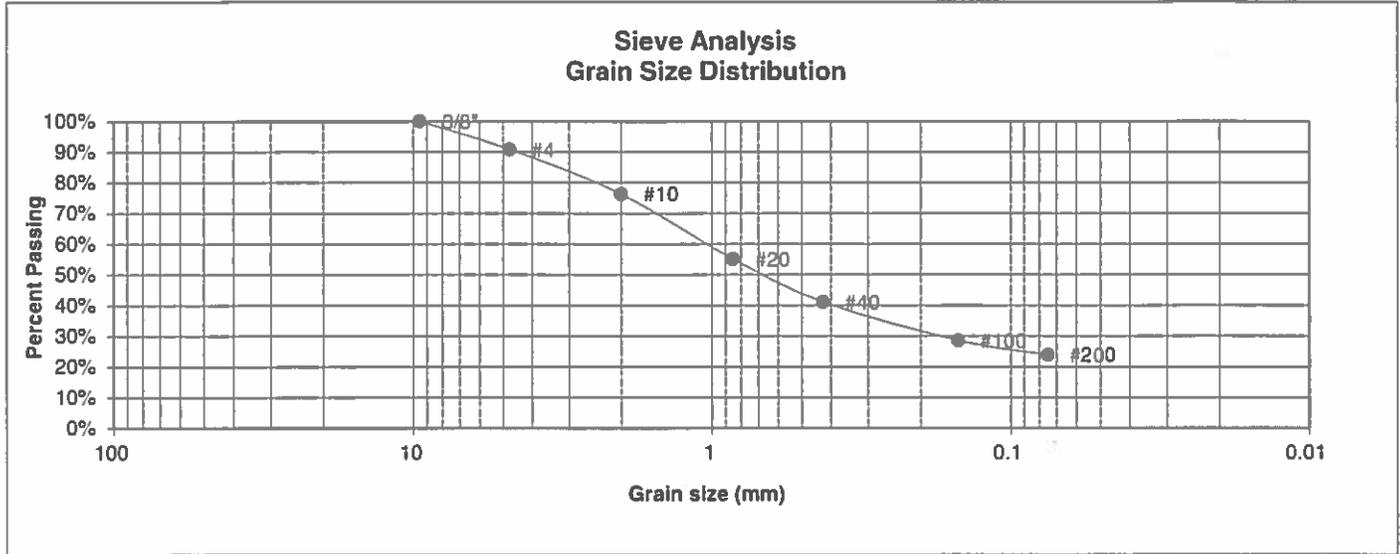
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	1/13/21

JOB NO.:  
202508

FIG NO.:  
C-2

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	WINSOME, LLC
<b>SOIL TYPE #</b>	2	<b>PROJECT</b>	HODGEN AND MERIDIAN
<b>TEST BORING #</b>	1	<b>JOB NO.</b>	202508
<b>DEPTH (FT)</b>	15	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	90.8%
10	76.2%
20	55.1%
40	41.1%
100	28.5%
200	23.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE  
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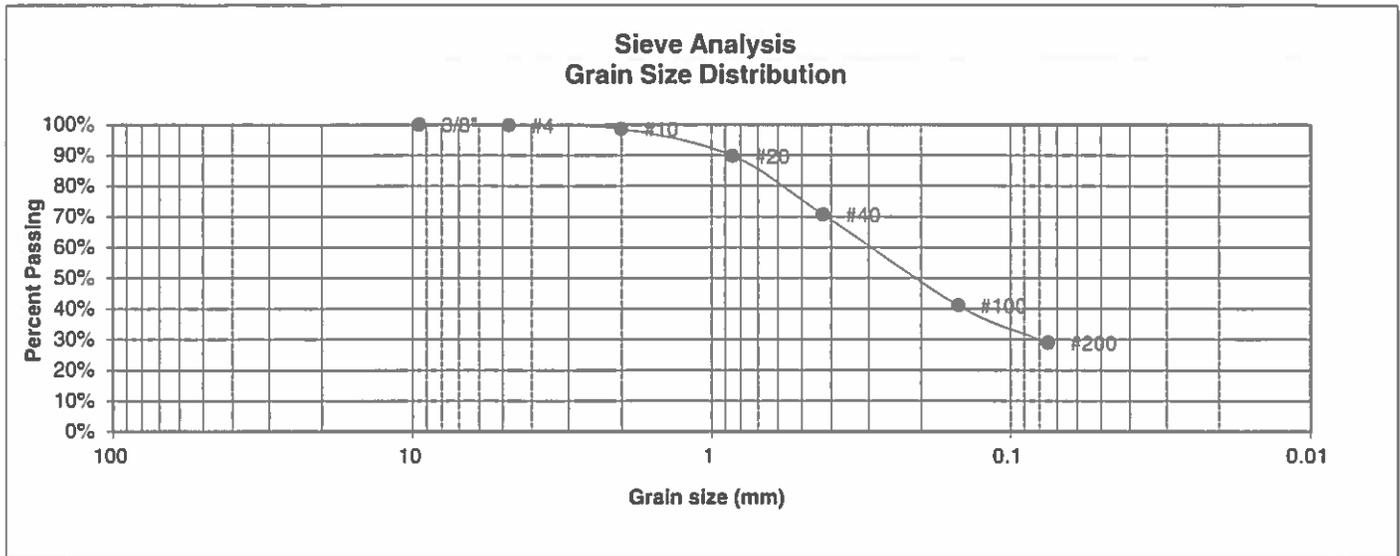
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: LLL	DATE: 1/13/21
--------	-------	-----------------	------------------

JOB NO.:  
202508

FIG NO.:  
C-3

<b>UNIFIED CLASSIFICATION</b>	SM	<b>CLIENT</b>	WINSOME, LLC
<b>SOIL TYPE #</b>	2	<b>PROJECT</b>	HODGEN AND MERIDIAN
<b>TEST BORING #</b>	3	<b>JOB NO.</b>	202508
<b>DEPTH (FT)</b>	2-3	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.8%
10	98.6%
20	89.7%
40	70.7%
100	41.0%
200	29.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

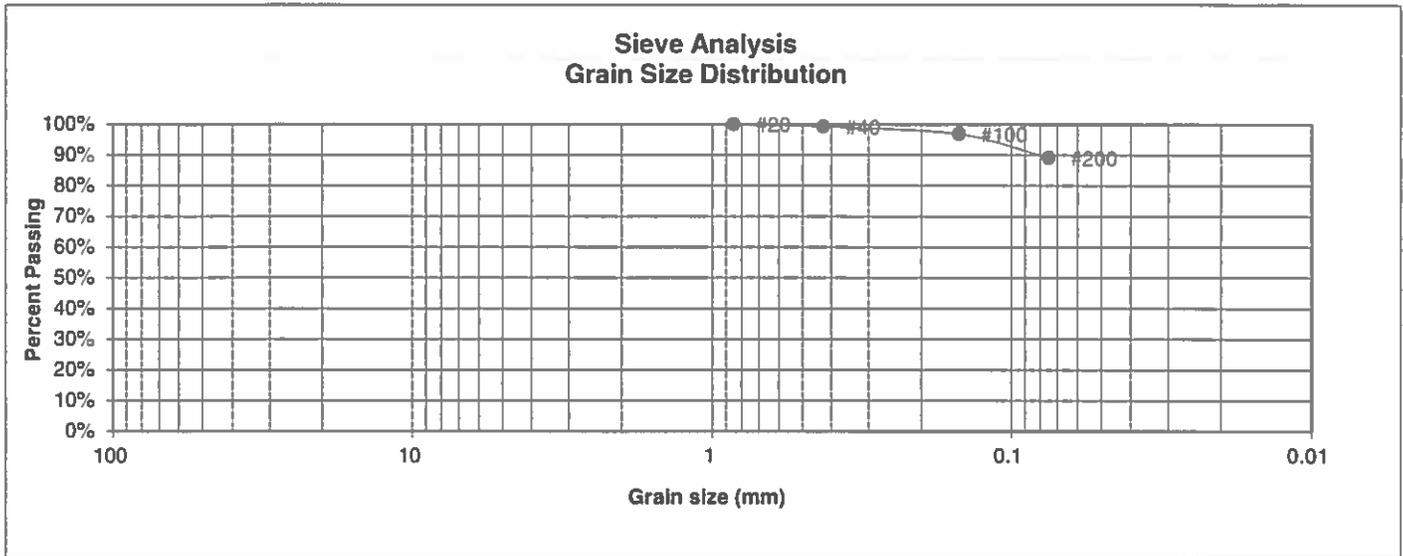
**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	1/13/21

JOB NO.:  
202508

FIG NO.:  
C-4

<b>UNIFIED CLASSIFICATION</b>	CL	<b>CLIENT</b>	WINSOME, LLC
<b>SOIL TYPE #</b>	3	<b>PROJECT</b>	HODGEN AND MERIDIAN
<b>TEST BORING #</b>	2	<b>JOB NO.</b>	202508
<b>DEPTH (FT)</b>	5	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.2%
100	96.9%
200	89.1%

**Atterberg Limits**  
 Plastic Limit  
 Liquid Limit  
 Plastic Index

<b>Swell</b>	
Moisture at start	13.8%
Moisture at finish	21.3%
Moisture increase	7.5%
Initial dry density (pcf)	104
Swell (psf)	850



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505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

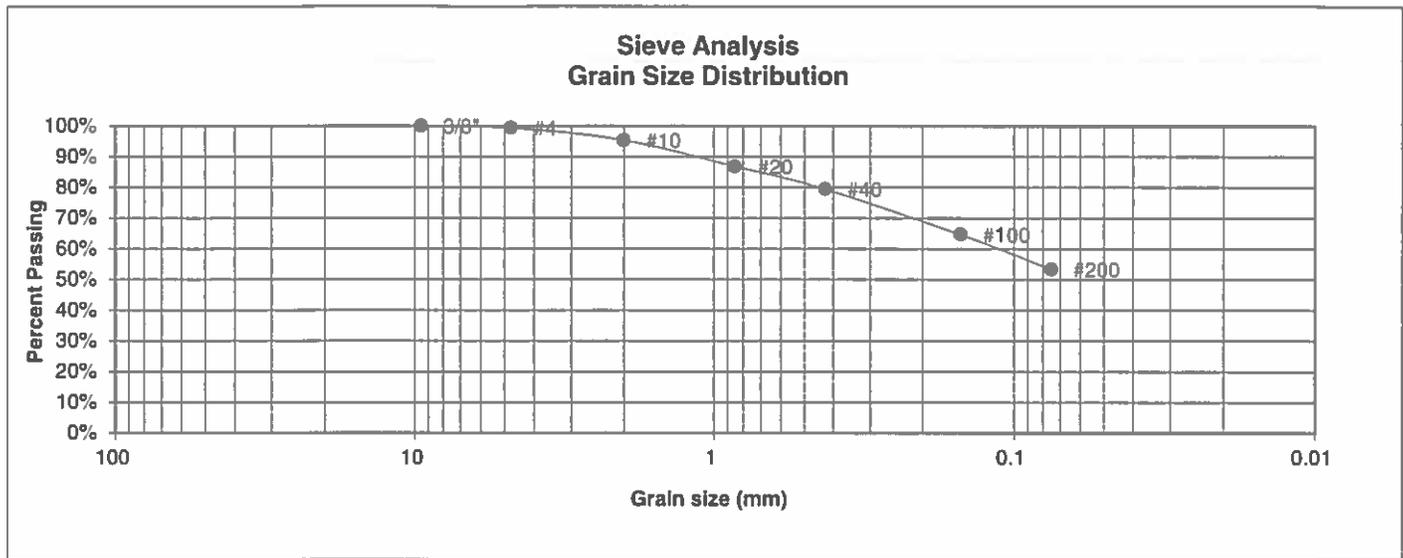
**LABORATORY TEST  
RESULTS**

<b>DRAWN:</b>	<b>DATE:</b>	<b>CHECKED:</b>	<b>DATE:</b>
		LL	1/13/21

JOB NO:  
202508

FIG NO:  
C-5

<b>UNIFIED CLASSIFICATION</b>	CL	<b>CLIENT</b>	WINSOME, LLC
<b>SOIL TYPE #</b>	3	<b>PROJECT</b>	HODGEN AND MERIDIAN
<b>TEST BORING #</b>	4	<b>JOB NO.</b>	202508
<b>DEPTH (FT)</b>	20	<b>TEST BY</b>	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	95.4%
20	86.8%
40	79.4%
100	64.7%
200	53.3%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	29
Plastic Index	13

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



**ENTECH  
ENGINEERING, INC.**

505 ELKTON DRIVE  
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST  
RESULTS**

DRAWN:	DATE:	CHECKED: LLL	DATE: 1/13/21
--------	-------	-----------------	------------------

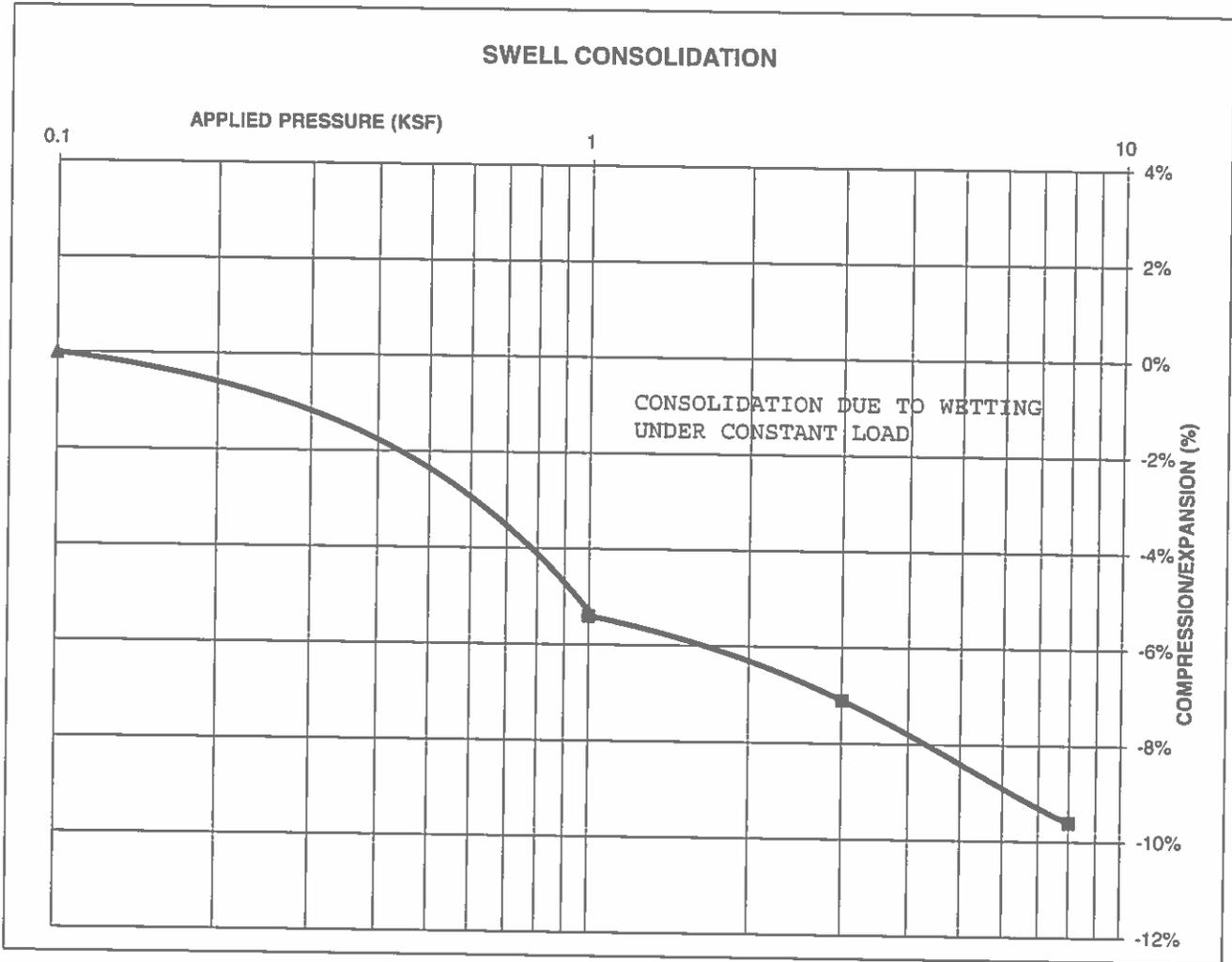
JOB NO:  
202508

FIG NO:  
C-6

**CONSOLIDATION TEST RESULTS**

TEST BORING #	4	DEPTH(ft)	20
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			107
NATURAL MOISTURE CONTENT			21.8%
SWELL/CONSOLIDATION (%)			-0.1%

JOB NO. 202508  
 CLIENT WINSOME, LLC  
 PROJECT HODGEN AND MERIDIAN



**ENTECH**  
**ENGINEERING, INC.**

505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION  
 TEST RESULTS**

DRAWN:

DATE:

CHECKED:  
*LLL*

DATE:  
*1/13/21*

JOB NO.:  
 202508

FIG NO.:  
*C-7*

**APPENDIX D: Laboratory Testing Summary Table, Test Boring**

**Entech Job No. 181495**

**TABLE 1**

**SUMMARY OF LABORATORY TEST RESULTS**

CLIENT PROTERRA PROPERTIES  
 PROJECT WINSOME SUBDIVISION  
 JOB NO. 181459

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	2	2-3			12.1	NV	NP				SM	SAND, SILTY
1	3	10			6.5			<0.01			SM-SW	SAND, SLIGHTLY SILTY
1	5	5			17.3						SM	SAND, SILTY
1	TP-3	2-3			23.7						SM	SAND, SILTY
1	TP-4	5-6			15.3						SM	SAND, SILTY
1	TP-5	2-3			19.2						SM	SAND, SILTY
1	TP-7	2-3			33.5						SM	SAND, SILTY
1	TP-9	5-6			21.3			30			SM	SAND, SILTY
1	TP-10	2-3			32.0						SM	SAND, SILTY
2	TP-1	5-6			74.8	30	10				CL	CLAY, SANDY
3	TP-2	5-6			14.0	30	9				SM	SANDSTONE, SILTY
3	TP-8	5-6			21.1	33	14				SC	SANDSTONE, CLAYEY
3	TP-6	5-6			54.2				350		CL-SC	SANDSTONE, VERY CLAYEY
3	4	20			18.6	21	7	<0.01			SC-SM	SANDSTONE, SILTY, CLAYEY
4	1	15	13.4	120.4	73.2	35	13	<0.01		2.5	CL	CLAYSTONE, SANDY

TEST BORING NO 1  
 DATE DRILLED 9/18/2018  
 Job # 181459

TEST BORING NO 2  
 DATE DRILLED 9/18/2018  
 CLIENT PROTERRA PROPERTIES  
 LOCATION WINSOME SUBDIVISION

REMARKS

DRY TO 20', 9/19/18

SAND, SILTY, FINE TO  
 COARSE GRAINED, TAN,  
 MEDIUM DENSE, MOIST

SAND, CLAYEY, FINE TO  
 COARSE GRAINED, TAN,  
 MEDIUM DENSE, MOIST

CLAYSTONE, SANDY, TAN,  
 HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			29	3.7	1
5			17	4.7	1
10			15	11.1	1
15			50	12.4	4
			11"		
20			50	12.8	4
			7"		

REMARKS

DRY TO 17.5', 9/19/18

SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, MEDIUM DENSE,  
 DRY TO MOIST

CLAY, SANDY, BROWN, FIRM,  
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			12	1.5	1
5			16	2.4	1
10			24	3.3	1
15			25	3.1	1
20			13	13.2	2



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505 ELKTON DRIVE  
 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN: DATE: CHECKED: LLL DATE: 1/7/19

JOB NO.  
 181459

FIG NO.

D-1

TEST BORING NO 3  
 DATE DRILLED 9/18/2018  
 Job # 181459

TEST BORING NO 4  
 DATE DRILLED 9/18/2018  
 CLIENT PROTERRA PROPERTIES  
 LOCATION WINSOME SUBDIVISION

REMARKS

WATER @ 16.5', 9/19/18

SAND, SILTY TO SLIGHTLY  
 SILTY, FINE TO COARSE  
 GRAINED, TAN, DENSE TO  
 MEDIUM DENSE, DRY TO WET

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			35	1.7	1
5			16	3.0	1
10			28	3.9	1
15			24	3.6	1
20			17	10.7	1



REMARKS

DRY TO 20', 9/19/18

SAND, SILTY, FINE TO COARSE  
 GRAINED, TAN, MEDIUM  
 DENSE, MOIST

SANDSTONE, SILTY, CLAYEY,  
 FINE TO COARSE GRAINED,  
 TAN, VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			29	2.5	1
5			26	5.0	1
10			16	3.7	1
15			27	6.9	1
20			50	6.2	3
			10"		



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

LLL

1/7/19

JOB NO:  
 181459

FIG NO:

02

TEST BORING NO 5  
 DATE DRILLED 9/18/2018  
 Job # 181459

TEST BORING NO.  
 DATE DRILLED  
 CLIENT PROTERRA PROPERTIES  
 LOCATION WINSOME SUBDIVISION

REMARKS

REMARKS

DRY TO 20', 9/19/18  
 SAND, SILTY, FINE TO COARSE  
 GRAINED, BROWN TO TAN,  
 LOOSE TO MEDIUM DENSE,  
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			5	3.8	1
5			5	6.0	1
10			14	6.2	1
15			10	8.1	1
20			27	7.8	1

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5					
10					
15					
20					



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 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:

DATE:

CHECKED:  
*LLL*

DATE:  
*1/7/19*

JOB NO.:  
 181459

FIG NO.:

*D-3*

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## **APPENDIX E: Soil Survey Descriptions**

## El Paso County Area, Colorado

### 25—Elbeth sandy loam, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 367x  
*Elevation:* 7,300 to 7,600 feet  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Elbeth and similar soils:* 85 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Elbeth

##### Setting

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from arkose

##### Typical profile

*A - 0 to 3 inches:* sandy loam  
*E - 3 to 23 inches:* loamy sand  
*Bt - 23 to 68 inches:* sandy clay loam  
*C - 68 to 74 inches:* sandy clay loam

##### Properties and qualities

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Moderate (about 7.1 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* B  
*Hydric soil rating:* No

#### Minor Components

##### Other soils

*Percent of map unit:*

*Hydric soil rating:* No

## Data Source Information

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 18, Jun 5, 2020

## El Paso County Area, Colorado

### 67—Peyton sandy loam, 5 to 9 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369d  
*Elevation:* 6,800 to 7,600 feet  
*Mean annual air temperature:* 43 to 45 degrees F  
*Frost-free period:* 115 to 125 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Peyton and similar soils:* 85 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Peyton

##### Setting

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

##### Typical profile

*A - 0 to 12 inches:* sandy loam  
*Bt - 12 to 25 inches:* sandy clay loam  
*BC - 25 to 35 inches:* sandy loam  
*C - 35 to 60 inches:* sandy loam

##### Properties and qualities

*Slope:* 5 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Moderate (about 7.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* B  
*Ecological site:* R049XB216CO - Sandy Divide  
*Hydric soil rating:* No

### **Minor Components**

#### **Pleasant**

*Percent of map unit:*  
*Landform:* Depressions  
*Hydric soil rating:* Yes

#### **Other soils**

*Percent of map unit:*  
*Hydric soil rating:* No

### **Data Source Information**

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 18, Jun 5, 2020

## El Paso County Area, Colorado

### 68—Peyton-Pring complex, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369f

*Elevation:* 6,800 to 7,600 feet

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Peyton and similar soils:* 40 percent

*Pring and similar soils:* 30 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Peyton

##### Setting

*Landform:* Hills

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

##### Typical profile

*A - 0 to 12 inches:* sandy loam

*Bt - 12 to 25 inches:* sandy clay loam

*BC - 25 to 35 inches:* sandy loam

*C - 35 to 60 inches:* sandy loam

##### Properties and qualities

*Slope:* 3 to 5 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 (0.20 to 0.60 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Moderate (about 7.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4c

*Hydrologic Soil Group:* B

*Ecological site:* R049XB216CO - Sandy Divide

*Hydric soil rating:* No

## Description of Pring

### Setting

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Arkosic alluvium derived from sedimentary rock

### Typical profile

*A - 0 to 14 inches:* coarse sandy loam  
*C - 14 to 60 inches:* gravelly sandy loam

### Properties and qualities

*Slope:* 3 to 8 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):* High  
(2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Low (about 6.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* B  
*Ecological site:* R048AY222CO  
*Hydric soil rating:* No

## Minor Components

### Pleasant

*Percent of map unit:*  
*Landform:* Depressions  
*Hydric soil rating:* Yes

### Other soils

*Percent of map unit:*  
*Hydric soil rating:* No

## Data Source Information

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 18, Jun 5, 2020

## El Paso County Area, Colorado

### 71—Pring coarse sandy loam, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 369k  
*Elevation:* 6,800 to 7,600 feet  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Pring and similar soils:* 85 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Pring

##### Setting

*Landform:* Hills  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Arkosic alluvium derived from sedimentary rock

##### Typical profile

*A - 0 to 14 inches:* coarse sandy loam  
*C - 14 to 60 inches:* gravelly sandy loam

##### Properties and qualities

*Slope:* 3 to 8 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):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Low (about 6.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 3e  
*Hydrologic Soil Group:* B  
*Ecological site:* R048AY222CO  
*Hydric soil rating:* No

#### Minor Components

##### Pleasant

*Percent of map unit:*  
*Landform:* Depressions  
*Hydric soil rating:* Yes

**Other soils**

*Percent of map unit:*

*Hydric soil rating:* No

**Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 18, Jun 5, 2020

## El Paso County Area, Colorado

### 92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 36b9  
*Elevation:* 7,300 to 7,600 feet  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Tomah and similar soils:* 50 percent  
*Crowfoot and similar soils:* 30 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Tomah

##### Setting

*Landform:* Hills, alluvial fans  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Alluvium derived from arkose and/or residuum weathered from arkose

##### Typical profile

*A - 0 to 10 inches:* loamy sand  
*E - 10 to 22 inches:* coarse sand  
*C - 48 to 60 inches:* coarse sand

##### Properties and qualities

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*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  
*Available water capacity:* Very low (about 2.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* B  
*Ecological site:* R049XB216CO - Sandy Divide  
*Hydric soil rating:* No

#### Description of Crowfoot

##### Setting

*Landform:* Alluvial fans, hills

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Alluvium

**Typical profile**

*A - 0 to 12 inches:* loamy sand

*E - 12 to 23 inches:* sand

*Bt - 23 to 36 inches:* sandy clay loam

*C - 36 to 60 inches:* coarse sand

**Properties and qualities**

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Well drained

*Runoff class:* Medium

*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

*Available water capacity:* Low (about 4.7 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4e

*Hydrologic Soil Group:* B

*Ecological site:* R049XB216CO - Sandy Divide

*Hydric soil rating:* No

**Minor Components**

**Other soils**

*Percent of map unit:*

*Hydric soil rating:* No

**Pleasant**

*Percent of map unit:*

*Landform:* Depressions

*Hydric soil rating:* Yes

**Data Source Information**

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 18, Jun 5, 2020