

Revision 1, 5/8/2026

# Geology and Soils Evaluation Report

**The Markets at Bent Grass**

**NEC Bent Grass Meadows Drive & E. Woodmen Road**

**El Paso County, Colorado**

**VIVID Project No.: D25-2-928**



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Report prepared for:

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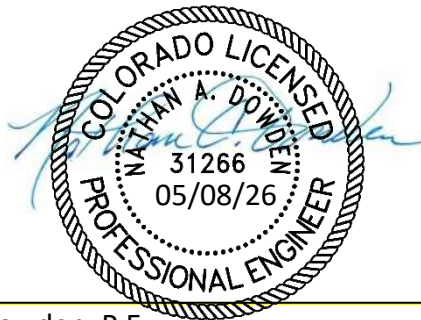
**GEOLOGY AND SOILS EVALUATION REPORT**  
**The Markets at Bent Grass**  
**NEC Bent Grass Meadows Drive & E. Woodmen Road**  
**El Paso County, Colorado**  
**VIVID Project No. D25-2-928**

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## 1.0 INTRODUCTION

### 1.1 General

This report presents the results of a geology and soils evaluation report performed for the proposed The Markets at Bent Grass project to be developed at the northeast corner of Bent Grass Meadows Drive and E. Woodmen Road in El Paso County, Colorado (Ref. 1). The project is identified in “The Markets at Bent Grass, Concept Plan (A7.2)” dated 02/11/2026 prepared by Galloway (Ref. 2). An attached Vicinity Map (Figure 1) shows the general location of the project (Ref. 1). Our evaluation was performed for Evergreen Devco, Inc., in accordance with our proposal dated June 20, 2025, and was authorized by Mr. Sean Murphy.

### 1.2 Project Description

The proposed project includes the development of three existing parcels, comprising approximately 53.91-acres, into a multi-lot commercial development. As currently conceptualized, the development will include two large anchor retail facilities with 12 smaller retail/commercial out-parcels and 4 identified tracts. The development will include construction of access roadways and utilities. The development will be serviced by municipal water and wastewater systems. A preliminary conceptual site layout (Ref.2) is shown on Figure 2.0, attached to this report.

Review of information from the El Paso County Assessor’s website (Ref. 3), the three existing parcels comprising this development are:

- EPC Parcel ID No. 5301000016
- EPC Parcel ID No. 5301000017
- EPC Parcel ID No. 5301002007

### 1.3 Purpose and Scope

The purpose of this evaluation was to assess the site geology and potential geologic hazards for the proposed development. Additionally, VIVID’s efforts included the performance of a preliminary subsurface soil investigation and development of pertinent geotechnical engineering information for use by others in planning and engineering studies of the site. This report is part of the submittal of the Preliminary Development Plan for this proposed development to El Paso County.

VIVID’s scope of services included:

- A visual reconnaissance to observe surface and geologic conditions at the project site and locating the proposed soil borings;
- Completion of soil borings/monitoring wells and logging of subsurface soil/bedrock and groundwater conditions for tactile evaluation of the soils and sampling for further laboratory testing;
- Laboratory testing of selected samples obtained during the test pit explorations to evaluate relevant physical, geologic, and engineering properties of the soil; and
- Preparation of this report, which includes

- a description of the proposed project, a description of the surface and subsurface site conditions based on review of previous reports, and conditions found during our investigation,
- geologic and geotechnical research and mapping for evaluation of challenges or geologic hazards that may impact the development,
- develop geotechnical recommendations for:
  - earthwork and site preparation,
  - preliminary estimates of bearing capacities for shallow foundation systems, including seismic design parameters,
  - support of slab-on-grade floors,
  - flexible asphalt and rigid Portland cement concrete pavement sections,
  - guidance regarding surface and subsurface drainage, from a geotechnical perspective.

#### 1.4 Qualifications of Preparers

This Geology and Soils Evaluation Report was prepared by a Professional Geologist as defined by Colorado Revised Statutes section 34-1-201(3) and by a qualified Professional Engineer, with geotechnical expertise, pursuant to the requirements outlined in the El Paso County Land Development Code and Engineering Criteria Manual.

The principal investigators for this study are Brysen Mustain, P.G. and Nathan (Nate) Dowden, P.E. Mr. Mustain is a Professional Geologist as defined by State Statute (C.R.S 34-1-201) and a licensed Professional Geologist (PG-3718) by the State of Wyoming with over 21 years of experience in the geological and geotechnical engineering field. Brysen holds a B.S. in Geology from Adams State College, Alamosa, Colorado. Mr. Mustain has supervised and performed numerous geological and geotechnical field investigations throughout Colorado.

Nate Dowden, P.E. is a licensed Professional Engineer with over 38 years of experience in the geotechnical engineering fields. Mr. Dowden is a licensed professional engineer in Colorado (PE# 31266), Arizona and New Mexico. He holds a B.S. in Civil Engineering from the University of New Mexico and a M.S. in Civil Engineering (Geotechnical Emphasis) from the Colorado State University, Fort Collins, Colorado. Mr. Dowden has extensive experience in the development, supervision and performance of geological and geotechnical field investigation programs in Colorado and the Southwest Region of the United States.

## 2.0 FIELD EXPLORATION AND LABORATORY TESTING

### 2.1 Field Exploration

A field exploration was performed between July 14 through July 17, 2025, and included drilling twenty-one exploratory borings at the approximate locations indicated on the attached Field Exploration Plans (Figures 2.1 and 2.2), shown overlain on aerial imagery obtained from Google Earth Pro© (Ref. 4). The selected boring locations were distributed across the site to develop a generalized understanding of subsurface conditions anticipated to impact the proposed development. Borings B-1 through B-15 were drilled to maximum depths below existing ground surface ranging from 14.8 to 29.8 feet. Depths to groundwater, if present, were obtained at time of drilling; borings were backfilled with cuttings following groundwater measurement and are presented in Table 1, below.

Borings P-1 through P-6 were drilled to maximum depths below existing ground surface ranging from 24.4 to 24.7 feet. Depths to groundwater, if present, were obtained at time of drilling and 24-hours after drilling; depths to groundwater are presented in Table 1, below. Ground water monitoring wells were constructed within Borings P-1 through P-6 following completion of drilling. The monitoring wells allow for the measurement of variations in seasonal ground water levels following installation.

All borings were advanced using either a truck-mounted CME-45 or Diedrich D-90 drill rig equipped with 4-inch diameter, continuous-flight, solid-stem auger. Samples were taken with a standard split-spoon (SPT) sampler and California-type sampler (2.0-inch I.D./2.5-inch O.D.) sampler driven into the subsurface soils using a 140-pound hammer free-falling 30 inches. The hammer blows required to advance the driven samplers were recorded as blows per six inches. Samples were also obtained by bulk methods. Penetration tests were obtained at the various sample depths as well.

A summary of the subsurface exploration is presented below.

**Table 1  
Summary of Subsurface Exploration**

Boring Designation	Approximate Total Depth of Exploration <sup>1,2</sup> [feet, bgs]	Approximate Depth of Bedrock <sup>1</sup> [feet, bgs]	Approximate Depth to Groundwater at time of Drilling <sup>1</sup> [feet, bgs]	Approximate Depth to Groundwater 24-hours after Drilling <sup>1</sup> [feet, bgs]
<b>Soil Borings</b>				
B-1	20.5	12.0	10.0	Not measured
B-2	14.8	7.0	7.0	Not measured
B-3	24.4	7.0	12.0	Not measured
B-4	19.4	7.0	13.0	Not measured
B-5	17.0	12.0	9.50	Not measured
B-6	24.4	9.0	9.0	Not measured

Boring Designation	Approximate Total Depth of Exploration <sup>1,2</sup> [feet, bgs]	Approximate Depth of Bedrock <sup>1</sup> [feet, bgs]	Approximate Depth to Groundwater at time of Drilling <sup>1</sup> [feet, bgs]	Approximate Depth to Groundwater 24-hours after Drilling <sup>1</sup> [feet, bgs]
<b>Soil Borings</b>				
B-7	19.8	7.0	6.0	Not measured
B-8	19.4	12.0	11.0	Not measured
B-9	29.6	13.0	8.0	Not measured
B-10	19.8	9.5	None encountered	Not measured
B-11	29.3	14.0	12.0	Not measured
B-12	14.4	7.0	None encountered	Not measured
B-13	24.4	9.0	None encountered	Not measured
B-14	24.4	9.0	None encountered	Not measured
B-15	29.8	10.0	14.0	Not measured
<b>Piezometer/Monitoring Well Borings</b>				
P-1	24.4	9.5	10.0	5.0
P-2	24.4	12.0	9.0	8.0
P-3	24.5	12.0	7.0	8.0
P-4	24.7	17.0	10.0	9.25
P-5	24.4	12.0	8.0	8.5
P-6	24.4	8.0	12.0	8.5

1. Depths referenced to feet below existing ground surface (bgs) at time of drilling.

2. "Total Depth of Exploration" includes final sampler penetration below bottom of auger.

Appendix A to this report includes logs describing the subsurface conditions. The lines defining boundaries between soil types on the logs are based upon drill behavior and interpolation between samples and are therefore approximate. Transition between soil types may be abrupt or may be gradual.

## 2.2 Geotechnical Laboratory Testing

Laboratory tests were performed on selected soil samples to estimate their relative engineering properties. Tests were performed in general accordance with the following methods of ASTM or other recognized standards-setting bodies, and local practice:

- Description and Identification of Soils (Visual-Manual Procedure)
- Classification of Soils for Engineering Purposes

- Moisture Content
- Sieve Analysis of Fine and Coarse Aggregates
- Liquid Limit, Plastic Limit, and Plasticity Index
- Swell/Settlement Tests
- Modified Proctor Maximum Theoretical Unit Weight/Optimum Moisture Content
- Unconfined Compressive Strength
- Direct Shear
- Hveem R-Value

Results of the laboratory tests are included in Appendix B of this report. Selected test results are also shown on the boring logs in Appendix A.

### 2.3 Analytical Laboratory Testing

Analytical testing for soil corrosivity was performed on a selected sample and included the following tests:

- pH
- Resistivity
- Redox Potential
- Water-soluble Sulfate Content
- Water-soluble Chloride Content
- Sulfide Presence

Results of the analytical laboratory tests are presented in the report text, where applicable, and included in Appendix C of this report.

## 3.0 GEOLOGY AND SOILS

### 3.1 Site Description

The site is approximately 54 acres and is currently covered with native grasses, trees, and shrubs. The topography includes slightly rolling terrain with ephemeral drainages. A constructed drainage channel extends through the easterly portion of the site, flowing from north to south. The site is bounded by residential properties to the north, Bent Grass Meadows Drive to the west, Mountain View Electric Association offices and materials storage site to the east, and Woodmen Frontage Road to the south. Representative photographs of the site, obtained at the time of our field exploration, are presented in Appendix D to this report

### 3.2 Geologic Reconnaissance

A visual geologic reconnaissance of the site was performed. This reconnaissance was supported by the review of geologic mapping and information from the following sources:

- Falcon Quadrangle Geologic Map, El Paso County, Colorado by M.L. Morgan and J.L. White., 2012, Colorado Geologic Survey Open-File Report OF-12-05 (Ref. 5)
- US Department of Agriculture (USDA), *Soil Survey of El Paso County Area, Colorado*, Soil Conservation Service, USDA, 1981 (Ref. 6)
- Review of Available Geologic Hazard Studies in the surrounding area (Refs. 7-11)

A portion of the geologic map is presented as Figure 3 attached to this report. An NRCS Soil Survey Map and associated Soil Descriptions are presented as Figure 4.

### 3.3 Site Soils and Geology

#### 3.3.1 Site Stratigraphy

A portion of the Geologic Map of the Falcon Quadrangle showing the approximate site boundaries is presented on Figure 3. Four mappable units were identified on the site, which are underlain by Paleocene to Eocene-aged Dawson Arkose Formation (Tda):

<b>Qes</b> <u>Holocene to Late Pleistocene</u> <u>Eolian sand</u>	The eolian sand deposits encountered on the site are generally associated with the Late Pleistocene and Holocene Ages. The material is typically yellowish-brown to light brown to tan in color. This unit typically consists of fine to coarse-grained sand and silt windblown deposits.
<b>Qa<sub>1</sub></b> <u>Late Holocene Alluvium One</u>	This alluvium unit is present within or near the east boundary of the site, within the unnamed ephemeral drainage. Based on the mapping, these alluvium deposits are generally tan to pale-brown in color and consist of poorly to moderately-sorted sand, gravel, silt and minor clay in currently active stream channels.
<b>Qa<sub>2</sub></b> <u>Early Holocene Alluvium Two</u>	This alluvium unit is present near the northeast border of the site, near the unnamed ephemeral drainage. Based on the mapping, these alluvium deposits are generally dark gray to brown in color and consist of poorly to well-sorted sand, gravel, silt and minor clay in stream terrace deposits.
<b>Qa<sub>3</sub></b> <u>Late Pleistocene Alluvium Three</u>	This alluvium unit is present within the majority of the site. Based on the mapping, these alluvium deposits are generally tan to reddish-brown to grayish-brown in color and consist of poorly-sorted, moderately consolidated silt, sand, gravel, silt and cobbly gravel and occasional boulders in stream terrace deposits. The unit also contains dark gray clay beds that may be expansive.

Based on our exploratory soil borings and review of previous preliminary investigation and geologic mapping, the following soil and bedrock materials are anticipated to be encountered on the site.

### Sand and Clay

The overburden soils encountered at this site predominately consisted of clayey to silty sand and poorly to well graded sand soils. The sand soils were light to dark brown, yellowish-brown and grayish-brown in color, slightly moist to wet and loose to dense based on field penetration testing.

Interbedded layers of sandy lean clay and sandy silty clay were encountered in seven of the exploratory borings at varying depths. Highly plastic (fat) clay was encountered in one exploratory boring, P-3, from a depth of 3 feet to 5 feet below existing ground surface. The clay soils were gray and light to dark brown in color, slightly moist to wet, and stiff to very stiff based on field penetration testing.

### Bedrock

Although not shown as a mappable unit on the site, weathered to competent sandstone and claystone bedrock of the Dawson Arkose Formation was encountered underlying the surficial alluvium and eolian sand soils in all twenty-one of our borings across the site at depths of varying between 7 to 17 feet below the existing ground surface. The Dawson Formation material extends to the bottom of all borings advanced on the site.

As noted in our logs of exploratory borings, within the Dawson Formation, lenses of claystone bedrock will likely be encountered within the sandstone. We anticipate the sandstone bedrock encountered on this site will be weakly to moderately cemented. The estimated bedrock elevation throughout the site is presented as Figure 5, based on interpolation of the depths to bedrock encountered in our exploratory borings.

### 3.4 Engineering Geology and Mitigation of Geologic Hazards

No geologic hazards were found that would preclude the proposed development as planned. The following presents a list of geologic hazards, their applicability to this site, and the typical mitigation techniques.

### Expansive Soil and Bedrock

Clay soils and claystone layers within the Dawson Formation were encountered in our exploratory borings. Based on our laboratory testing, the clay soils exhibit low swell potential; a sample of the lean clay swelled 0.5% under a 1,000 psf load upon wetting, and a sample of the highly-plastic clay swelled 2.9% under a 200 psf load upon wetting.

A sample of claystone bedrock exhibited slight compression of -0.3% when wetted under a 1,000 psf load.

Swell potential of the clays and claystone materials encountered at the site are anticipated to vary. If clay soils or claystone bedrock are encountered at elevations at or near the bottom of structure elevations, mitigation for this potential hazard may include over-excavation of a zone of the expansive materials and replacement with moisture treated soils or granular structural fill, or the use of deep foundations (i.e. drilled piers). Due to the variability in elevation of the clay soils and claystone bedrock, depth and lateral extent of over-excavation will need to be determined at the time of the final Geotechnical Investigation

for each structure within the development. The specific mitigation method, if required, should be addressed in more detail in the site-specific Geotechnical Evaluation Report for each structure.

### Settlement Prone Soil

Based on the variability of the in situ density/consistency of the sand/clay soils present on the site, compression, or settlement, of soils should be anticipated. This condition, if it exists, should be evaluated at the time of final geotechnical investigations for each structure. Compressible, or settlement-prone, soils can be mitigated through typical engineering approaches including adjustment of allowable foundation bearing capacity, over-excavation and treatment or replacement of such soils, or use of deep foundations if building loads are such that conventional mitigation and shallow foundations are unable to adequately support the structure without excessive or deleterious movement.

### Erodible Soils

Soils with a sandy matrix, such as that encountered on the site, are susceptible to erosion when exposed. These concerns are normally addressed in an erosion control plan during construction and a long-term seeding/landscape plan that is typical for this type of development. Since we understand the majority of the site will have either a building constructed on it or will be paved and/or landscaped, the potential for erosion will be mitigated by these improvements.

### Corrosive Soils

The site may be underlain by soil or bedrock materials that may contain corrosive minerals. Corrosive minerals can have detrimental effects on concrete and buried metals if not identified prior to design and properly mitigated.

Laboratory testing was completed to provide data regarding potential corrosivity of onsite soils. Our scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required.

Laboratory chloride concentration, sulfate concentration, pH, and electrical resistivity tests were performed on samples of onsite materials obtained during our field investigation. The results of the tests are included in Appendix C to this report and are summarized below in Table 2.

**Table 2  
Summary of Laboratory Soil Corrosivity Testing**

Boring No.	Sample Depth (ft)	Material	Water Soluble Chloride (%)	pH	Redox Potential (mV)	Resistivity (ohm-cm)	Water Soluble Sulfate (%)	Sulfide Presence
B-2	4.0	Lean Clay	0.001	8.6	77.1	2,750	0.004	Positive
B-6/B-7	19.0	Claystone	0.001	7.6	67.6	1,250	<0.001	Trace

Metal and concrete elements in contact with soil, whether part of a foundation system or part of a supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried metal and concrete elements should be designed to resist corrosion and degradation based on accepted practices.

Based on the “10-point” method developed by the American Water Works Association (AWWA) in standard AWWA C105/A21.5, the corrosivity test results indicate that the onsite clays and claystone have corrosive potential just based upon the low electrical resistivity alone.

### Mine Subsidence

This project is outside of areas of known mining and identified mine subsidence.

### Slope Stability

The Dawson Formation and moderate to gentle slopes on this site are not considered to be prone to slope instability and there are no published geologic maps that indicate these issues exist on this site.

### Flooding Potential

As shown in Figure 6, Flood Hazard Map, the proposed developed pad sites of the project site are outside of mapped flood plain areas. Based on the FEMA flood mapping (Ref. 12) and our site observations, flooding is not considered to be a hazard for this development. However, surface runoff water from the surrounding area is currently being directed into drainage features that cross the project site. These historical surface water flows must not be interrupted or blocked by new construction of the proposed streets, structures, or other site features.

### Seismicity

The major structural feature of this region is the Rampart Range Fault System which is located approximately 15 miles west of the site along the Front Range. There is evidence of movement during the past 2 million years along this fault zone. The Rampart Range Fault is considered to be active by the Colorado Geologic Survey. This area, as is the case with most of central Colorado, is subject to a degree of risk due to seismic activity (Ref. 13).

Based upon the geologic setting, subsurface soil conditions, and low seismic activity in this region, liquefaction is not expected to be a hazard at the site and should be addressed in the site-specific Geotechnical Evaluation Report. Based on correlation of blow count data (N-values) from the borings advanced during this evaluation, we estimate that the subsurface soil profiles correspond with Site Class D (Stiff Soils) of the 2021 International Building Code (IBC) (Ref 14). The intermediate design acceleration values from IBC are presented below.

**Table 3  
Summary of Subsurface Exploration**

$S_s$	$F_a$
0.187	1.6

- $S_s$  = The mapped spectral accelerations for short periods (seismicmaps.org, 2025)  
 $F_a$  = Site coefficient from ASCE 7-16, Table 11.4-2, 2019

**Table 4  
Design Acceleration for 1-Second Period**

$S_1$	$F_v$
0.059	2.4

- $S_1$  = The mapped spectral accelerations for 1-second period (seismicmaps.org, 2025) = 0.055. Minimum allowable per PPRBD = 0.059  
 $F_v$  = Site coefficient from ASCE 7-16, Table 11.4-2, 2019

### Elevated Radioactivity/Radon

Results of an EPA supported radon study in Colorado (Ref. 15) found that soils similar to those that underlie this site are generally below the EPA guideline level of 4 pCi/l. However, radon levels often vary significantly within the same geologic formation. It should be mentioned that all of El Paso County is considered to be in Zone 1 of the EPA’s Map of Radon Zones, which is a county considered to have a predicted average indoor radon screening level greater than 4 pCi/L. This is a more significant issue for inhabited below-grade construction and structures that are more air-tight such as residential structures. The higher concentrations of radon gas normally occur in residential structures that have been sealed to prevent exchange of outside air. Buildup of radon gas can usually be mitigated by providing frequent exchange of air within the structure and by sealing joints and cracks that are located adjacent to the subsoil. The presence and concentration of radon gas was not included in this investigation and is not considered an issue impacting development as no residential lots are proposed.

### Groundwater

Groundwater was encountered in 17 of the exploratory borings at the locations, approximate depths, and times presented above in Table 1, and on the individual boring logs presented in Appendix A. Groundwater may tend to perch on top of, or within, the less-permeable clay soils and claystone bedrock layers within the underlying Dawson Formation. If shallow groundwater is encountered during site-specific geotechnical investigations for structures and pavements, mitigation designs should be developed to address control of groundwater, both during construction and throughout the life of the structure. Measures may include cut-off drains, underdrains, or foundation perimeter drains, common to local design and construction techniques.

Based on the topography of the site, the surface water likely drains to the south and southeast. Ponding is anticipated to occur within any low-lying/depression features on the site during high precipitation events.

Design of water-quality ponds and underground utilities should consider the presence of groundwater, and anticipated depths, in planning of retention/detention facilities and underground elements. Use of conventional design and construction techniques, such as cut-off drains and/or dewatering, may be necessary to achieve satisfactory performance of the permanent features.

Periodic groundwater measurements have been obtained monthly from July 14, 2025 through February 17, 2026. Appendix E presents the monthly groundwater measurements.

To aid in the evaluation of groundwater conditions present at the site, we have prepared a "Groundwater Elevation Map" based on the data we obtained. This exhibit is included as Figure 7 to this report. The groundwater elevations presented are interpolated based on the depths/elevations at which groundwater was encountered within our exploratory boring during our field investigation.

### Geologic Hazards Opinion

It is our opinion that the project site exhibits no geologic hazards that pose a significant risk to the proposed project or adjacent properties that cannot be mitigated through proper land usage planning, foundation design, engineering design, and/or construction practice generally as discussed above. Recommendations regarding mitigation of the identified potential hazards must be addressed in the lot-specific geotechnical investigation report, or through the use of current building design codes. Additional recommendations pertinent to this development are provided in subsequent sections of this report.

### 3.5 Economic Mineral Resources

According to *El Paso County Master Plan for Mineral Extraction*, the project site is not mapped with any significant or viable aggregate deposits. The site is mapped as "UPLAND DEPOSITS: Sand, gravel with silt and clay deposited by older streams on topographic highs or bench like features". Based on the limited quantity and quality of the aggregate resources on the site and the proximity to developed residential features, the site is not deemed suitable for aggregate or mineral extraction. (Ref 16)

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

### 4.1 Geotechnical Feasibility of Proposed Construction

VIVID found generally fair subsurface conditions during this investigation that would indicate that development of the site essentially as planned involves an average risk of suitable performance of the structures, assuming localized subgrade conditions are mitigated. The main geotechnical issue is the localized presence of loose, compressible overburden soils, low swell potential clays and claystone, and shallow groundwater. However, as long as the recommendations in this report are incorporated in the design and construction of the project, the deleterious effects of the identified geotechnical conditions of concern can be reduced.

Our geotechnical design and construction recommendations for site preparation, foundations, floor systems, pavements, and other related construction topics are provided in the following sections.

### 4.2 Construction Considerations

#### 4.2.1 General

All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, State, or Federal guidelines.

#### 4.2.2 Site Preparation and Grading

Initial site work should consist of removing all undocumented fill materials (if encountered) and other deleterious materials from all areas to be filled and areas to be cut. All material should be removed for offsite disposal in accordance with local laws and regulations or, if appropriate, stockpiled in proposed landscaped areas for future use. Excavations to remove existing site features must be backfilled and properly compacted. Areas to receive fill should be evaluated by the geotechnical engineer prior to the placement of any fill materials.

After performing the required excavations and prior to the placement of any compacted fill and/or structural elements, processing of the subgrade should be performed. This should include scarifying the subgrade to a depth of at least 12 inches and compacting as recommended in Section 4.2.6 of this report. **If bedrock is encountered at bottom of excavation elevation, it should not be scarified but scraped clean of any loose material.** All fill materials should be placed on a horizontal plane and placed in loose lifts not to exceed 8 inches in thickness, unless otherwise accepted by the geotechnical engineer.

For preliminary earthwork balance considerations, the following guidance is provided.

Average, existing "in-place, dry density", pcf	Maximum Mod. Proctor Density (ASTM D-1557), pcf	Target degree of Compaction of grading fill, %	Estimated shrink (-) or "fluff" factor (+)
105-112	127.8 <sup>(1)</sup>	95	-18 to -12

<sup>(1)</sup>Mod. Proctor data presented in "Appendix B - Geotechnical Laboratory Test Results"

### 4.2.3 Excavation Characteristics

Proposed site grading plans were not provided to us prior to compilation of this report. However, we anticipate localized cuts and fills for general grading will be on the order of about 1 to 5 feet. We anticipate that excavation of the on-site overburden soils can be performed with conventional heavy-duty earthmoving equipment. It is likely heavy-duty backhoes, hoe rams, and dozers equipped with rock excavating teeth/rippers and similar equipment will be required to excavate a large proportion of the on-site bedrock materials, where encountered.

We believe that the unsaturated soils on this site will classify as Type C materials using OSHA criteria. OSHA requires that unsupported cuts in Type C materials be laid back to ratios no steeper than 1½:1 (horizontal to vertical). However, the hard and intact on-site sandstone and claystone bedrock may be classified as Type A material, if not saturated. OSHA requires that unsupported cuts up to 20 feet in height be laid back to ratios no steeper than ¾H:1V (horizontal to vertical) for a Type A material. In general, we believe that these slope ratios will be temporarily stable under unsaturated conditions. Where groundwater occurs, flatter slopes will be required. Please note that the actual determination of soil type and allowable sloping must be made in the field by an OSHA-qualified “competent person.”

VIVID’s recommendations for excavation support are intended for the Client’s use in planning the project, and in no way relieve the Contractor of its responsibility to construct, support, and maintain safe slopes. Under no circumstances should the following recommendations be interpreted to mean that VIVID is assuming responsibility for either construction site safety or the Contractor’s activities.

### 4.2.4 Fill Materials

One, or a combination of moisture of, treated (on-site soils) and granular structural fill (imported to site), will be required for this project. Specific recommendations in regard to depth of structural fill are presented in the following sections of this report for foundations, floor slabs, pavements, etc.

#### Site Grading Fill:

On-site soils may be used for general site grading, provided that deleterious materials are removed, and these materials are properly processed (i.e., large pieces are broken down to a soil-like consistency with particle sizes of less than three inches), moisture-conditioned, and compacted. If imported site grading fill is required at this site, it should consist of a non-expansive material with a maximum particle size of 2 inches, a liquid limit of less than 40 percent, and a plasticity index of less than 15. The fill should have between about 30 and 60 percent passing the No. 200 sieve. A sample of any imported site grading fill material should be submitted to our office for approval and testing at least 1 week prior to stockpiling at the site.

Clay soils and claystone should not be utilized in the upper 2 feet, directly below required aggregate base course, of roadway/pavement subgrades,

#### Structural Fill:

On-site soils may be re-used as structural fill, provided deleterious materials are removed and it is prepared in accordance with Section 4.2.6 of this report. Imported structural fill, if required, at this site should consist of materials with fines content of less than 60 percent (pass the No. 200 sieve), Liquid Limit

of 40 or less, Plasticity Index of 15 or less, and an expansion potential of 1.0 percent or less (under a surcharge load of 200 psf). A sample of any imported structural fill material should be submitted to our office for approval and testing at least 1 week prior to stockpiling at the site. Specific recommendations regarding depth of structural fill are presented in the following sections of this report for foundations, floor slabs, etc.

**Pavement Aggregate Base Course:**

Aggregate Base Course (ABC) below pavements should consist of materials meeting CDOT Class 5 or 6 aggregate base course specifications, as described in Section 703.03 of the 2023 CDOT Standard Specifications for Road and Bridge Construction. A sample of any imported aggregate base course material should be submitted to our office for approval and testing at least 1 week prior to stockpiling at the site.

Fill should be compacted according to the recommendations in Section 4.2.6 of this report. We recommend that a qualified representative of VIVID visit the site during excavation and during placement of the structural fill to verify the soils exposed in the excavations are consistent with those encountered during our subsurface exploration and that proper foundation subgrade preparation and placement is performed.

**4.2.5 Utility Trench Backfill**

Backfill material should consist of granular structural fill and be essentially free of plant matter, organic soil, debris, trash, other deleterious matter, and rock particles larger than 3 inches. However, backfill material in the “pipe zone” (from the trench floor to 1 foot above the top of pipe) should not contain rock particles larger than 1 inch. Strictly observe any requirements specified by the utility agency for bedding and pipe-zone fill. In general, backfill above the pipe zone in utility trenches should be placed in lifts of 6 to 8 inches, and compacted using power equipment designed for trench work. Backfill in the pipe zone should be placed in lifts of 8-inches or less and compacted with hand-held equipment. Compact trench backfill as recommended in Section 4.2.6 of this report.

**4.2.6 Compaction Requirements**

Fill materials should be placed in horizontal lifts compatible with the type of compaction equipment being used, moisture conditioned, and compacted in accordance with the following criteria:

**Table 5  
Compaction Specifications**

<b>FILL LOCATION <sup>2</sup></b>	<b>MATERIAL TYPE</b>	<b>PERCENT COMPACTION<sup>1</sup></b>	<b>MOISTURE CONTENT</b>
Subgrade Preparation (except bedrock – bedrock should not be scarified but scraped clean)	On-site Sand Soils	95 minimum of ASTM D 1557	± 2 % of optimum
General Site Grading Fill	On-site Sand Soils/Imported Site Grading Fill (see Section 4.2.4)	95 minimum of ASTM D 1557	± 2 % of optimum

FILL LOCATION <sup>2</sup>	MATERIAL TYPE	PERCENT COMPACTION <sup>1</sup>	MOISTURE CONTENT
Structural Fill	Import or On-site Sand soils (see Section 4.2.4)	95 minimum of ASTM D 1557	± 2 % of optimum
Pavement Section Aggregate Base Course	Imported CDOT Class 5 or 6 ABC (see Section 4.2.4)	95 minimum of ASTM D 1557	± 2 % of optimum
Exterior Flatwork Areas	Import or On-site Sand soils (see Section 4.2.4)	95 minimum of ASTM D 1557	± 2 % of optimum
Utility Trenches	(see Section 4.2.5)	95 minimum of ASTM D 1557	± 2 % of optimum

- 1) In non-structural, unpaved or landscaped areas, the compaction specification may be reduced to 90 percent. Water quality ponds may have differing element-specific requirements.
- 2) Where two or more “Fill Locations” coincide, the more stringent specification should be used.

Fill should be placed in level lifts not exceeding 8 inches in loose thickness and compacted to the specified percent compaction to produce a firm and unyielding surface. If field density tests indicate the required percent compaction has not been obtained, the fill material should be reconditioned as necessary and re-compacted to the required percent compaction before placing any additional material.

#### 4.2.7 Construction in Wet or Cold Weather

During construction, grade the site such that surface water can drain readily away from the building and pavement areas. Promptly pump out or otherwise remove any water that may accumulate in excavations or on subgrade surfaces and allow these areas to dry before resuming construction. The use of berms, ditches and similar means may be used to prevent stormwater from entering the work area and to convey any water off site efficiently.

If earthwork is performed during the winter months when freezing is a factor, no grading fill, structural fill, or other fill should be placed on frosted or frozen ground, nor should frozen material be placed as fill. Frozen ground should be allowed to thaw or be completely removed prior to placement of fill. A good practice is to cover the compacted fill with a “blanket” of loose fill to help prevent the compacted fill from freezing.

If the buildings are erected during cold weather, foundations, concrete slabs-on-grade, or other concrete elements should not be constructed on frozen soil. Frozen soil should be completely removed from beneath the concrete elements, or thawed, scarified, and recompacted. The amount of time passing between excavation or subgrade preparation and placing concrete should be minimized during freezing conditions to prevent the prepared soils from freezing. The use of blankets, soil cover or heating as required may be utilized to prevent the subgrade from freezing.

#### 4.2.8 Construction Testing and Observation

Testing and construction observation should take place under the direction of VIVID to support that engineer’s professional opinion as to whether the earthwork does or does not substantially conform to the recommendations in this report. Furthermore, the opinions and conclusions of a geotechnical report are based upon the interpretation of a limited amount of information obtained from the field exploration. It is therefore not uncommon to find that actual site conditions differ somewhat from those indicated in

the report. The geotechnical engineer should remain involved throughout the project to evaluate such differing conditions as they appear, and to modify or add to the geotechnical recommendations, as necessary.

#### 4.2.9 Surface Drainage and Landscaping

Positive drainage away from the structures is essential to the performance of foundations and flatwork and should be provided during the life of the structures. Landscape areas within 10 feet of structures should slope away at a minimum of 8 percent. Areas where pavements or slabs are constructed adjacent to the structures should slope away at a minimum grade of 2 percent. All downspouts from roof drains should be tight-lined to the on-site stormwater system or, at a minimum, cross all backfilled areas such that they discharge all water away from the backfill zone and the structures. Drainage should be created such that water is diverted off the site and away from backfill areas of adjacent buildings. Landscaping improvements requiring supplemental watering are not recommended adjacent to improved areas including foundations, pavements, or slabs.

#### 4.2.10 Permanent Cut and Fill Slopes

If required, permanent cut and fill slopes exposing the materials encountered in our borings are anticipated to be stable at slope ratios as steep as 3:1 (horizontal to vertical) under dry conditions. We believe that slope ratios of 4:1 or flatter are more reliable if subjected to wetting, and present less of a maintenance problem. New slopes should be revegetated as soon as possible after completion to reduce erosion problems.

### 4.3 FOUNDATION RECOMMENDATIONS

#### 4.3.1 Shallow Foundation Recommendations

As noted previously, site-specific geotechnical investigations will be necessary for each structure within the development, in accordance with Pikes Peak Regional Building Department (PPRBD) requirements, to develop building-specific foundation recommendations. Based on the conditions encountered in our investigation, it is our opinion that structures within this development can be designed and constructed utilizing shallow foundation systems.

For foundations supported on the **medium-dense to dense silty to clayey sands**, we estimate allowable foundation soils contact pressure to be on the order of 2,500 to 3,000 psf. We estimate a total movement of up to 1-1.5 inches is possible, with differential movement, over a 20-foot span, being approximately ½ the total value, for these shallow foundations. Shallow foundations bearing completely on sandstone bedrock are anticipated to be able to utilize allowable bearing capacities of approximately 4,000 to 5,000 psf.

Foundation sizes should be determined by a structural engineer. However, as a minimum, we recommend isolated columns be supported on square pads of at least three feet wide. Continuous wall footings should be at least two feet in width.

Shallow foundations should not bear on very loose to loose sand soils. Clay soils and claystone, where encountered, should be removed to a minimum depth of four feet below the bottom of any foundation component. Lean and fat clay soils with consistencies of soft to medium stiff should be removed completely from beneath foundation components.

As noted previously in this report, bedrock encountered is hard to very hard. It is likely heavy-duty backhoes, hoe rams, and dozers equipped with rock excavating teeth/rippers and similar equipment will be required to excavate a large proportion of the on-site bedrock materials, if the shallow foundation excavations encounter bedrock.

Modification of the bearing level expansive soils below foundations should consist of excavation to a depth to a depth of at least 4 feet below footing bearing elevation and replacement with processed (i.e., large pieces broken down to a soil-like consistency with particle sizes of less than three inches), moisture-conditioned, compacted structural fill in accordance with Sections 4.2.4 and 4.2.6 of this report.

To decrease the estimated total movement of shallow foundations bearing on the silty to clayey sand, foundations may be supported on a 3-feet of compacted structural fill, placed and compacted on top of properly prepared subgrade soils.

Provided the following recommendations are complied with, the proposed structure may be supported on a shallow spread footing foundation. We recommend conventional shallow foundation elements be designed with the following criteria:

- Under no circumstances may the footings be installed on non-engineered fill, topsoil, soft or disturbed soils, construction debris, frozen soil, moisture sensitive soils, or within ponded water. All undocumented fills should be removed and replaced prior to foundation construction. If bearing soils or structural fill upon which the footings are to be constructed become loose or disturbed, the subgrade should be recompacted to the requirements of structural fill or excavated to firmer, undisturbed soils and replaced with structural fill or CLSM.
- Exterior foundations must be protected from frost action. We recommend footings be protected with at least 30 inches of soil cover or that which is required by local building codes. Foundation components must not be placed on frozen soils.
- A representative of VIVID should observe all foundation excavations prior to placement of fill and/or concrete. Additionally, the placement and compaction of structural fill should be observed and tested by a representative of our firm.
- A modulus of subgrade reaction,  $K_{v1}$ , of 150 pounds per cubic inch may be used for design of mat foundations.  $K_{v1}$  refers to a one-foot square plate and should be adjusted for actual foundation dimensions using the following equation (B is foundation width in feet):

$$K_v = K_{v1} \left( \frac{B + 1}{2B} \right)^2$$

- The foundation subgrade should be protected from wetting and drying prior to and after concrete placement. Footings should be backfilled as soon as practical after concrete placement.

#### 4.5 LATERAL EARTH PRESSURES

- If foundation walls are partially backfilled with soil on one side they will be subjected to lateral earth pressures. The design and construction criteria presented below should be observed for earth retention systems (foundation walls in this case) on this site with flat back slopes. Active and at-rest lateral earth pressures apply to the structural fill soils that are “retained” by the foundation and/or tank walls. Passive lateral earth pressure applies to soils placed adjacent the inside edge of

the footing/wall beneath the floor slab. The sliding coefficient applies to the friction between the base of the foundation and the underlying soil. The following values were estimated assuming a moist unit weight of 120 pounds per cubic foot (pcf), for soils above groundwater, and an internal friction angle of 34 degrees for on site silty to clayey sands and imported granular structural fill materials. For submerged conditions, the wet unit weight of soil is assumed to be 130 pcf.

**Table 6  
Lateral “Equivalent Fluid” Earth Pressure Parameter Summary**

Parameter	On site Sands and Imported Structural Fill, above groundwater	On site Sands and Imported Structural Fill, submerged
At-Rest <sup>1</sup>	53 pcf	92 pcf
Active <sup>2</sup>	34 pcf	82 pcf
Passive <sup>3</sup>	424 pcf	239 pcf
Unfactored Coefficient of Sliding Friction <sup>3</sup>	0.67	0.67

Notes:

1. Retaining walls that are laterally supported (structurally restrained from rotation) can be expected to undergo only a slight amount of deflection. These walls should be designed for an “at-rest” lateral earth pressure.
2. Retaining structures which can deflect sufficiently to mobilize the full “active” earth pressure condition should be designed for an “active” lateral earth pressure. For the medium dense sand soils encountered on this site, a wall deflection of at least 0.002H (where H is the wall height) is required to mobilize active earth pressures.
3. Lateral loads may be resisted using these unfactored coefficients of sliding friction and unfactored passive earth pressures presented above. Because significant movement is required to fully mobilize passive earth pressure, we recommend a minimum factor of safety (FoS) of 2 be applied for design purposes. Typically a FoS ≥1.5 is applied to the Coefficient of Sliding Friction.

## 4.4 FLOOR SYSTEMS

### 4.4.1 Slab-on-Grade Floor System

Slab-on-grade floor systems are considered acceptable provided any existing fill materials are removed and a portion of the near-surface expansive soils are modified, and the owner is willing to accept risk of some slab movement on the order of 1-inch or more. If floor movement cannot be tolerated, then a structurally supported floor system is recommended, or modification of subgrade soils supporting slabs is required.

To limit slab movement, associated with soil supporting the slab, to approximately 0.5 inches, we recommend that a minimum of 3 feet of native silty to clayey sand be removed and replaced with CDOT Class 5 or 6 aggregate base course, placed and compacted with the criteria presented in Section 4.2.6 for “Structural Fill”.

The criteria presented below should be observed for design and construction of floor slabs on this site. The construction details should be considered when preparing the project documents.

- For concrete slab-on-grade design purposes, a modulus of subgrade reaction of 150 pounds per cubic inch (pci) can be used for properly compacted, structural fill, and compacted subgrade preparation as described above. Additional reinforcement can also be used to help resist damage due to differential movement of slabs.

- Floor slabs should be separated from all bearing walls and columns with expansion joints that allow unrestrained vertical movement. At door thresholds only, both interior and exterior slabs can be dowelled into the foundation stem wall to resist movement that can create a trip hazard or impede proper door operation.
- Floor slab control joints should be used to reduce damage due to shrinkage cracking. Control joint spacing is a function of slab thickness, aggregate size, slump and curing conditions. The requirements for concrete slab thickness, joint spacing and reinforcement should be established by the designer based on experience, recognized design guidelines and the intended slab use. Placement and curing conditions will have a strong impact on the final concrete slab integrity.
- Minimum 2-inch void space should be constructed above, or below, non-bearing partition walls placed on the floor slab to accommodate potential vertical slab movement, unless specific design and construction consideration has been implemented to limit slab movement. Partition walls should be isolated from suspended ceilings.
- Utility lines should be provided with flexible joints or oversized sleeves where they penetrate floor slabs to prevent breakage caused by differential movement.
- Recommendations pertaining to the design, construction and curing of slabs provided by the American Concrete Institute (ACI) should be implemented to aid in achieving satisfactory concrete slab on grade performance.

#### 4.4.2 Capillary Break or Moisture Barrier

If moisture sensitive flooring or adhesives will be utilized within the structures, a capillary break or moisture barrier should be constructed below slabs at this site. The placement of compacted granular fill materials (CDOT Class I Structure Backfill) within the upper 12 inches of soil below the slab is considered a capillary break unless this does not meet the flooring manufacturer's recommendations.

#### 4.4.3 Perimeter Exterior Drain System

If there are areas where the floor slab will be below exterior grade, we recommend installation of an exterior foundation perimeter drain connected to a gravity outlet or sump, with a working sump pump.

### 4.5 EXTERIOR CONCRETE FLATWORK/SLABS-ON-GRADE

The project will include exterior concrete for walkways, sidewalks, drive/truck pads, etc. Some potential for differential movement and cracking is possible. While it is not likely that exterior slabs can be economically protected from distress, several techniques are available to reduce the expected long-term movement of the slab, including:

- Placement of a thick zone of imported granular, non-expansive structural fill beneath slabs;
- At thresholds, thickened slabs can be dowelled into the structure to avoid differential movement and trip hazards;
- Avoidance of watering adjacent to slabs, and
- Structural reinforcement of slabs.

**Note that exterior slabs constructed directly adjacent to the building structure shall be constructed on prepared subgrade the same as the interior floor slab per Section 4.4.1 of this report.**

## 4.6 CHEMICAL SULFATE SUSCEPTIBILITY AND CONCRETE TYPE

The degradation of concrete or cement grout can be caused by chemical agents in the soil or groundwater that react with concrete to either dissolve the cement paste or precipitate larger compounds within the concrete, causing cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. The American Concrete Institute (ACI) in their publication Guide to Durable Concrete (ACI 201.2R-08) provides guidelines for this assessment.

The concentration of water-soluble sulfates measured on subsurface materials submitted for testing represents Class 2 exposure of sulfate attack on concrete exposed to the soils per CDOT Standard Specifications for Road and Bridge Construction, 2023, Section 601.04.

## 4.7 PAVEMENT RECOMMENDATIONS

### 4.7.1 General

Paved parking lots, interior circulation access/drive lanes, and the primary access road from East Woodmen Road and the Woodmen Frontage Road are proposed for the site. Our borings indicate the pavement subgrade soils will generally consist of silty to clayey sand materials. These types of soils are generally considered to provide good support for pavements. All subgrade preparation, fill, and aggregate base course shall be compacted as recommended in Sections 4.2.2, 4.2.4, and 4.2.6 of this report.

### 4.7.2 Traffic Values

No traffic estimates were available for our use at the time this report was written. Based on past experience with similar projects, we anticipate areas of the pavement will be subjected to “light” passenger vehicle traffic, while other areas will be subject to heavier delivery trucks, trash trucks, and maintenance vehicles. For our design we have assigned a 20-year, 18-kip Equivalent Single Axle Load (ESAL) of 36,500 for parking areas/parking stalls for “light duty” vehicle use only, an ESAL of 292,000 for interior/circulation roads and drives where heavier traffic loads are anticipated. The Non-residential Collector roadway accessing E. Woodmen Road and the Woodmen Frontage Road was designed utilizing an ESAL value of 821,000 per the El Paso County (EPC) Engineering Criteria Manual (ECM).

Note that the pavement section recommendations for the Non-residential Collector are preliminary; pursuant to the EPC ECM, a final pavement subgrade investigation and pavement section design will be required following rough grading activities, when the roadway subgrade has been constructed.

### 4.7.3 Pavement Subgrade Characteristics

The majority of the near-surface soils encountered at the site are composed of silty and clayey sands, ranging from poor- to well-graded sands. Localized zones of lean and fat (highly-plastic) clays were encountered. The dominant soils, comprising the silty and clayey sands, classify as A-1-b to A-2-4 materials in accordance with the AASHTO Soil Classification System. The clay soils generally classify as an A-6 material within the AASHTO system.

Testing of the A-6 material yielded a Hveem R-Value  $\leq 5$ . Correlated R-values of the A-1-b to A-2-4 materials range from approximately 25 to 35 based on CDOT correlations and comparison to measured properties from pavement designs for roadways in the immediate vicinity of the project (Ref. 17-19). For

purposes of design of pavement section thicknesses for this project, we have utilized an R-value = 26, which yields a soil resilient modulus,  $M_r$ , of 6,010 psi.

***We recommend that site grading and roadway construction utilize the silty and sandy clay soils within the upper 2 feet of subgrade. Clay soils, if encountered in roadway areas, should be removed and replaced with sand soils in the upper 2 feet of subgrade construction.***

If traffic estimates vary significantly from those assumed, we should be contacted to re-evaluate our recommendations. The following pavement sections were designed using the AASHTO design methods for flexible and rigid pavements.

**Table 7  
Preliminary Pavement Section Thickness Recommendations**

<b>PAVEMENT AREA</b>	<b>PORTLAND CEMENT CONCRETE/ AGGREGATE BASE COURSE (INCHES)<sup>1</sup></b>	<b>ASPHALT CONCRETE/ AGGREGATE BASE COURSE (INCHES)<sup>1</sup></b>
Parking Lot/Light Duty Use	--	4/ 6
Interior/Circulation Roads	--	4.5/9
Non-residential Collector (access off of Woodmen)	--	5.5/10
Concrete Pavements/Truck pads	7/6	--

1) Overlying a properly prepared subgrade as described in Section 4.7.4.

Concrete pavements should be provided with adequate reinforcement based upon anticipated loads. Asphalt does not perform well where trucks perform tight turn maneuvers, therefore concrete should be considered for these areas. A concrete pad is recommended in front of trash dumpster locations to support the heavy front wheel loads of trash trucks.

#### 4.7.4 Pavement Subgrade Preparation

The prepared subgrade should be proof-rolled with a heavily loaded pneumatic-tired vehicle (such as a fully-loaded dump truck or similar weight equipment) after subgrade preparation and prior to placement of the pavement section and structural fill, if required. Pavement design procedures assume a firm and stable subgrade. Areas that deform under heavy wheel loads are not stable and should be removed to firm material and replaced to achieve a stable subgrade prior to paving. Care should be taken to ensure areas around manholes or other utility protrusions are proof-rolled adequately.

**Subgrade soils may be at risk of pumping during construction. This risk is increased if pavements are being constructed during adverse weather conditions (e.g., heavy precipitation). In this event, stabilization options can only be determined when the conditions are observed but may include deeper**

**Aggregate Base Course sections in combination with additional geo-grid placement, structural fill, rock stabilization, or similar options.**

#### 4.7.5 Pavement Construction Considerations

Pavement construction must be completed in accordance with El Paso County specifications, for public roadways, and Site Developer's requirements for parking areas and private drives. The specifications contain requirements for the roadway materials (asphalt concrete, concrete pavement, and aggregate base course) and the construction practices used (compaction and material sampling). Of particular importance are those specifications directed towards embankment construction, subgrade compaction, base course compaction, and utility trench compaction. Prior to pavement construction, the prepared subgrade should be proof-rolled with heavy construction equipment. A fully loaded dump truck or water truck would be acceptable for this purpose. During proof-rolling, particular attention should be directed to the areas immediately adjacent to manholes, valves, catch basins, and other similar surface features. Areas which exhibit excessive deflection during proof-rolling should be over-excavated and stabilized as required. If soil is imported to the subject site for final grading, the soil materials must be of a character similar to those described in this report.

Proper drainage is of paramount importance in enhancing pavement performance. To avoid distress to pavement from wet subgrade soils, we recommend the maintenance of good drainage away from all pavements. Possible water sources include storm runoff, irrigation of landscaping adjacent the pavement and localized groundwater seepage, among others. Landscaping adjacent to the pavements should be avoided. Joints in the pavement or at asphalt/concrete interfaces should be sealed. Any cracks or openings in the finished pavement surface should be sealed and/or repaired as quickly as possible.

## 5.0 ADDITIONAL SERVICES & LIMITATIONS

### 5.1 Additional Services

Attached to this report is a document by the Geoprofessional Business Association (GBA) that summarizes limitations of geotechnical reports as well as additional services that are required to further confirm subgrade materials are consistent with that encountered at the specific boring locations presented in this report. This document should be read in its entirety before implementing design or construction activities. Examples of other services beyond completion of a geotechnical report are necessary or desirable to complete a project satisfactorily include:

- Review of design plans and specifications to verify that our recommendations were properly interpreted and implemented.
- Attendance at pre-bid and pre-construction meetings to highlight important items and clear up misunderstandings, ambiguities, or conflicts with design plans and specifications.
- Performance of construction observation and testing which allows verification that existing materials at locations beyond our borings are consistent with that presented in our report, construction is compliant with the requirements/recommendations, evaluation of changed conditions.

### 5.2 Limitations

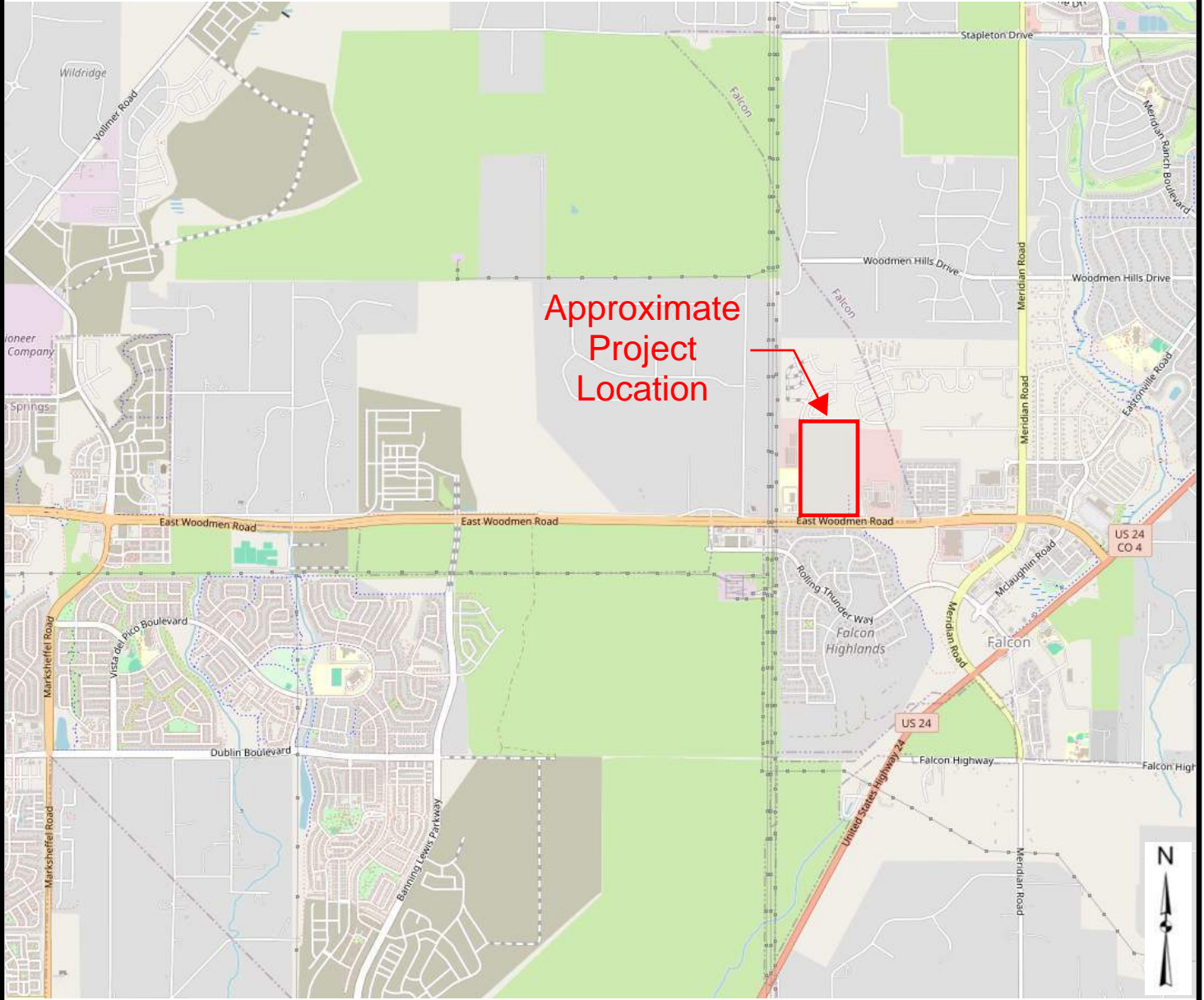
This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of VIVID's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. VIVID makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than two (2) years from the date of the report.

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16. El Paso County, Colorado, *El Paso County Master Plan for Mineral Extraction*, February 8, 1996 [[www.planningdevelopment.elpasoco.com/mp-topical-elements/Master Plan for Mineral Extraction](http://www.planningdevelopment.elpasoco.com/mp-topical-elements/Master_Plan_for_Mineral_Extraction)]
17. Intertek PSI, *Falcon Marketplace Roadways, East Woodmen Road & Meridian Road, Falcon, Colorado*, PSI Project No. 05322095, September 29, 2020, Revised January 8, 2021, EPC Planning & Community Development Department approval 01/31/21
18. A.G. Wassenaar, Inc., *Pavement Study, Falcon Meadows at Bent Grass, Filing No. 1, El Paso County, Colorado*, Project Number 2140161-P2, September 15, 2021, Revised October 1, 2012, EPC Planning & Community Development Department approval 10/07/2021
19. RMG Engineers, *PAVEMENT DESIGN REPORT, Bent Grass Residential Filing No. 2, El Paso County, Colorado, SF-19-014*, Job No. 173851, May 29, 2020, EPC Planning & Community Development Department approval 06/09/2020


## Figures

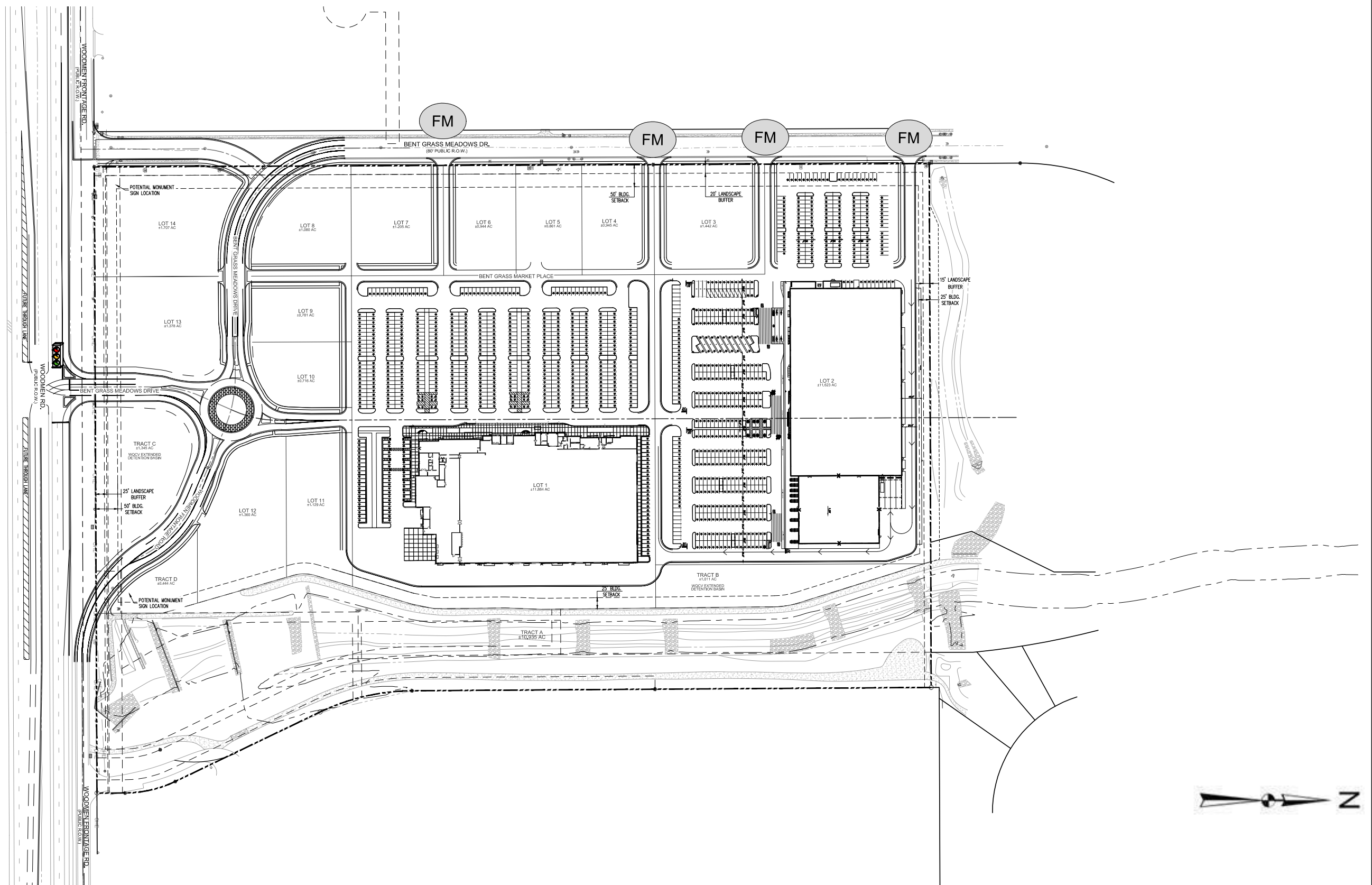


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**REFERENCE:**

Base image obtained from  
OpenStreetMap, 6/24/2025

 <p><b>VIVID Engineering Group, Inc.</b> 1053 Elkton Drive Colorado Springs, CO 80907 719-896-4356</p>	Project No. D25-2-928	<b>VICINITY MAP</b>	<b>FIGURE</b>  <b>1</b>
	Date: 6/24/2025		
	Drawn by: SAM	The Markets at Bent Grass El Paso County Falcon, Colorado	
	Reviewed by: ND		



Note: Not to Scale.

**REFERENCE**

Base Image obtained from Galloway Evergreen Development, Bent Grass South Commercial, Concept (A7.2), 2026.

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Project No. D25-2-928

Date: 2/11/2026

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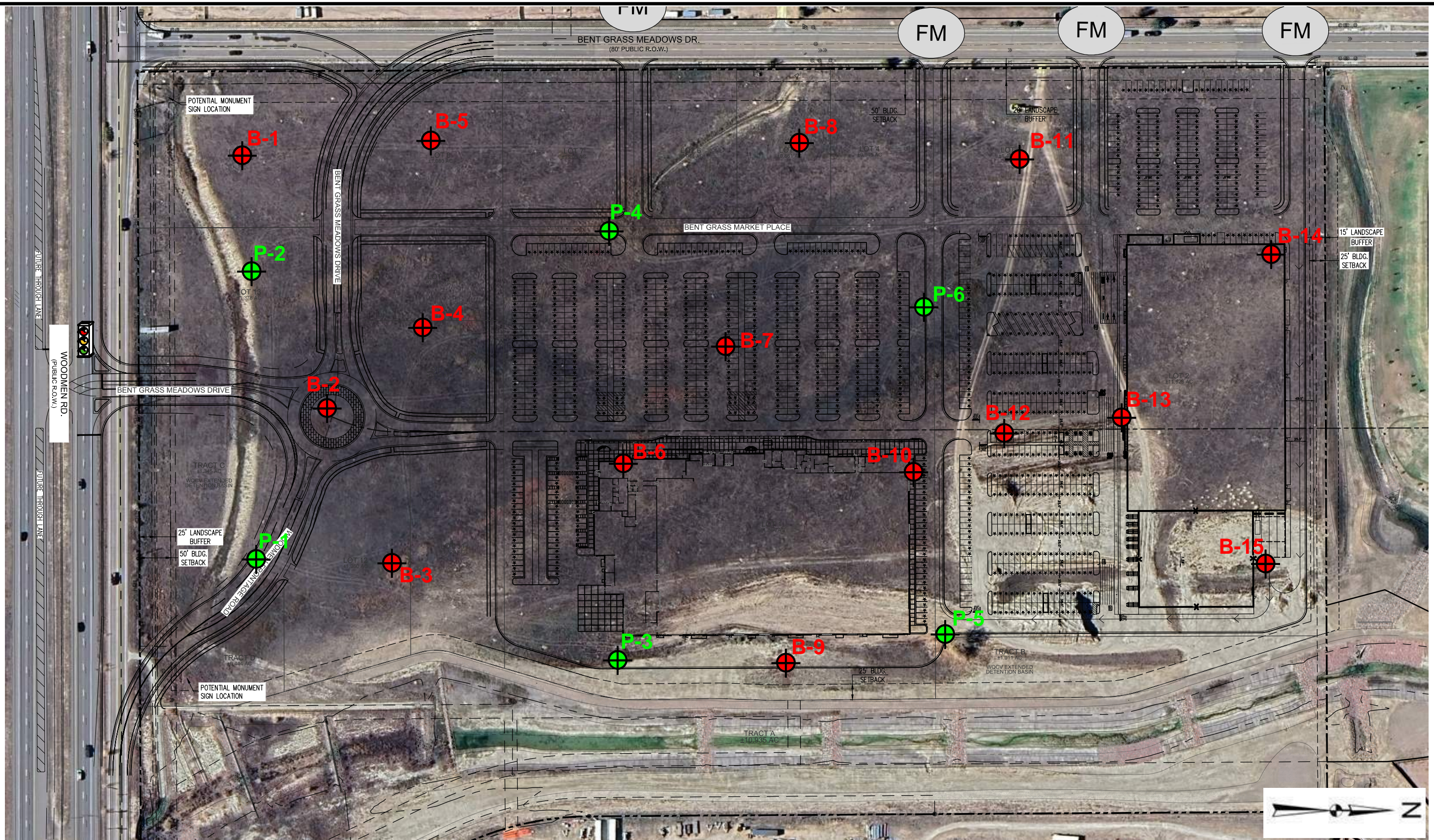
Reviewed by: ND

**DEVELOPMENT CONCEPT PLAN**

The Markets at Bent Grass  
 El Paso County  
 Falcon, Colorado



FIGURE

2.0



Note: Not to Scale.

**REFERENCE**  
 Base Image obtained from Galloway Evergreen Development, Bent Grass South Commercial, Concept (A7.2), 2026.

**LEGEND**  
 **B-1** Approximate Building Boring Location  
 **P-1** Approximate Piezometer Location



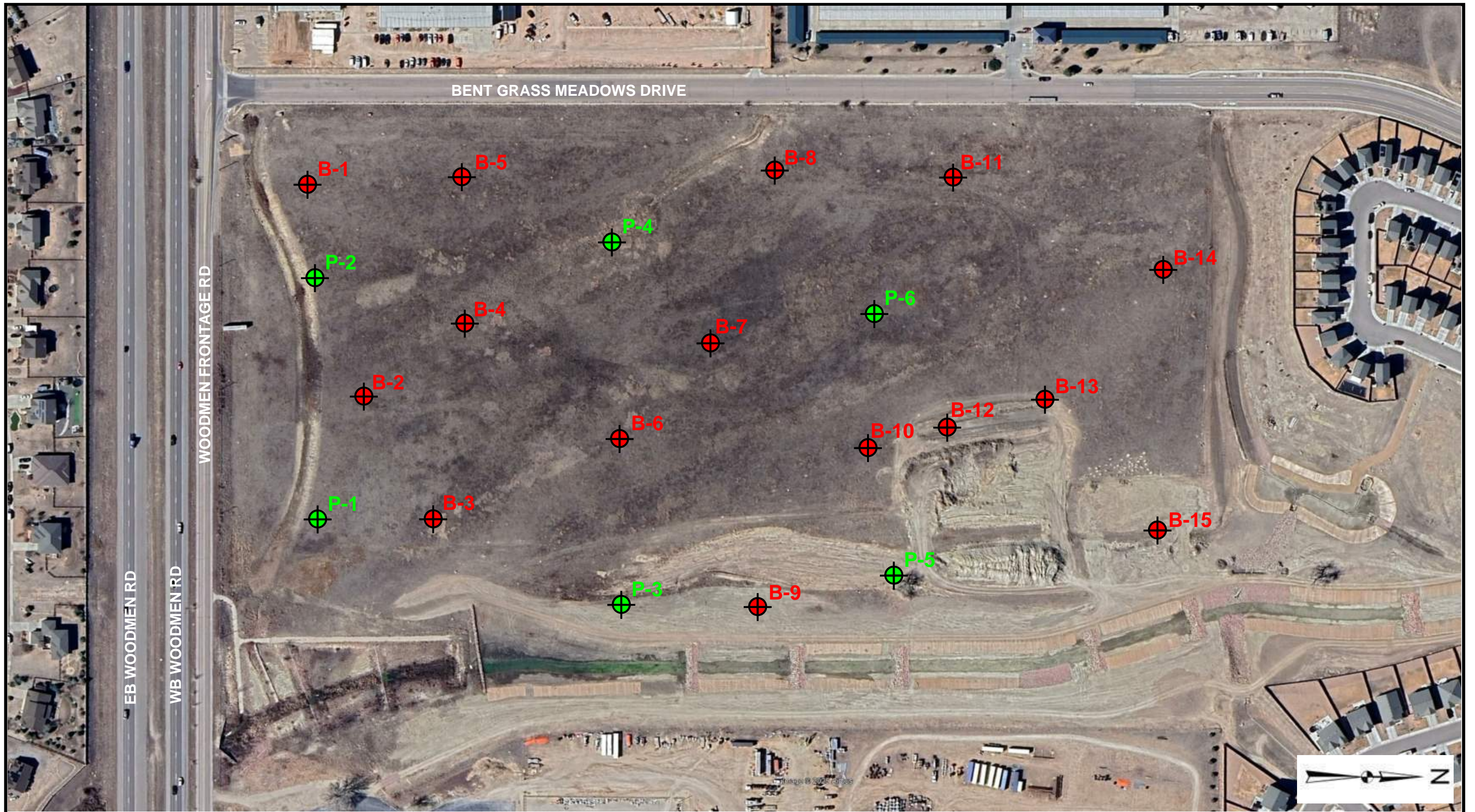
**VIVID Engineering Group, Inc.**  
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 Colorado Springs, CO 80907  
 719-896-4356

Project No. D25-2-928  
 Date: 2/13/2026  
 Drawn by: DHC  
 Reviewed by: ND

**FIELD EXPLORATION PLAN (CONCEPTUAL)**  
 The Markets at Bent Grass  
 El Paso County  
 Falcon, Colorado



**FIGURE 2.1**

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Note: Not to Scale.

**REFERENCE**  
Base Image obtained from Google Earth Pro, 2025.

**LEGEND**  
 **B-1** Approximate Building Boring Location  
 **P-1** Approximate Piezometer Location



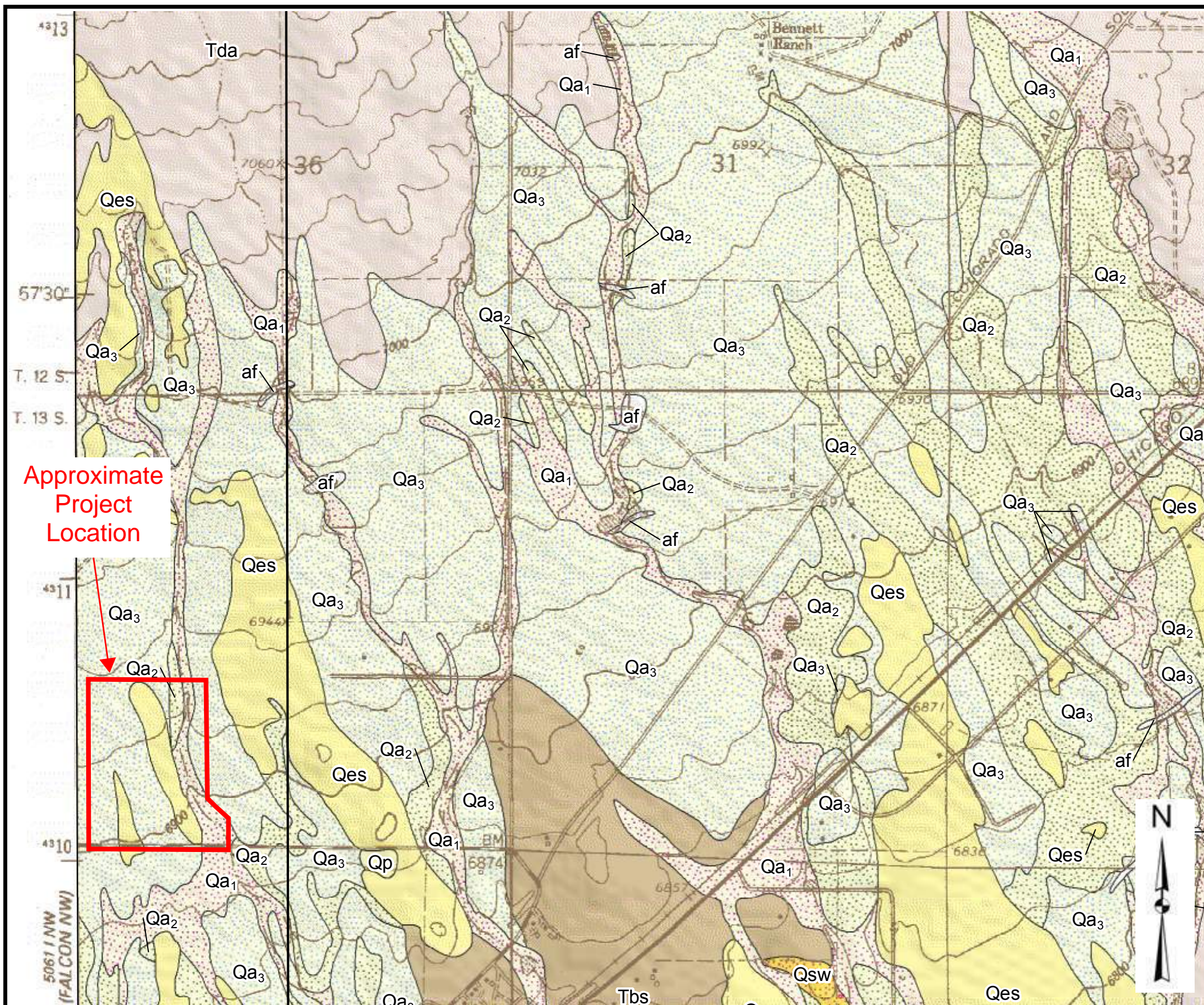
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 Colorado Springs, CO 80907  
 719-896-4356

Project No. D25-2-928
Date: 6/24/2025
Drawn by: SAM
Reviewed by: ND

<b>FIELD EXPLORATION PLAN (AERIAL)</b>
The Markets at Bent Grass El Paso County Falcon, Colorado

**FIGURE**  
**2.2**

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Approximate  
Project  
Location

Note: Not to Scale.

**REFERENCE**

Base Image obtained from Falcon Quadrangle Geologic Map, El Paso County, Colorado (Morgan, M.L., and White, J.L.), 2012, Colorado Geological Survey Open-File Report OF-12-05.

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**VIVID Engineering Group, Inc.**  
1053 Elkton Drive  
Colorado Springs, CO 80907  
719-896-4356

Project No. D25-2-949

Date: 8/21/2025

Drawn by: SAM

Reviewed by: ND

**GEOLOGIC MAP**

The Markets at Bent Grass  
El Paso County  
Falcon, Colorado

**FIGURE**

**3**

**LIST OF MAP UNITS**  
**SURFICIAL DEPOSITS**

**HUMAN-MADE DEPOSITS**



**Artificial fill (latest Holocene)** — Riprap, engineered fill, and refuse placed during construction of roads, railroads, buildings, dams, and landfills. Generally consists of unsorted silt, sand, clay, and rock fragments. The average thickness of the unit is less than 20 feet. Artificial fill may be subject to settlement, slumping, and erosion if not adequately compacted.

**ALLUVIAL DEPOSITS**



**Alluvium one (late Holocene)** — Tan to pale-brown, poorly to moderately sorted, poorly consolidated, sand, gravel, silt, and minor clay and occasional boulders in the currently active stream channels or in low stream-terrace deposits less than 5 feet above the current stream channel. It may be deposited as non-terrace forming alluvium in valleys and swales. Clasts are subrounded to well rounded and the dominant sediment is sandy gravel with a sandy silt matrix. The unit correlates with the Post-Piney Creek Alluvium described by Hunt (1954) in the Denver area and of Maberry and Lindvall (1972). The unit is subject to frequent flooding and is a source of sand and gravel. Maximum exposed thickness of the unit locally exceeds 5 feet.



**Alluvium two (early Holocene)** — Dark gray to brown, poorly to well sorted, moderately consolidated, silt, sand, gravel, and minor clay and occasional boulders in stream terrace deposits approximately 6-12 feet above the modern flood plain or as non-terrace forming alluvium in valley headwaters. Clasts are subrounded to well rounded and the dominant sediment is sandy gravel with a silty sand matrix. Clay seams are poorly to moderately stratified. The unit correlates with the Piney Creek Alluvium described by Hunt (1954) in the Denver area and of Maberry and Lindvall (1972). The unit is subject to occasional flooding and is a potential source of sand and gravel. Maximum exposed thickness of the unit locally exceeds 20 feet.



**Alluvium three (late Pleistocene)** — Tan to reddish brown to grayish brown, poorly sorted, moderately consolidated, poorly to moderately stratified silt, sand, gravel, and cobbly gravel and occasional boulders in stream terrace deposits approximately 10-20 feet above the modern flood plain or as non-terrace forming alluvium in valley headwaters that underlies the younger alluviums. The unit contains dark gray clay beds that may be expansive. Clasts are subrounded to well rounded and the dominant sediment is sandy gravel with a sandy matrix. The unit correlates with the Broadway Alluvium described by Hunt (1954) in the Denver area and of Maberry and Lindvall (1972). The unit is a potential source of sand and gravel. Maximum exposed thickness of the unit locally exceeds 20 feet.

**EOLIAN DEPOSITS**



**Eolian sand (Holocene to late Pleistocene)** — Yellowish-brown to tan, fine- to coarse-grained, frosted sand and silt deposited by wind. Typically this unit is faintly stratified and non-cohesive; dune forms are not present. The unit is likely deposited as a sandsheet by winds capable of moving very fine gravel-sized clasts. Eolian sand is moderately compacted, easily excavated, and drains well. Unit locally may exceed 5 feet in thickness.

**BEDROCK**

**Denver Basin Group**



**Dawson Arkose (Paleocene to Eocene)** — White and tan thick to massive, cross-bedded arkoses, pebbly arkoses, and arkosic pebble conglomerates. Contains beds of white and tan fine- to medium-grained feldspathic cross-bedded friable sandstone that are poorly sorted, have high clay contents, and are commonly thin or medium bedded. The unit also contains sparse interbeds of thin-bedded gray claystone and sandy claystone or dark-brown, organic-rich siltstone to coarse sandstone that contains fossilized plant fragments. Thickness may reach 1000 feet in the Monument area; however, the exposed thickness in the Falcon quadrangle is approximately 700 feet. The unit is prone to swelling when wet. The Dawson Arkose is described in detail by Thorson (2011).



**Black Squirrel Formation (Paleocene)** — Gray-green to tan to brownish gray, moderately-well sorted cross-bedded sandy arkoses interbedded with micaceous sandy claystones that contain abundant plant fragments and occasional, fine- to medium-grained massive arkosic beds. Intermittent paleosols are developed locally. The exposed upper part of the Black Squirrel Formation is gradational with the overlying Dawson Arkose making the location of the contact problematic. The basal contact with the underlying Jimmy Camp Formation is not exposed within the mapped area. Thickness may reach 600 feet in the Monument area; however, the exposed thickness in the Falcon quadrangle is approximately 130 feet. The claystones within this unit may be prone to swelling when wet. The Black Squirrel Formation is described in detail by Thorson (2011).



Note: Not to Scale.

**REFERENCE**

Base Image obtained from Soil Survey of El Paso County Area, Colorado Soil Conservation Service, USDA, 1981

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Project No. D25-2-949

Date: 8/21/2025

Drawn by: SAM

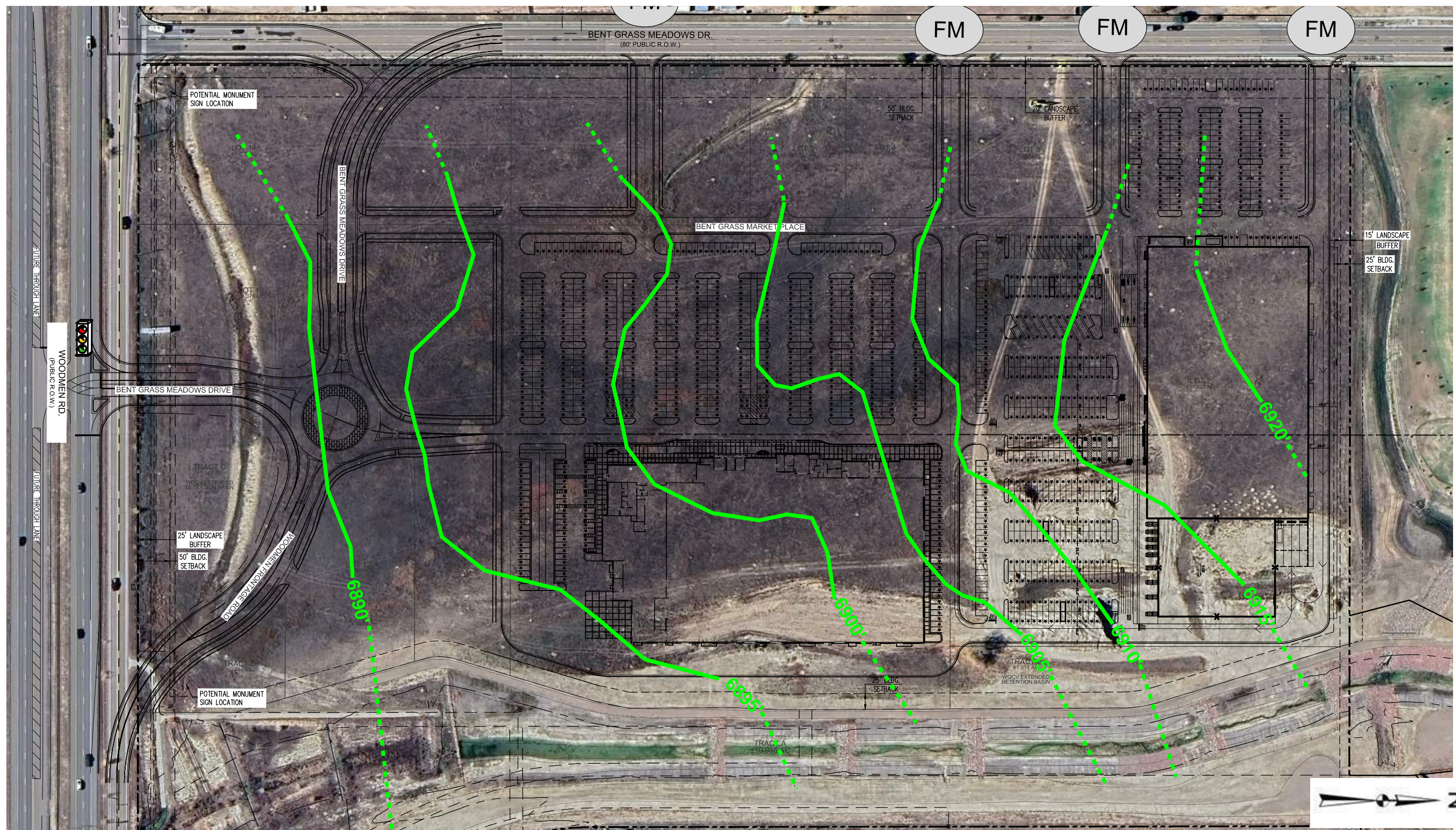
Reviewed by: ND

**NRCS SOIL SURVEY MAP**

The Markets at Bent Grass  
 El Paso County  
 Falcon, Colorado

**FIGURE**

**4**



Note: Not to Scale.

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**REFERENCE**

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Project No. D25-2-928

Date: 2/13/2026

Drawn by: DHC

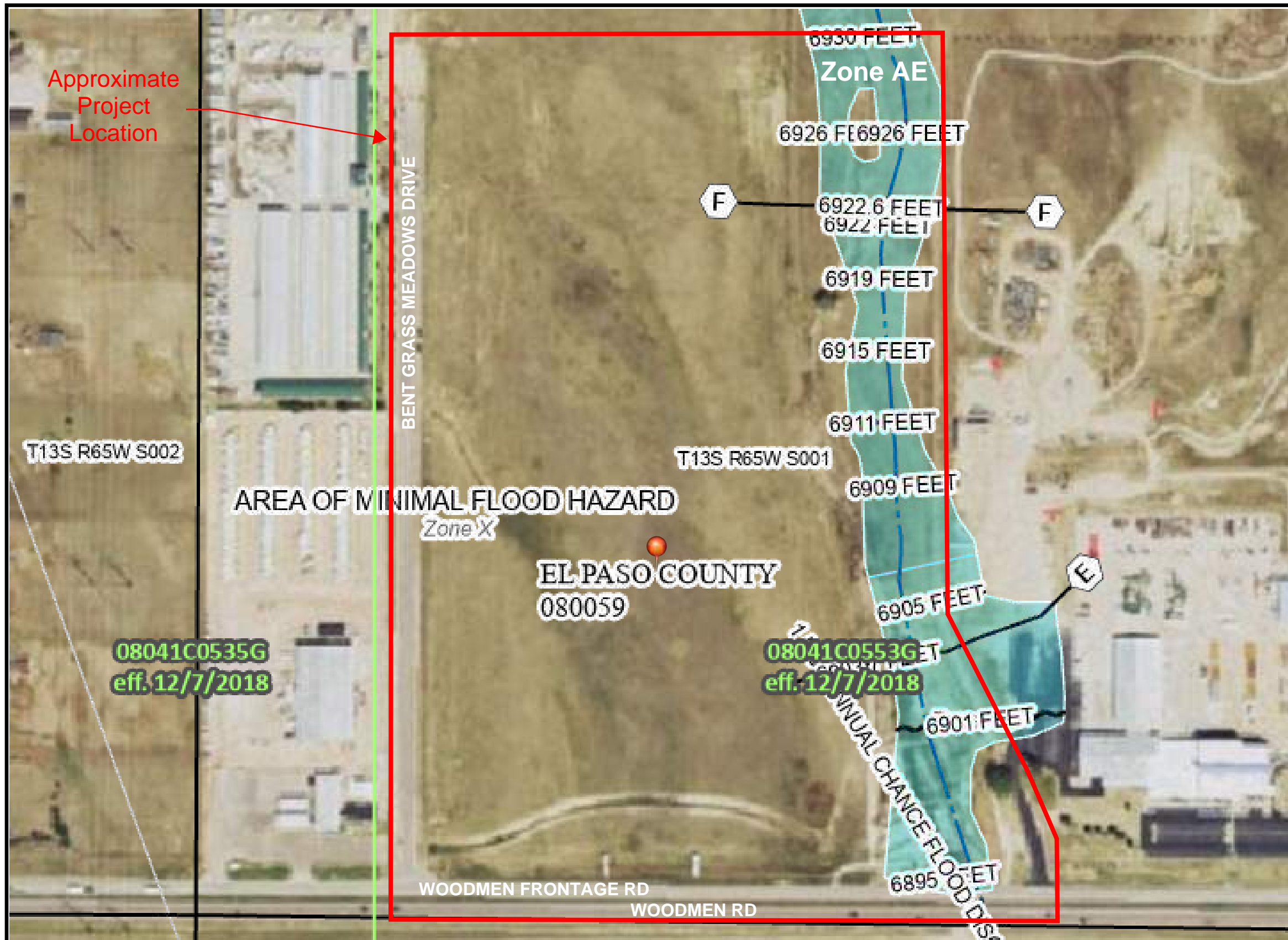
Reviewed by: ND

**BEDROCK ELEVATION MAP**

The Markets at Bent Grass  
 El Paso County  
 Falcon, Colorado

**FIGURE**

**5**



**/HJHQG**

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 SRLQW VHOHFWHG E\ WKH X'  
 DQ DXWKRULWDWLYH SURSH

Note: Not to Scale.

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**REFERENCE**  
 Base Image obtained from <https://msc.fema.gov/portal/home>, 2025.



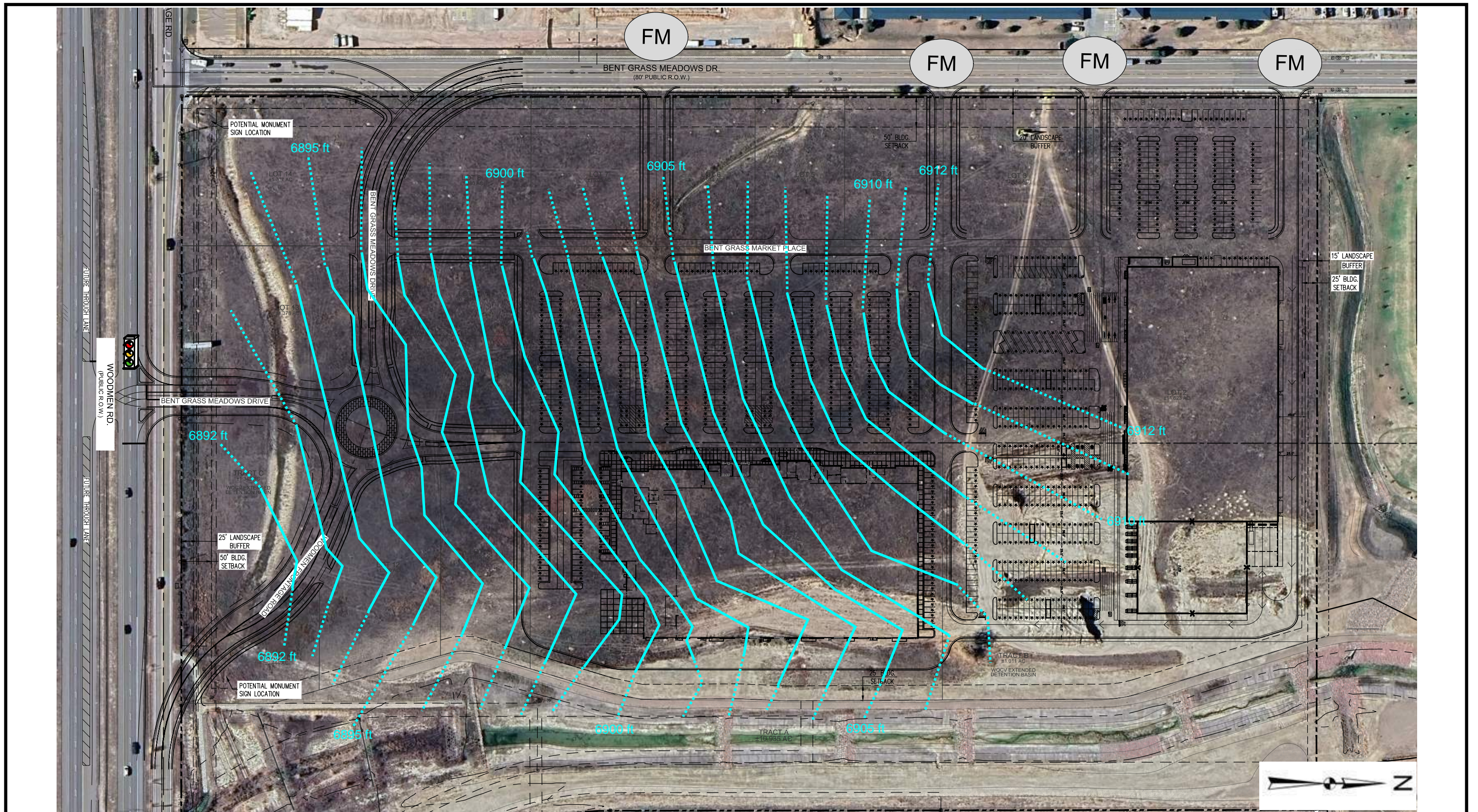
**VIVID Engineering Group, Inc.**  
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 719-896-4356

Project No. D25-2-949
Date: 8/20/2025
Drawn by: SAM
Reviewed by: ND

**FLOOD HAZARD MAP**

The Markets at Bent Grass  
 El Paso County  
 Falcon, Colorado

**FIGURE**  
**6**



Note: Groundwater elevations have been interpolated based on depths to groundwater measured 07/14/25 - 02/17/26. Not to Scale.

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**REFERENCE**

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Groundwater elevation data from Vivid Engineering Group.



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Project No. D25-2-949

Date: 2/18/2026

Drawn by: DHC

Reviewed by: ND

**GROUNDWATER ELEVATION MAP**

The Markets at Bent Grass  
 El Paso County  
 Falcon, Colorado

**FIGURE**

**7.0**

**Appendix A**  
**Log of Exploratory Borings**



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 Fax: 719-896-4357

# KEY TO SYMBOLS













**CLIENT** Evergreen

**PROJECT NAME** Bent Grass South Commercial




**PROJECT NUMBER** D25-2-928

**PROJECT LOCATION** Falcon, Colorado

## LITHOLOGIC SYMBOLS (Unified Soil Classification System)




-  CH: USCS High Plasticity Clay
-  CL: USCS Low Plasticity Clay
-  CLAYSTONE
-  CL-ML: USCS Low Plasticity Silty Clay
-  CLS: USCS Low Plasticity Sandy Clay
-  SANDSTONE
-  SC: USCS Clayey Sand
-  SC-SM: USCS Clayey Sand
-  SM: USCS Silty Sand
-  SP-SM: USCS Poorly-graded Sand with Silt
-  SW-SC: USCS Well-graded Sand with Clay
-  SW-SM: USCS Well-graded Sand with Silt

## SAMPLER SYMBOLS

-  Grab Sample
-  2" I.D. Modified California Sampler (MC)
-  Standard Penetration Test (SPT)

## ABBREVIATIONS

- LL - LIQUID LIMIT (%)
- PI - PLASTIC INDEX (%)
- MC - MOISTURE CONTENT (%)
- DD - DRY DENSITY (PCF)
- NP - NON PLASTIC
- FINES- PERCENT PASSING NO. 200 SIEVE
- UCS - UNCONFINED COMPRESSIVE STRENGTH

-  Water Level at Time of Drilling, or as Shown
-  Water Level at End of Drilling, or as Shown
-  Water Level After 24 Hours, or as Shown

GENERAL BH / TP / WELL - MODIFIED - GINT STD US LAB.GDT - 2/25/26 14:10 - C:\USERS\THE DEAN\VID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS - 2025\ID25-2-928 - EVERGREEN - NEC BENT GRASS & WOODMENG - DRAFTING\ID25-2-928 2.GPJ



Vivid Engineering Group, Inc.  
 1053 Elkton Drive  
 Colorado Springs, Colorado 80907  
 Telephone: 7198964356  
 Fax: 7198964357

# BORING NUMBER B-1

<b>CLIENT</b> <u>Evergreen</u> <b>PROJECT NUMBER</b> <u>D25-2-928</u> <b>DATE STARTED</b> <u>7/16/25</u> <b>COMPLETED</b> <u>7/16/25</u> <b>DRILLING CONTRACTOR</b> <u>GDI Drilling, Inc. (Diedrich D-90 Truck)</u> <b>DRILLING METHOD</b> <u>4" Solid Stem Auger</u> <b>LOGGED BY</b> <u>D. Crozier</u> <b>CHECKED BY</b> <u>N. Dowden</u> <b>NOTES</b> _____	<b>PROJECT NAME</b> <u>The Markets at Bent Grass</u> <b>PROJECT LOCATION</b> <u>Falcon, Colorado</u> <b>GROUND ELEVATION</b> <u>6902.5 ft</u> <b>HOLE SIZE</b> <u>4 inches</u> <b>GROUND WATER LEVELS:</b> ▽ <b>AT TIME OF DRILLING</b> <u>10.00 ft / Elev 6892.50 ft</u> <b>AT END OF DRILLING</b> <u>---</u> <b>AFTER DRILLING</b> <u>---</u>
--	---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB				Poorly Graded Silty SAND, light brown, slightly moist to wet, medium dense
	MC	13-11	MC = 1.8% DD = 98.0 pcf		
	GB				
5	MC	7-10			
10	SPT	5-8-9 (17)	MC = 12.3% Fines = 7.4%	▽	
				12.0	6890.5
					<b>DAWSON FORMATION</b> SANDSTONE, grayish-brown, very moist to wet, moderately hard to very hard
15	MC	50/5"			
20	SPT	25-25-19 (44)	MC = 15.4%	20.5	6882.0

Bottom of borehole at 20.5 feet.

GENERAL BH / TP / WELL - MODIFIED - GINT STD US LAB.GDT - 2/25/26 14:10 - C:\USERS\THE DEAN\VIDD ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS - 2025\ID25-2-928 - EVERGREEN\_INEC BENT GRASS & WOODMENG - DRAFTING\ID25-2-928 2.GPJ



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 Colorado Springs, Colorado 80907  
 Telephone: 7198964356  
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# BORING NUMBER B-2

PAGE 1 OF 1

**CLIENT** Evergreen  
**PROJECT NUMBER** D25-2-928  
**DATE STARTED** 7/14/25 **COMPLETED** 7/14/25  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45)  
**DRILLING METHOD** 4" Solid Stem Auger  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden  
**NOTES** \_\_\_\_\_

**PROJECT NAME** The Markets at Bent Grass  
**PROJECT LOCATION** Falcon, Colorado  
**GROUND ELEVATION** 6899.5 ft **HOLE SIZE** 4 inches  
**GROUND WATER LEVELS:**  
 ▽ **AT TIME OF DRILLING** 7.00 ft / Elev 6892.50 ft  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB				Lean CLAY with sand, dark brown to light brown, moist to wet, very stiff to stiff
	SPT	7-9-10 (19)	MC = 12.8% LL = 33 PL = 13 Fines = 76.0%		
	GB				7.0 ▽ 6892.5
5	SPT	8-9-6 (15)	Chloride = 0.001%, pH = 8.6, Redox Potential = 77.1 mv, Resistivity = 2750 ohm-cm, Sulfate = 0.004%, Sulfide = positive		
					<b>DAWSON FORMATION</b> CLAYSTONE, gray, wet to moist, moderately hard
10	MC	16-27	MC = 16.2% DD = 110.9 pcf Swell = 0.9% when wetted under a 1000 psf load		12.0 6887.5
					<b>DAWSON FORMATION</b> SANDSTONE, bluish-gray, moist, very hard
	MC	40-50/4"			14.8 6884.7

Bottom of borehole at 14.8 feet.



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# BORING NUMBER B-3

PAGE 1 OF 1

**CLIENT** Evergreen  
**PROJECT NUMBER** D25-2-928  
**DATE STARTED** 7/14/25 **COMPLETED** 7/14/25  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45)  
**DRILLING METHOD** 4" Solid Stem Auger  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden  
**NOTES** \_\_\_\_\_

**PROJECT NAME** The Markets at Bent Grass  
**PROJECT LOCATION** Falcon, Colorado  
**GROUND ELEVATION** 6901 ft **HOLE SIZE** 4 inches  
**GROUND WATER LEVELS:**  
 ▽ **AT TIME OF DRILLING** 12.00 ft / Elev 6889.00 ft  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		-		Clayey SAND, medium brown to light brown, slightly moist, medium dense
	SPT	10-11-12 (23)			
	GB				
5	SPT	10-6-6 (12)	MC = 12.7% LL = 29 PL = 13 Fines = 39.0%		5.0 Sandy Lean CLAY, gray, moist, stiff 6896.0
					7.0 6894.0
					<b>DAWSON FORMATION</b> SANDSTONE, tan, moist to wet, moderately hard to very hard
10	MC	24-44	MC = 13.9% DD = 119.0 pcf		
					▽
15	MC	50/5"			15.0 6886.0
					<b>DAWSON FORMATION</b> CLAYSTONE, gray with iron oxide staining, moist, moderately hard to very hard
20	MC	50/6"	Swell = 2.0% when wetted under a 1000 psf load		
	MC	50/5"			24.4 6876.6

Bottom of borehole at 24.4 feet.

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# BORING NUMBER B-4

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**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/15/25 **COMPLETED** 7/15/25 **GROUND ELEVATION** 6904 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 13.00 ft / Elev 6891.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB				Well-Graded Silty SAND, light brown, slightly moist, loose to medium dense
	SPT	6-4-6 (10)			
	GB				
5	SPT	7-10-11 (21)	MC = 6.8% LL = NP PL = NP Fines = 9.0%		
					7.0 <span style="float: right;">6897.0</span>
					<b>DAWSON FORMATION</b> Clayey SANDSTONE, tan, very moist to wet, moderately hard to very hard
10	MC	27-45	MC = 8.1% DD = 131.0 pcf		
					▽
15	MC	41-50/5"	MC = 12.0% DD = 122.2 pcf		
	MC	50/5"			19.4 <span style="float: right;">6884.6</span>

Refusal at 17.0 feet.  
 Bottom of borehole at 19.4 feet.

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# BORING NUMBER B-5

PAGE 1 OF 1

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/15/25 **COMPLETED** 7/15/25 **GROUND ELEVATION** 6908 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 9.50 ft / Elev 6898.50 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Rig breakdown at 17 foot depth, terminated hole **AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		-		Silty SAND, light brown, slightly moist, medium dense
	SPT	8-8-8 (16)			
	GB				
5	SPT	10-8-8 (16)	MC = 4.7% LL = NP PL = NP Fines = 24.0%		
	MC	11-15	MC = 12.2% DD = 119.1 pcf		▽
					12.0 6896.0
					<b>DAWSON FORMATION</b> Sandy CLAYSTONE, gray, moist, moderately hard
15	MC	22-36	MC = 14.4% DD = 111.8 pcf Fines = 55.0% Compression = 0.3% when wetted under a 1000 psf load		
					17.0 6891.0
					Bottom of borehole at 17.0 feet.

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# BORING NUMBER B-6

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**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/14/25 **COMPLETED** 7/14/25 **GROUND ELEVATION** 6909 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 9.00 ft / Elev 6900.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		MC = 3.0% LL = NP PL = NP Fines = 16.0%		Silty SAND with thin clay lenses interspersed throughout, light brown to tan, slightly moist to moist, loose to medium dense
	SPT	3-4-7 (11)			
	GB				
5	SPT	7-9-6 (15)			
10	MC	21-39			9.0 $\nabla$ <b>DAWSON FORMATION</b> SANDSTONE, gray, wet, moderately hard to very hard
15	MC	23-50/5"			
20	MC	50/3"	Chloride = 0.001%, pH = 7.6, Redox Potential = 67.6 mv, Resistivity = 1250 ohm-cm, Sulfate = <0.001%, Sulfide = trace		17.0 <b>DAWSON FORMATION</b> CLAYSTONE, gray, moist, very hard
	MC	50/5"			24.4

Bottom of borehole at 24.4 feet.

6900.0  
6892.0  
6884.6

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**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/15/25 **COMPLETED** 7/15/25 **GROUND ELEVATION** 6913 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 6.00 ft / Elev 6907.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		MC = 9.1% LL = 22 PL = 16 Fines = 25.0%		Silty, Clayey SAND, light brown, slightly moist to wet, medium dense
	SPT	11-13-14 (27)			
	GB				
5	SPT	11-12-13 (25)			
					7.0 <span style="float: right;">6906.0</span>
					<b>DAWSON FORMATION</b> Clayey SANDSTONE, brown and gray with iron oxide staining, moist, very hard
10	MC	43-50/5"			
15	MC	50/3"			15.0 <span style="float: right;">6898.0</span>
					<b>DAWSON FORMATION</b> CLAYSTONE, gray, moist, very hard
	SPT	39-50/3"	Chloride = 0.001%, pH = 7.6, Redox Potential = 67.6 mv, Resistivity = 1250 ohm-cm, Sulfate = <0.001%, Sulfide = trace		19.8 <span style="float: right;">6893.3</span>
					Bottom of borehole at 19.8 feet.

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# BORING NUMBER B-8

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**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/15/25 **COMPLETED** 7/15/25 **GROUND ELEVATION** 6919 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 11.00 ft / Elev 6908.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		MC = 6.6% LL = 22 PL = 18 Fines = 29.0%		Silty, Clayey SAND, medium brown, moist, loose
	SPT	3-4-5 (9)			
	GB				3.0 ----- 6916.0 Silty, Clayey SAND, tan, slightly moist, loose to medium dense
5	SPT	3-2-3 (5)			
	MC	8-12			12.0 ----- 6907.0 <b>DAWSON FORMATION</b> SANDSTONE, light brown, wet, moderately hard to very hard
15	MC	28-38	MC = 11.9% DD = 119.4 pcf		
	MC	50/5"			19.4 ----- 6899.6 Bottom of borehole at 19.4 feet.



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# BORING NUMBER B-9

**CLIENT** Evergreen  
**PROJECT NUMBER** D25-2-928  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck)  
**DRILLING METHOD** 4" Solid Stem Auger  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden  
**NOTES** \_\_\_\_\_

**PROJECT NAME** The Markets at Bent Grass  
**PROJECT LOCATION** Falcon, Colorado  
**GROUND ELEVATION** 6909 ft **HOLE SIZE** 4 inches  
**GROUND WATER LEVELS:**  
 ▽ **AT TIME OF DRILLING** 8.00 ft / Elev 6901.00 ft  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

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DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		-		Clayey SAND, dark brown to light brown, moist to wet, medium dense
	MC	9-9			
	GB				▽
5	MC	6-11	MC = 7.3% DD = 109.7 pcf		
10	SPT	6-7-10 (17)	MC = 14.1%		
					13.0 6896.0
					<b>DAWSON FORMATION</b> Clayey SANDSTONE, gray, moist, very hard
15	MC	50/5"			
					17.0 6892.0
					<b>DAWSON FORMATION</b> SANDSTONE, gray, moist, very hard
20	SPT	30-50/4"	MC = 11.6% Fines = 23.0%		
25	MC	50/5"			
					27.0 6882.0
					<b>DAWSON FORMATION</b> CLAYSTONE, gray, moist, hard
					29.6 6879.4
					<b>DAWSON FORMATION</b> CLAYSTONE, gray, moist, hard
					29.6 6879.4

Bottom of borehole at 29.6 feet.

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**BORING NUMBER B-10**  
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**CLIENT** Evergreen  
**PROJECT NUMBER** D25-2-928  
**DATE STARTED** 7/14/25 **COMPLETED** 7/14/25  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45)  
**DRILLING METHOD** 4" Solid Stem Auger  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden  
**NOTES** \_\_\_\_\_

**PROJECT NAME** The Markets at Bent Grass  
**PROJECT LOCATION** Falcon, Colorado  
**GROUND ELEVATION** 6917 ft **HOLE SIZE** 4 inches  
**GROUND WATER LEVELS:**  
**AT TIME OF DRILLING** --- None Encountered  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		-		Silty SAND, tan, moist, medium dense to dense
	SPT	7-8-9 (17)			
	GB				
5	SPT	17-20-25 (45)			
10	MC	15-22	MC = 14.4% DD = 118.2 pcf UCS = 12,705 psf	9.5	<b>DAWSON FORMATION</b> CLAYSTONE, gray and brown with iron oxide staining, moist, hard to very hard
15	MC	30-50/3"		17.0	<b>DAWSON FORMATION</b> SANDSTONE, gray, moist, very hard
	MC	32-50/3"		19.8	

Bottom of borehole at 19.8 feet.

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# BORING NUMBER B-11

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**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/14/25 **COMPLETED** 7/14/25 **GROUND ELEVATION** 6925 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 12.00 ft / Elev 6913.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB				Silty SAND, light brown, slightly moist to wet, medium dense
	SPT	6-8-10 (18)			
	GB				
5	SPT	11-11-11 (22)			
10	MC	10-12	MC = 3.4% LL = NP PL = NP Fines = 17.0%		
					▽
14.0					6911.0
15	MC	50/5"	MC = 13.6% DD = 119.5 pcf LL = NP PL = NP Fines = 16.0%		<b>DAWSON FORMATION</b> SANDSTONE interbedded with CLAYSTONE, gray, wet to moist, very hard
20	MC	50/2"			
25	SPT	50/5"			
	MC	50/4"			29.3
					6895.7

Bottom of borehole at 29.3 feet.

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# BORING NUMBER B-12

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<b>CLIENT</b> <u>Evergreen</u>	<b>PROJECT NAME</b> <u>The Markets at Bent Grass</u>
<b>PROJECT NUMBER</b> <u>D25-2-928</u>	<b>PROJECT LOCATION</b> <u>Falcon, Colorado</u>
<b>DATE STARTED</b> <u>7/14/25</u> <b>COMPLETED</b> <u>7/14/25</u>	<b>GROUND ELEVATION</b> <u>6922 ft</u> <b>HOLE SIZE</b> <u>4 inches</u>
<b>DRILLING CONTRACTOR</b> <u>Custom Auger Drilling (CME-45)</u>	<b>GROUND WATER LEVELS:</b>
<b>DRILLING METHOD</b> <u>4" Solid Stem Auger</u>	<b>AT TIME OF DRILLING</b> <u>--- None Encountered</u>
<b>LOGGED BY</b> <u>D. Crozier</u> <b>CHECKED BY</b> <u>N. Dowden</u>	<b>AT END OF DRILLING</b> <u>---</u>
<b>NOTES</b> _____	<b>AFTER DRILLING</b> <u>---</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		MC = 5.8% LL = NP PL = NP Fines = 18.0%	[Dotted Pattern]	Silty SAND, light brown, slightly moist, loose to medium dense
	SPT	4-5-6 (11)			
	GB			[Dotted Pattern]	
5	SPT	7-8-6 (14)			
				5.5	6916.5
				7.0	6915.0
				[Diagonal Hatching]	Lean CLAY, gray, moist, stiff
				[Dotted Pattern]	<b>DAWSON FORMATION</b> SANDSTONE, light brown, moist, very hard
10	MC	50/5"	MC = 7.8% DD = 115.0 pcf UCS = 290 psf	[Dotted Pattern]	
				[Dotted Pattern]	
	MC	50/5"	MC = 11.1% DD = 116.6 pcf	[Dotted Pattern]	
				14.4	6907.6

Bottom of borehole at 14.4 feet.



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# BORING NUMBER B-13

**CLIENT** Evergreen  
**PROJECT NUMBER** D25-2-928  
**DATE STARTED** 7/14/25 **COMPLETED** 7/14/25  
**DRILLING CONTRACTOR** Custom Auger Drilling (CME-45)  
**DRILLING METHOD** 4" Solid Stem Auger  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden  
**NOTES** \_\_\_\_\_

**PROJECT NAME** The Markets at Bent Grass  
**PROJECT LOCATION** Falcon, Colorado  
**GROUND ELEVATION** 6925 ft **HOLE SIZE** 4 inches  
**GROUND WATER LEVELS:**  
**AT TIME OF DRILLING** --- None Encountered  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

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DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		-		Silty SAND, light brown, slightly moist, medium dense
	SPT	9-10-12 (22)			
	GB				
5	SPT	11-16-22 (38)			
10	MC	34-38			9.0 6916.0 <b>DAWSON FORMATION</b> Clayey SANDSTONE, gray, slightly moist, moderately hard to hard
					12.0 6913.0 <b>DAWSON FORMATION</b> CLAYSTONE, gray, slightly moist, very hard
15	MC	50/5"			
20	MC	50/5"			
					22.0 6903.0 <b>DAWSON FORMATION</b> SANDSTONE, gray, slightly moist, very hard
	MC	50/5"	MC = 10.8% DD = 112.1 pcf Swell = 0.1% when wetted under a 1000 psf load		24.4 6900.6 Bottom of borehole at 24.4 feet.





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# BORING NUMBER B-15

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**CLIENT** Evergreen  
**PROJECT NUMBER** D25-2-928  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck)  
**DRILLING METHOD** 4" Solid Stem Auger  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden  
**NOTES** \_\_\_\_\_

**PROJECT NAME** The Markets at Bent Grass  
**PROJECT LOCATION** Falcon, Colorado  
**GROUND ELEVATION** 6925.5 ft **HOLE SIZE** 4 inches  
**GROUND WATER LEVELS:**  
 ▽ **AT TIME OF DRILLING** 14.00 ft / Elev 6911.50 ft  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
	GB		-		Clayey SAND, dark brown, moist, loose to medium dense
	SPT	2-2-2 (4)			
	GB				
5	SPT	4-7-9 (16)	MC = 8.2% LL = 32 PL = 12 Fines = 18.0%		
10	SPT	15-25-25 (50)	MC = 8.3%		10.0 <span style="float: right;">6915.5</span>
					<b>DAWSON FORMATION</b> Clayey SANDSTONE, grayish-brown, moist to wet, moderately hard to hard
15	MC	30-50/2"	MC = 11.4% DD = 116.4 pcf No movement when wetted under 1000 psf		▽ - finer-grained with iron oxide staining from approximately 14 feet below the existing ground surface
20	SPT	50/6"			
25	MC	50/6"			
29.8	SPT	30-50/3"			29.8 <span style="float: right;">6895.8</span>

Bottom of borehole at 29.8 feet.

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# BORING NUMBER Composite-1

<b>CLIENT</b> <u>Evergreen</u>	<b>PROJECT NAME</b> <u>The Markets at Bent Grass</u>
<b>PROJECT NUMBER</b> <u>D25-2-928</u>	<b>PROJECT LOCATION</b> <u>Falcon, Colorado</u>
<b>DATE STARTED</b> <u>7/29/25</u> <b>COMPLETED</b> <u>7/29/25</u>	<b>GROUND ELEVATION</b> _____ <b>HOLE SIZE</b> <u>4 inches</u>
<b>DRILLING CONTRACTOR</b> _____	<b>GROUND WATER LEVELS:</b>
<b>DRILLING METHOD</b> _____	<b>AT TIME OF DRILLING</b> <u>---</u>
<b>LOGGED BY</b> <u>D. Crozier</u> <b>CHECKED BY</b> <u>N. Dowden</u>	<b>AT END OF DRILLING</b> <u>---</u>
<b>NOTES</b> <u>Composite Sample</u>	<b>AFTER DRILLING</b> <u>---</u>

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0				<b>Composite Sample: P-3, B-2, B-9, B-15 at 0-4 feet</b> USCS: Sandy Lean CLAY AASHTO: CLAY, A-6, Fair-Poor Subgrade
2	GB	MC = 13.5% LL = 26 PL = 14 Fines = 54.0%		
4				Bottom of borehole at 4.0 feet.

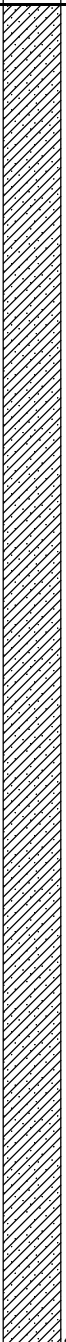


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# BORING NUMBER Composite-2

CLIENT Evergreen  
 PROJECT NUMBER D25-2-928  
 DATE STARTED 7/29/25 COMPLETED 7/29/25  
 DRILLING CONTRACTOR \_\_\_\_\_  
 DRILLING METHOD \_\_\_\_\_  
 LOGGED BY D. Crozier CHECKED BY N. Dowden  
 NOTES Composite Sample

PROJECT NAME The Markets at Bent Grass  
 PROJECT LOCATION Falcon, Colorado  
 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 4 inches  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
0 1 2 3 4	GB	MC = 5.5% LL = NP PL = NP Fines = 27.0% Modified Proctor: Max Density = 127.8 pcf, Opt. MC = 8.8%		<b>Composite Sample: B-1, B-4, B-6, B-7, B-10, B-12, B-13, P-2, P-4, P-6 at 0-4 feet</b> USCS: Silty SAND AASHTO: Silty to Clayey SAND, A-2-4, Excellent to Good Subgrade

Bottom of borehole at 4.0 feet.

GENERAL BH / TP / WELL - MODIFIED - GINT STD US LAB.GDT - 2/25/26 14:10 - C:\USERS\THE DEAN\VID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\ID25-2-928 - EVERGREEN\_INEC BENT GRASS & WOODMENG - DRAFTING\ID25-2-928 2.GPJ



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# WELL NUMBER P-1

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25 **GROUND ELEVATION** 6896 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 10.00 ft / Elev 6886.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Piezometer Installed **AFTER DRILLING** 5.00 ft / Elev 6891.00 ft on 7/17/2025, After rain event

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
0 - 3.0	GB SPT GB	6-7-7 (14)	MC = 4.1% LL = 21 PL = 15 Fines = 22.0%	[Hatched Pattern]	Silty, Clayey SAND, dark brown, moist, medium dense, organics	3' of Pipe Stick-up Above Grade, Bentonite Clay Cap (chips) Solid Riser Pipe (2" diameter)
3.0 - 5.0	GB SPT	3-5-9 (14)	MC = 15.7% LL = 37 PL = 12 Fines = 46.0%	[Hatched Pattern]	Clayey SAND, gray, moist to wet, medium dense, fine-grained	
5.0 - 9.5	MC	20-30	MC = 15.1% DD = 107.8 pcf LL = NP PL = NP Fines = 18.0%	[Dotted Pattern]	9.5 DAWSON FORMATION Clayey SANDSTONE, light brown to gray, wet to moist, hard to very hard	Slotted Pipe (2" diameter), Silica Sand (10/20)
9.5 - 15.0	MC	50/6"		[Dotted Pattern]		
15.0 - 20.0	MC	50/6"		[Dotted Pattern]		
20.0 - 24.4	MC	50/6"		[Dotted Pattern]		
24.4					Bottom of borehole at 24.4 feet.	

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# WELL NUMBER P-2

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25 **GROUND ELEVATION** 6900.5 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 9.00 ft / Elev 6891.50 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Piezometer Installed **AFTER DRILLING** 8.00 ft / Elev 6892.50 ft on 7/17/2025

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
0 - 5	GB SPT GB SPT	6-5-4 (9) 3-3-8 (11)	MC = 10.6% LL = NP PL = NP Fines = 35.0%		Silty SAND with clay lenses, light brown, moist to wet, loose to medium dense	3' of Pipe Stick-up Above Grade, Bentonite Clay Cap (chips) Solid Riser Pipe (2" diameter)
5 - 8.0					Well-Graded SAND with clay, light brown, wet, loose to medium dense	
8.0 - 10	MC	8-5	MC = 10.8% LL = 24 PL = 16 Fines = 5.4%			
10 - 12.0						Slotted Pipe (2" diameter), Silica Sand (10/20)
12.0 - 15	MC	50			<b>DAWSON FORMATION</b> Clayey SANDSTONE, dark gray, moist, hard to very hard	
15 - 20						
20 - 24.4	MC	50/6"	MC = 10.9% DD = 121.9 pcf LL = 29 PL = 15 Fines = 46.0%			
24.4	MC	50/5"				

Bottom of borehole at 24.4 feet.

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# WELL NUMBER P-3

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25 **GROUND ELEVATION** 6906 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 7.00 ft / Elev 6899.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Piezometer Installed **AFTER DRILLING** 8.00 ft / Elev 6898.00 ft on 7/17/2025

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
0	GB		MC = 10.7% LL = 26 PL = 15 Fines = 40.0%		Clayey SAND, medium brown, slightly moist, loose to medium dense, organics	3' of Pipe Stick-up Above Grade, Bentonite Clay Cap (chips) Solid Riser Pipe (2" diameter)
3.0	MC	5-6			Fat CLAY, dark gray, moist, medium stiff	
5.0	GB					
5.0	MC	3-3	MC = 30.2% DD = 91.6 pcf Swell = 2.9% when wetted under 200 psf, Fines = 87.0%		Silty SAND, gray, wet, dense	
10.0	MC	8-27	MC = 12.0% DD = 111.9 pcf Fines = 11.2%			
12.0						
15.0	MC	25-50/4"	MC = 12.8% DD = 119.8 pcf Fines = 49.0%		<b>DAWSON FORMATION</b> Clayey SANDSTONE, gray to dark brown, moist, moderately hard to hard	Slotted Pipe (2" diameter), Silica Sand (10/20)
20.0	SPT	30-50/3"				
24.5	MC	50/6"				

Bottom of borehole at 24.5 feet.

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# WELL NUMBER P-4

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25 **GROUND ELEVATION** 6912.5 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 10.00 ft / Elev 6902.50 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Piezometer Installed **AFTER DRILLING** 9.25 ft / Elev 6903.25 ft on 7/17/2025

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
0 - 3.0	GB SPT GB	7-9-10 (19)	-		Silty, Clayey SAND, medium brown, moist, loose, organics	3' of Pipe Stick-up Above Grade, Bentonite Clay Cap (chips) Solid Riser Pipe (2" diameter)
3.0 - 5.0	GB SPT	7-9-10 (19)	MC = 6.9% LL = NP PL = NP Fines = 5.8%		Poorly Graded SAND with silt, light brown, moist to wet, medium dense	
5.0 - 10.0	SPT	6-7-8 (15)	MC = 15.6%			Slotted Pipe (2" diameter), Silica Sand (10/20)
10.0 - 15.0	MC	10-16	MC = 14.3% DD = 117.0 pcf		Sandy Silty CLAY, gray with iron oxide staining, very moist, very stiff	
15.0 - 20.0	MC	30-40	MC = 14.0% DD = 114.9 pcf Fines = 17.0%		DAWSON FORMATION SANDSTONE, gray, moist, moderately hard to hard	
20.0 - 24.7	MC	30-50/2"				

Bottom of borehole at 24.7 feet.

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# WELL NUMBER P-5

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25 **GROUND ELEVATION** 6914 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 8.00 ft / Elev 6906.00 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Piezometer Installed **AFTER DRILLING** 8.50 ft / Elev 6905.50 ft on 7/17/2025

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
	GB				Silty to Clayey SAND, medium brown to light brown, moist, loose	3' of Pipe Stick-up Above Grade, Bentonite Clay Cap (chips) Solid Riser Pipe (2" diameter)
	MC	4-6				
	GB				3.0	6911.0
	MC	7-6	MC = 4.0%		Silty SAND, light brown, very moist to wet, medium dense	
5						
	SPT	4-4-5 (9)	MC = 16.6% LL = 25 PL = 18 Fines = 51.0%		9.0	6905.0
10						
	SPT	25-25			12.0	6902.0
15						
	MC	50/6"				
20						
	SPT	50/5"			24.4	6889.6

Bottom of borehole at 24.4 feet.

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# WELL NUMBER P-6

**CLIENT** Evergreen **PROJECT NAME** The Markets at Bent Grass  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado  
**DATE STARTED** 7/16/25 **COMPLETED** 7/16/25 **GROUND ELEVATION** 6918.5 ft **HOLE SIZE** 4 inches  
**DRILLING CONTRACTOR** GDI Drilling, Inc. (Diedrich D-90 Truck) **GROUND WATER LEVELS:**  
**DRILLING METHOD** 4" Solid Stem Auger **AT TIME OF DRILLING** 12.00 ft / Elev 6906.50 ft  
**LOGGED BY** D. Crozier **CHECKED BY** N. Dowden **AT END OF DRILLING** ---  
**NOTES** Piezometer Installed **AFTER DRILLING** 8.50 ft / Elev 6910.00 ft on 7/17/2025

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0						
0 - 3.0	GB				Silty, Clayey SAND, medium brown, slightly moist, medium dense	3' of Pipe Stick-up Above Grade, Bentonite Clay Cap (chips) Solid Riser Pipe (2" diameter)
3.0 - 4.5	SPT	6-8-10 (18)			Silty SAND, light brown, moist, loose, fine-grained	
4.5 - 5.0	GB				Lean CLAY, grayish-brown, moist, medium stiff	
5.0 - 8.0	SPT	4-3	MC = 19.5%		Silty SAND, light brown, moist, loose, fine-grained	Slotted Pipe (2" diameter), Silica Sand (10/20)
8.0 - 10.0					<b>DAWSON FORMATION</b> SANDSTONE, light brown to gray, moist to very moist, hard to very hard	
10.0 - 15.0	MC	30-50/4"	MC = 18.3% DD = 105.7 pcf Compression = 0.3% when wetted under 200 psf			
15.0 - 20.0	MC	30-50/2"			- clayey and gray at approximately 17 feet below the existing ground surface	
20.0 - 24.4	MC	50/6"				
24.4	MC	50/5"	MC = 13.9% DD = 101.7 pcf LL = NP PL = NP Fines = 17.0%		Bottom of borehole at 24.4 feet.	

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**Appendix B**  
**Geotechnical Laboratory Test Results**



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# SUMMARY OF LABORATORY RESULTS

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado

Exploration ID	Approx. Sample Depth (ft)	Sample Description	Passing 3/4" Sieve (%)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Moisture Content (%)	Dry Density (pcf)
B-1	1.0								1.8	98.0
B-1	9.0			89	7				12.3	
B-1	19.0								15.4	
B-2	1.0	LEAN CLAY with SAND(CL)		100	76	33	13	20	12.8	
B-2	9.0								16.2	110.9
B-3	4.0	CLAYEY SAND(SC)		98	39	29	13	16	12.7	
B-3	9.0								13.9	119.0
B-4	4.0	WELL-GRADED SAND WITH SILT(SW-SM)		91	9	NP	NP	NP	6.8	
B-4	9.0								8.1	131.0
B-4	14.0								12.0	122.2
B-5	4.0	SILTY SAND(SM)		94	24	NP	NP	NP	4.7	
B-5	9.0								12.2	119.1
B-5	14.0			100	55				14.4	111.8
B-6	0.0	SILTY SAND(SM)		100	16	NP	NP	NP	3.0	
B-7	0.0	SILTY, CLAYEY SAND(SC-SM)		98	25	22	16	6	9.1	
B-8	0.0	SILTY, CLAYEY SAND(SC-SM)		98	29	22	18	4	6.6	
B-8	14.0								11.9	119.4
B-9	4.0								7.3	109.7
B-9	9.0								14.1	
B-9	19.0								11.6	
B-10	9.0								14.4	118.2
B-11	9.0	SILTY SAND(SM)		92	17	NP	NP	NP	3.4	
B-11	14.0	SILTY SAND(SM)		92	16	NP	NP	NP	13.6	119.5
B-12	0.0	SILTY SAND(SM)		100	18	NP	NP	NP	5.8	
B-12	9.0								7.8	115.0
B-12	14.0								11.1	116.6
B-13	24.0								10.8	112.1
B-14	4.0	SILTY SAND(SM)			16	NP	NP	NP	1.7	91.3
B-14	9.0								14.6	113.7
B-15	4.0	CLAYEY SAND(SC)		96	18	32	12	20	8.2	
B-15	9.0								8.3	
B-15	14.0								11.4	116.4
Composite-1	0.0	SANDY LEAN CLAY(CL)		99	54	26	14	12	13.5	
Composite-2	0.0	SILTY SAND(SM)		97	27	NP	NP	NP	5.5	
P-1	0.0	SILTY, CLAYEY SAND(SC-SM)		91	22	21	15	6	4.1	
P-1	4.0	CLAYEY SAND(SC)		100	46	37	12	25	15.7	
P-1	9.0	SILTY SAND(SM)		95	18	NP	NP	NP	15.1	107.8
P-2	4.0	SILTY SAND(SM)		99	35	NP	NP	NP	10.6	
P-2	9.0	WELL-GRADED SAND WITH CLAY(SW-SC)		91	5	24	16	8	10.8	
P-2	19.0					29	15	14	10.9	121.9
P-3	0.0	CLAYEY SAND(SC)		98	40	26	15	11	10.7	
P-3	4.0								30.2	91.6
P-3	9.0								12.0	111.9

LAB SUMMARY - MODIFIED - GINT STD US LAB.GDT - 8/29/25 13:41 - C:\USERS\SARAH MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\ID25-2-928 - EVERGREEN\_NEC BENT GRASS & WOODMENG - DRAFTING\ID25-2-928 2.GPJ

LAB SUMMARY - MODIFIED - GINT STD US LAB.GDT - 8/29/25 13:41 - C:\USERS\SARAH MULCAHEY\VIDI ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\ID25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMENG - DRAFTING\ID25-2-928 2.GPJ



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# SUMMARY OF LABORATORY RESULTS

**CLIENT** Evergreen **PROJECT NAME** Bent Grass South Commercial  
**PROJECT NUMBER** D25-2-928 **PROJECT LOCATION** Falcon, Colorado

Exploration ID	Approx. Sample Depth (ft)	Sample Description	Passing 3/4" Sieve (%)	Passing #4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Moisture Content (%)	Dry Density (pcf)
P-3	14.0								12.8	119.8
P-4	4.0	POORLY-GRADED SAND WITH SILT(SP-SM)		94	6	NP	NP	NP	6.9	
P-4	9.0								15.6	
P-4	14.0								14.3	117.0
P-4	19.0								14.0	114.9
P-5	4.0								4.0	
P-5	9.0	SANDY SILTY CLAY(CL-ML)		99	51	25	18	7	16.6	
P-6	4.5								19.5	
P-6	9.0								18.3	105.7
P-6	24.0	SILTY SAND(SM)		98	17	NP	NP	NP	13.9	101.7



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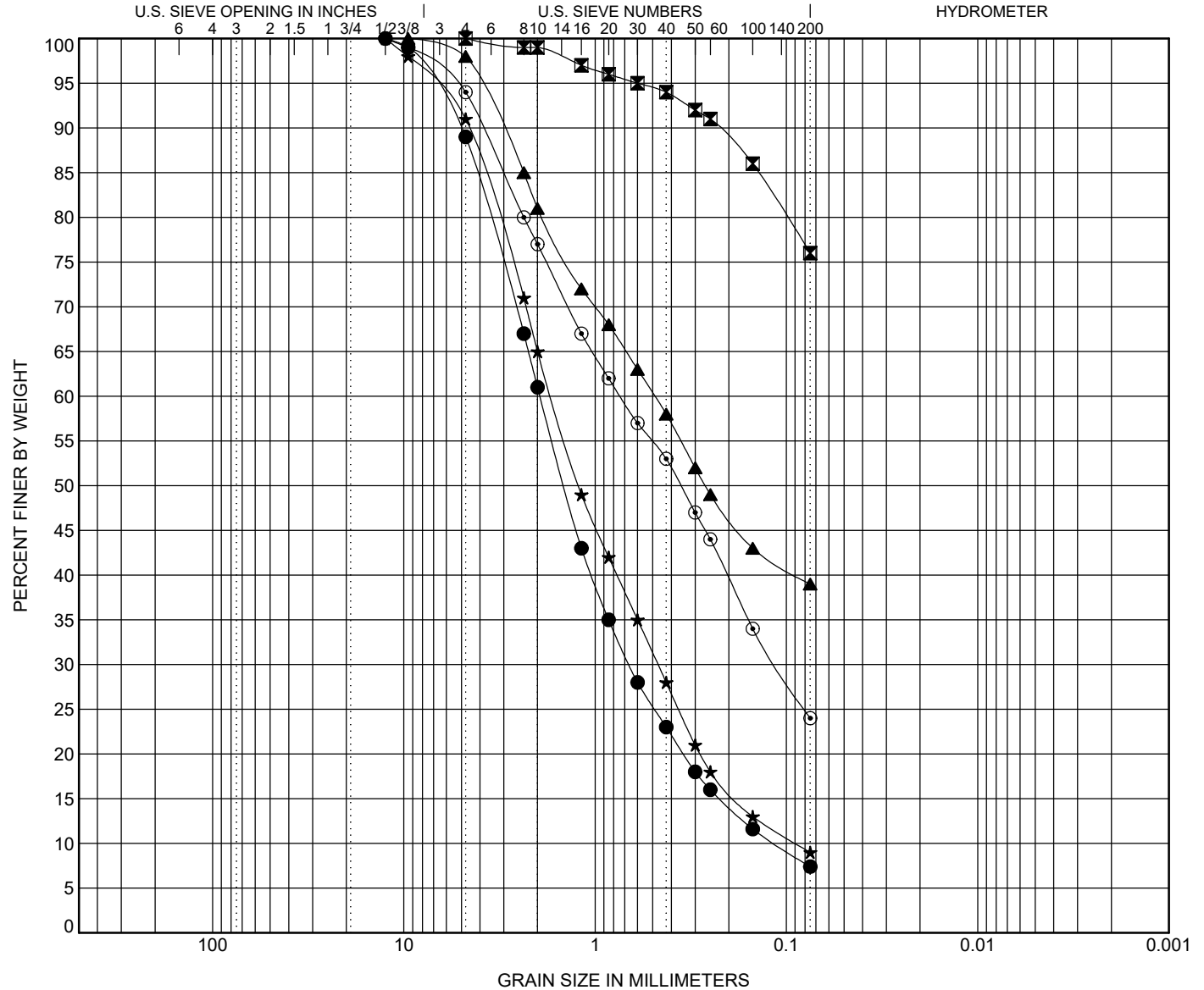
# GRAIN SIZE DISTRIBUTION

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-1	9.0					1.96	16.86
☒ B-2	1.0	LEAN CLAY with SAND(CL)	33	13	20		
▲ B-3	4.0	CLAYEY SAND(SC)	29	13	16		
★ B-4	4.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.45	19.02
⊙ B-5	4.0	SILTY SAND(SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	9.0	12.5	1.942	0.663	0.115	11.0	81.6	7.4	
☒ B-2	1.0	4.75				0.0	24.0	76.0	
▲ B-3	4.0	9.5	0.488			2.0	59.0	39.0	
★ B-4	4.0	12.5	1.696	0.469	0.089	9.0	82.0	9.0	
⊙ B-5	4.0	12.5	0.739	0.114		6.0	70.0	24.0	

GRAIN SIZE - GINT STD US LAB.GDT - 8/29/25 13:47 - C:\USERS\SARAH MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\D25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMEN6 - DRAFTING\D25-2-928 2.GPJ



Vivid Engineering Group, Inc.  
 1053 Elkton Drive  
 Colorado Springs, Colorado 80907  
 Telephone: 719-896-4356  
 Fax: 719-896-4357

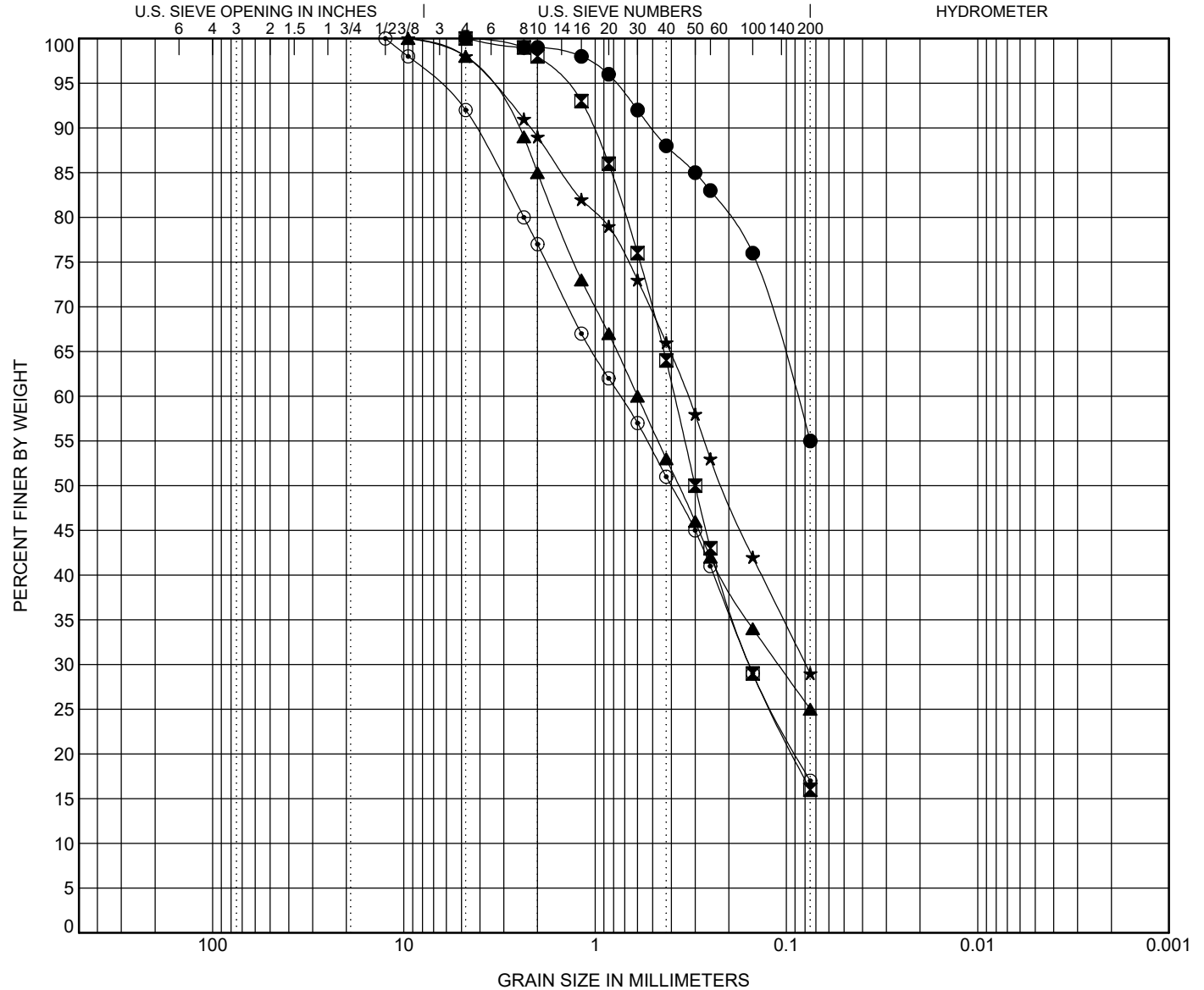
# GRAIN SIZE DISTRIBUTION

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-5	14.0										
☒ B-6	0.0	<b>SILTY SAND(SM)</b>					<b>NP</b>	<b>NP</b>	<b>NP</b>		
▲ B-7	0.0	<b>SILTY, CLAYEY SAND(SC-SM)</b>					<b>22</b>	<b>16</b>	<b>6</b>		
★ B-8	0.0	<b>SILTY, CLAYEY SAND(SC-SM)</b>					<b>22</b>	<b>18</b>	<b>4</b>		
◎ B-11	9.0	<b>SILTY SAND(SM)</b>					<b>NP</b>	<b>NP</b>	<b>NP</b>		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● B-5	14.0	4.75	0.088			0.0	45.0	55.0			
☒ B-6	0.0	4.75	0.385	0.156		0.0	84.0	16.0			
▲ B-7	0.0	9.5	0.6	0.11		2.0	73.0	25.0			
★ B-8	0.0	9.5	0.327	0.079		2.0	69.0	29.0			
◎ B-11	9.0	12.5	0.739	0.157		8.0	75.0	17.0			

GRAIN SIZE - GINT STD US LAB.GDT - 8/29/25 13:47 - C:\USERS\SARAH MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\D25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMEN6 - DRAFTING\D25-2-928 2.GPJ



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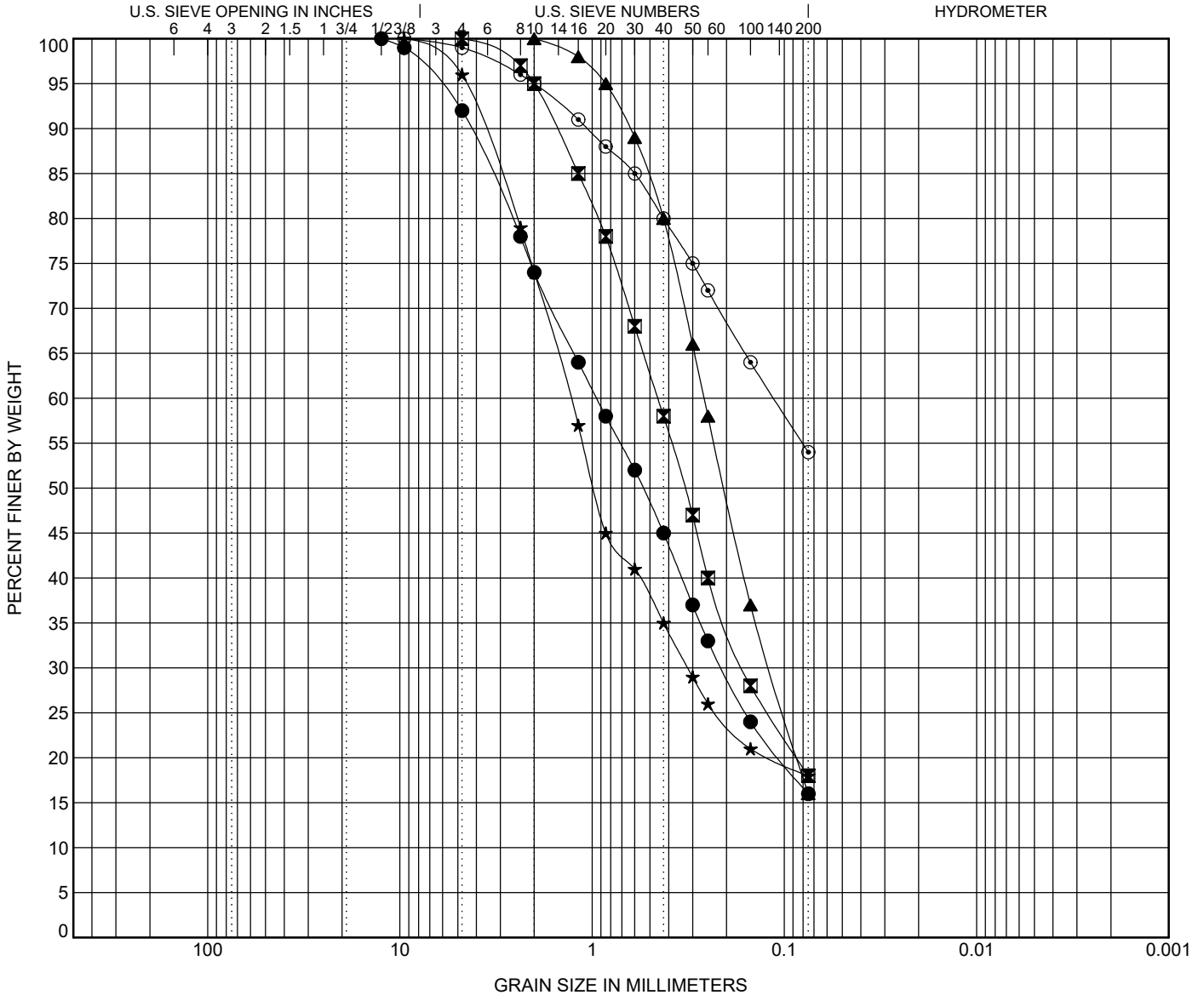
# GRAIN SIZE DISTRIBUTION

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-11	14.0	SILTY SAND(SM)	NP	NP	NP		
☒ B-12	0.0	SILTY SAND(SM)	NP	NP	NP		
▲ B-14	4.0	SILTY SAND(SM)	NP	NP	NP		
★ B-15	4.0	CLAYEY SAND(SC)	32	12	20		
◎ Composite-1	0.0	SANDY LEAN CLAY(CL)	26	14	12		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-11	14.0	12.5	0.948	0.211		8.0	76.0		16.0
☒ B-12	0.0	4.75	0.455	0.163		0.0	82.0		18.0
▲ B-14	4.0	2	0.262	0.119		0.0	84.0		16.0
★ B-15	4.0	9.5	1.295	0.318		4.0	78.0		18.0
◎ Composite-1	0.0	9.5	0.114			1.0	45.0		54.0

GRAIN SIZE - GINT STD US LAB.GDT - 8/29/25 13:47 - C:\USERS\SARAH MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\D25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMEN6 - DRAFTING\D25-2-928 2.GPJ



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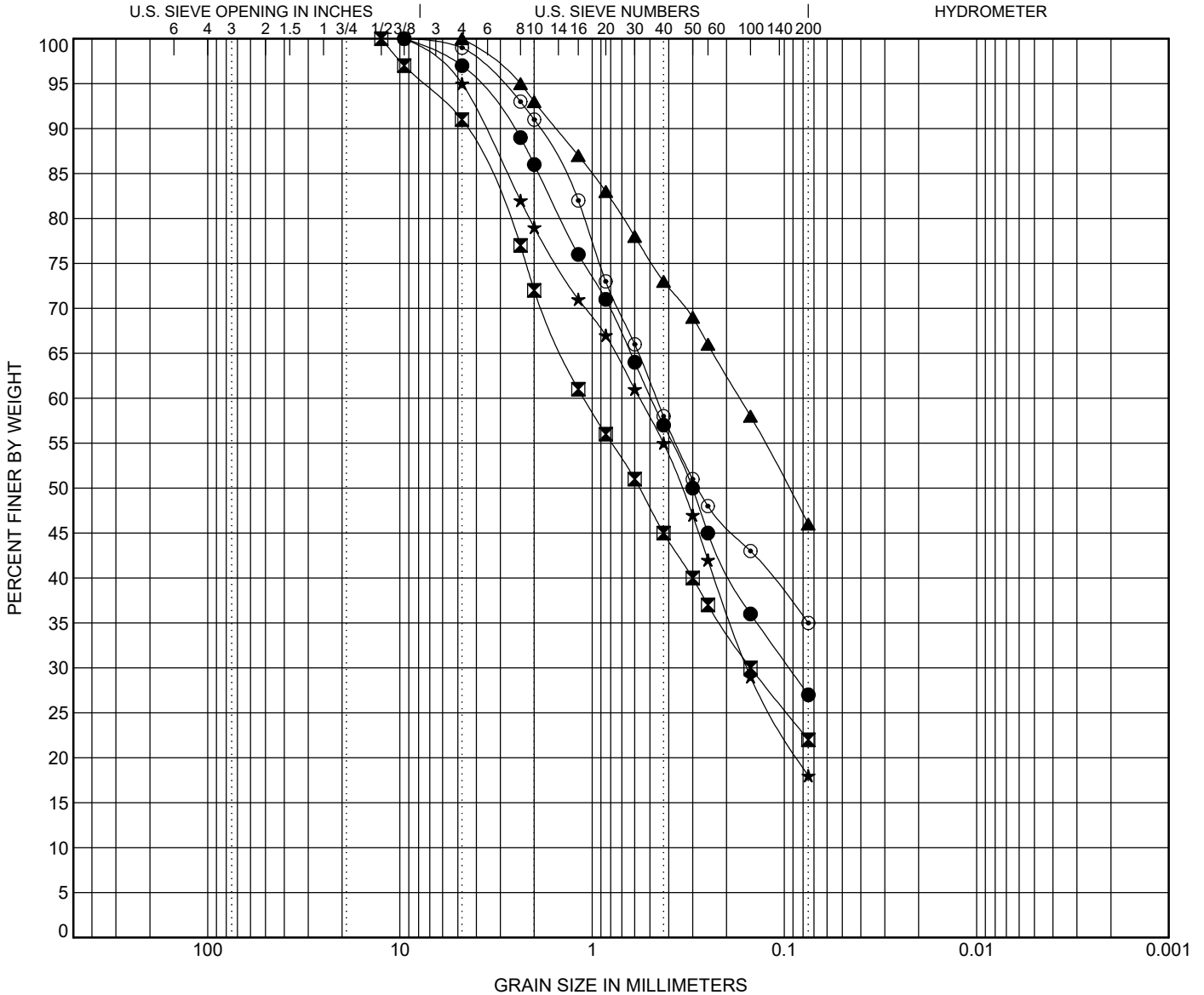
# GRAIN SIZE DISTRIBUTION

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Composite-2	0.0	SILTY SAND(SM)	NP	NP	NP		
☒ P-1	0.0	SILTY, CLAYEY SAND(SC-SM)	21	15	6		
▲ P-1	4.0	CLAYEY SAND(SC)	37	12	25		
★ P-1	9.0	SILTY SAND(SM)	NP	NP	NP		
⊙ P-2	4.0	SILTY SAND(SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Composite-2	0.0	9.5	0.493	0.094		3.0	70.0		27.0
☒ P-1	0.0	12.5	1.105	0.15		9.0	69.0		22.0
▲ P-1	4.0	4.75	0.17			0.0	54.0		46.0
★ P-1	9.0	9.5	0.566	0.156		5.0	77.0		18.0
⊙ P-2	4.0	9.5	0.463			1.0	64.0		35.0

GRAIN SIZE - GINT STD US LAB.GDT - 8/29/25 13:47 - C:\USERS\SARAH MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\D25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMEN6 - DRAFTING\D25-2-928 2.GPJ



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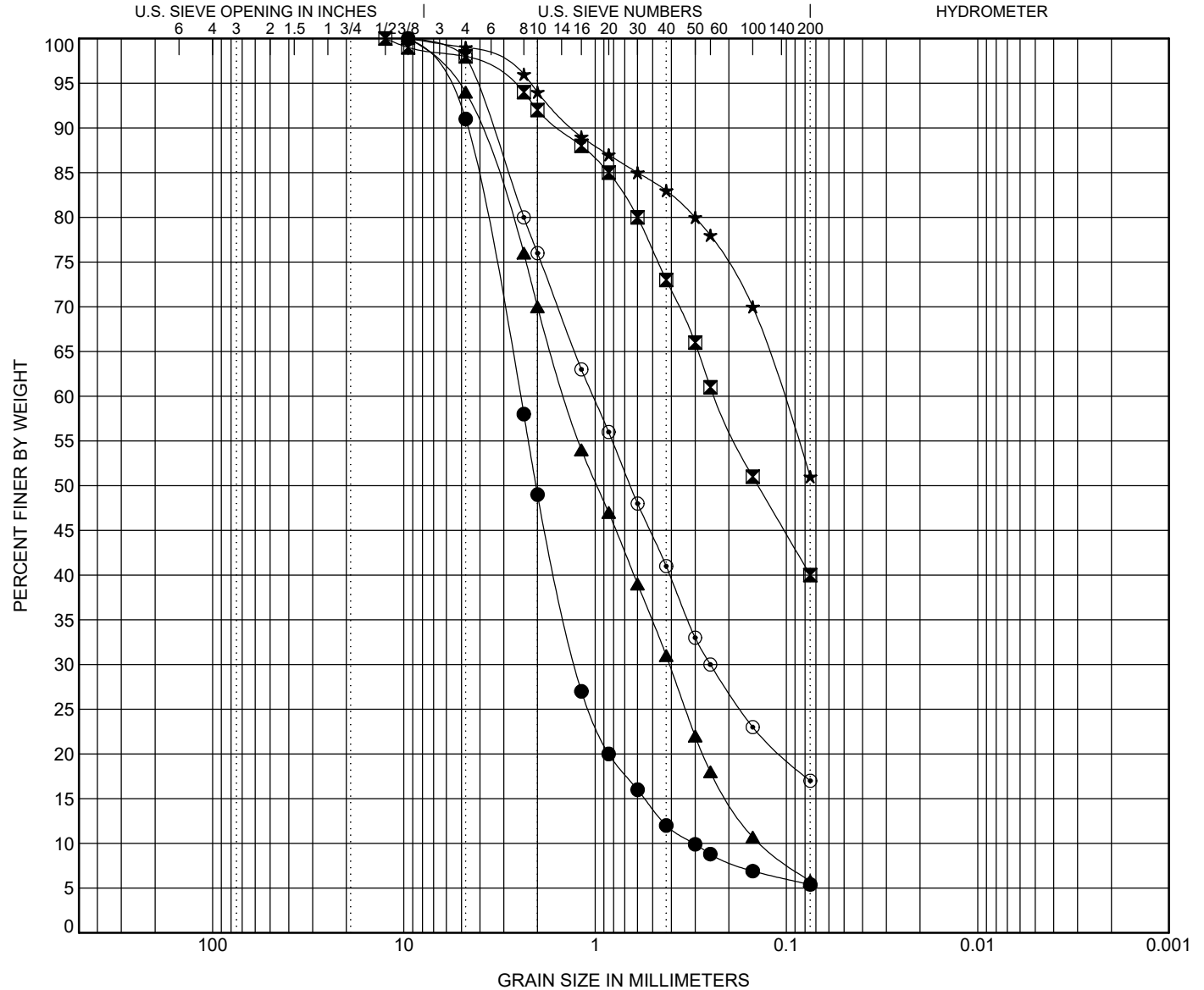
# GRAIN SIZE DISTRIBUTION

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● P-2	9.0	WELL-GRADED SAND with CLAY(SW-SC)	24	16	8	2.14	8.07
☒ P-3	0.0	CLAYEY SAND(SC)	26	15	11		
▲ P-4	4.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	0.86	10.59
★ P-5	9.0	SANDY SILTY CLAY(CL-ML)	25	18	7		
◎ P-6	24.0	SILTY SAND(SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● P-2	9.0	9.5	2.462	1.268	0.305	9.0	85.6	5.4	
☒ P-3	0.0	12.5	0.238			2.0	58.0	40.0	
▲ P-4	4.0	9.5	1.438	0.409	0.136	6.0	88.2	5.8	
★ P-5	9.0	9.5	0.104			1.0	48.0	51.0	
◎ P-6	24.0	9.5	1.025	0.25		2.0	81.0	17.0	

GRAIN SIZE - GINT STD US LAB.GDT - 8/29/25 13:47 - C:\USERS\SARAH MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\D25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMEN6 - DRAFTING\D25-2-928 2.GPJ



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 1053 Elkton Drive  
 Colorado Spings, Colorado 80907  
 Telephone: 719-896-4356  
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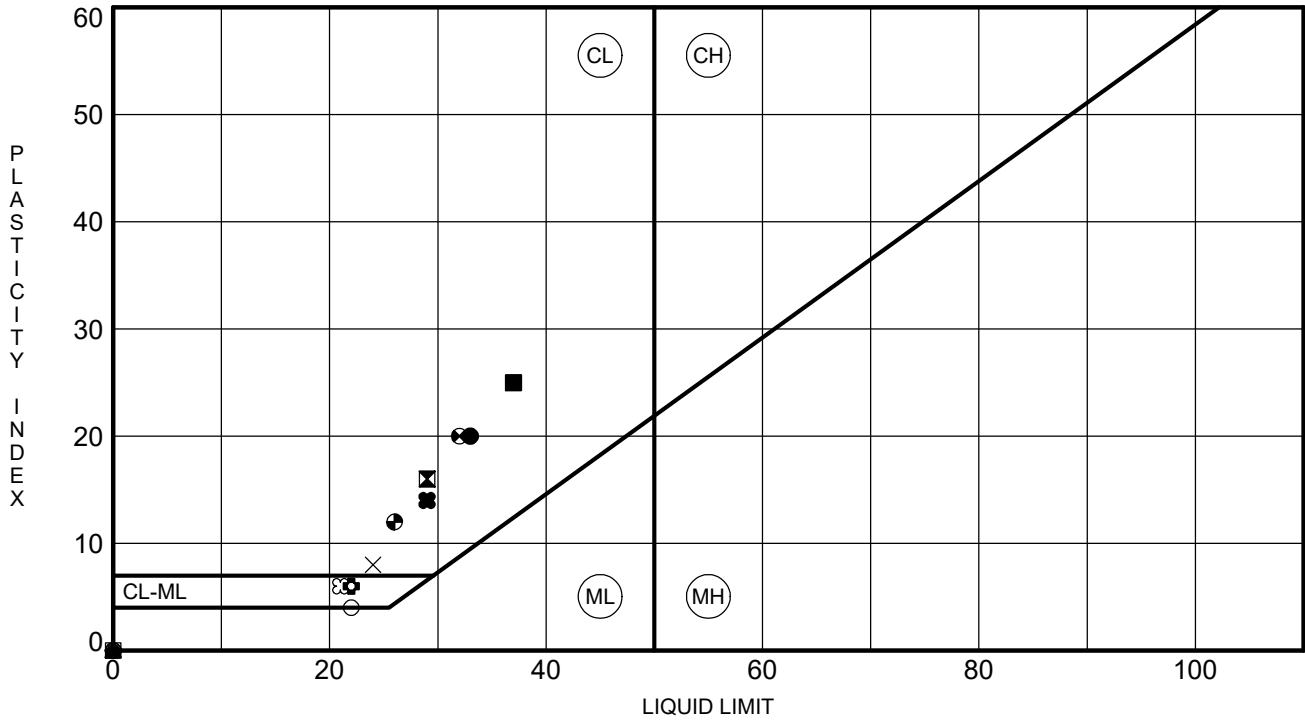
# ATTERBERG LIMITS' RESULTS

CLIENT Evergreen

PROJECT NAME Bent Grass South Commercial

PROJECT NUMBER D25-2-928

PROJECT LOCATION Falcon, Colorado



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	B-2	1.0	33	13	20	76	LEAN CLAY with SAND(CL)
⊠	B-3	4.0	29	13	16	39	CLAYEY SAND(SC)
▲	B-4	4.0	NP	NP	NP	9	WELL-GRADED SAND with SILT(SW-SM)
★	B-5	4.0	NP	NP	NP	24	SILTY SAND(SM)
⊙	B-6	0.0	NP	NP	NP	16	SILTY SAND(SM)
⊕	B-7	0.0	22	16	6	25	SILTY, CLAYEY SAND(SC-SM)
○	B-8	0.0	22	18	4	29	SILTY, CLAYEY SAND(SC-SM)
△	B-11	9.0	NP	NP	NP	17	SILTY SAND(SM)
⊗	B-11	14.0	NP	NP	NP	16	SILTY SAND(SM)
⊕	B-12	0.0	NP	NP	NP	18	SILTY SAND(SM)
□	B-14	4.0	NP	NP	NP	16	SILTY SAND(SM)
⊕	B-15	4.0	32	12	20	18	CLAYEY SAND(SC)
⊕	Composite-1	0.0	26	14	12	54	SANDY LEAN CLAY(CL)
★	Composite-2	0.0	NP	NP	NP	27	SILTY SAND(SM)
⊗	P-1	0.0	21	15	6	22	SILTY, CLAYEY SAND(SC-SM)
■	P-1	4.0	37	12	25	46	CLAYEY SAND(SC)
◆	P-1	9.0	NP	NP	NP	18	SILTY SAND(SM)
◇	P-2	4.0	NP	NP	NP	35	SILTY SAND(SM)
×	P-2	9.0	24	16	8	5	WELL-GRADED SAND with CLAY(SW-SC)
⊕	P-2	19.0	29	15	14		

ATTERBERG LIMITS - GINT STD US LAB.GDT - 8/29/25 13:43 - C:\USERS\SARAH\MULCAHEY\VIDVID ENGINEERING GROUP\GEO - DOCUMENTS\PROJECTS\_2025\ID25-2-928\_EVERGREEN\_NEC BENT GRASS & WOODMENG - DRAFTING\ID25-2-928 2.GPJ



## UNCONFINED COMPRESSION TEST ASTM D 2166

PROJECT NAME: D25-2-928  
 PROJECT NO. : Bent Grass  
 CLIENT NAME: N/A

BORING NO. : B-10  
 SAMPLE NO.: N/A  
 DEPTH, FT. : 9ft  
 TEST SPECIMEN NO.: N/A

PROJECT ENG.: MBR  
 DATE RECEIVED: 7/15/2025  
 DATE TESTED: 7/15/2025  
 TESTED BY: TK  
 DATA ENTRY: TK

DESCRIPTION: CLAYSTONE, IRON OXIDE, MOIST

### INITIAL DATA

Avg. Height, In.: 3.963  
 Avg. Diameter, In.: 1.923  
 L/D Ratio: 2.1  
 Moisture Content, %:  
     (Sample, After test) 14.4  
 Dry Density, pcf: 118.2  
 Assumed Specific Gravity: 2.7  
 Saturation, %: 91.4  
 Void Ratio: 0.425

Rate of Strain, %/Minute: 1.0

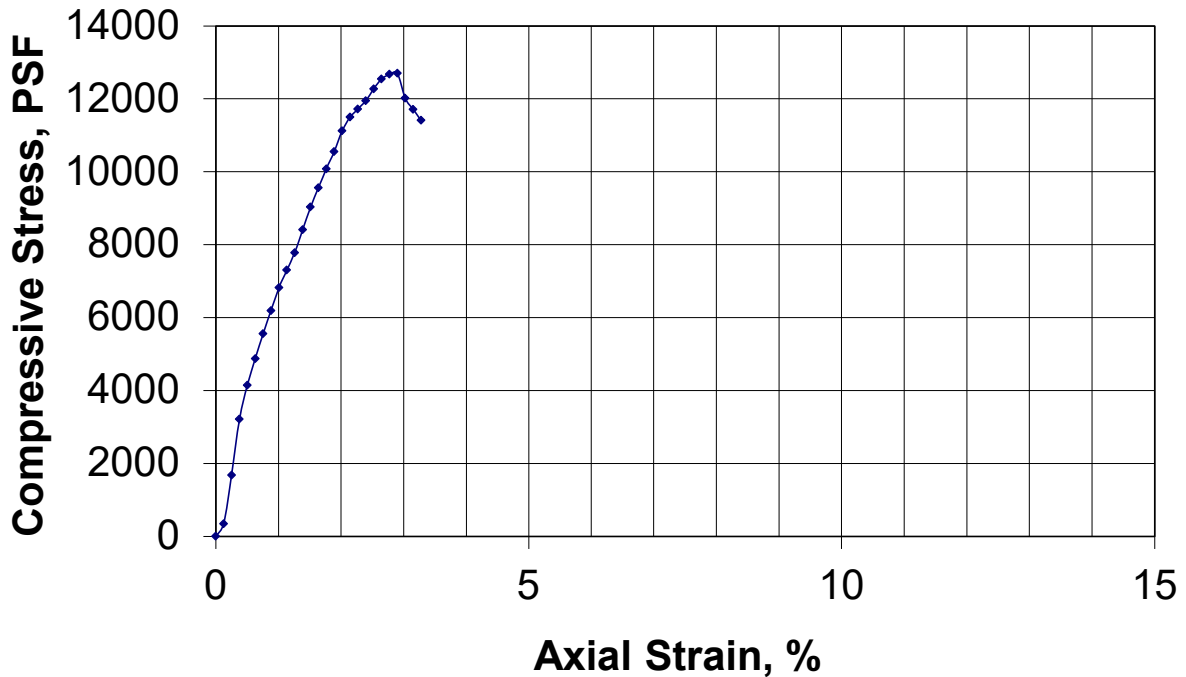
Compressive Strength @ Failure:  
 Shear Strength @ Failure:  
 Axial Strain @ Failure, %:

	PSF	PSI
Compressive Strength @ Failure:	12705	88
Shear Strength @ Failure:	6353	44
Axial Strain @ Failure, %:	2.9	2.9

Photo:



### Stress - Strain Curve



## UNCONFINED COMPRESSION TEST ASTM D 2166

PROJECT NAME: D25-2-928  
 PROJECT NO. : Bent Grass  
 CLIENT NAME: N/A

BORING NO. : B-12  
 SAMPLE NO.: N/A  
 DEPTH, FT. : 9ft  
 TEST SPECIMEN NO.: N/A

PROJECT ENG.: MBR  
 DATE RECEIVED: 7/15/2025  
 DATE TESTED: 7/15/2025  
 TESTED BY: TK  
 DATA ENTRY: TK

DESCRIPTION: SAND, SL GRAVEL, VERY MOIST,

### INITIAL DATA

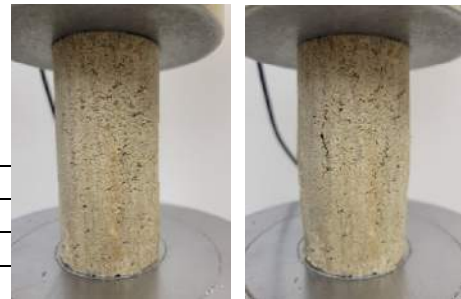
Avg. Height, In.: 3.920  
 Avg. Diameter, In.: 1.930  
 L/D Ratio: 2.0  
 Moisture Content, %:  
     (Sample, After test) 7.8  
 Dry Density, pcf: 115.0  
 Assumed Specific Gravity: 2.7  
 Saturation, %: 45.5  
 Void Ratio: 0.465

Rate of Strain, %/Minute: 1.0

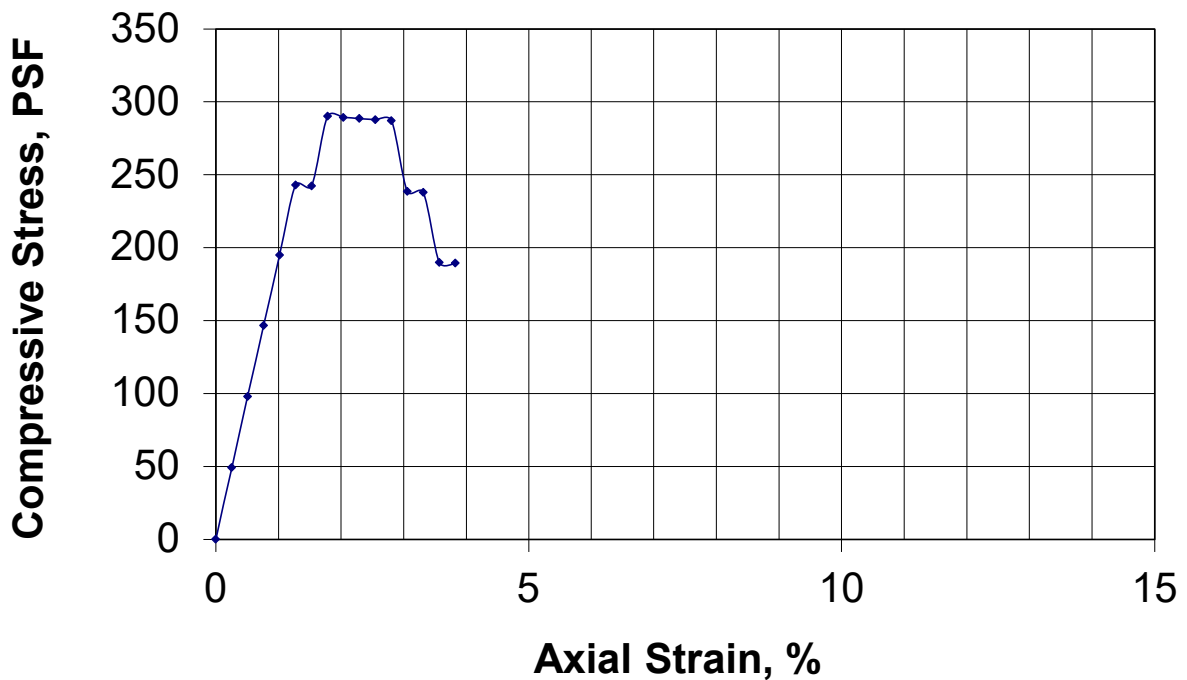
Compressive Strength @ Failure:  
 Shear Strength @ Failure:  
 Axial Strain @ Failure, %:

	PSF	PSI
Compressive Strength @ Failure:	290	2
Shear Strength @ Failure:	145	1
Axial Strain @ Failure, %:	1.8	1.8

Photo:



### Stress - Strain Curve



3885 Forest Street  
Denver, CO 80207

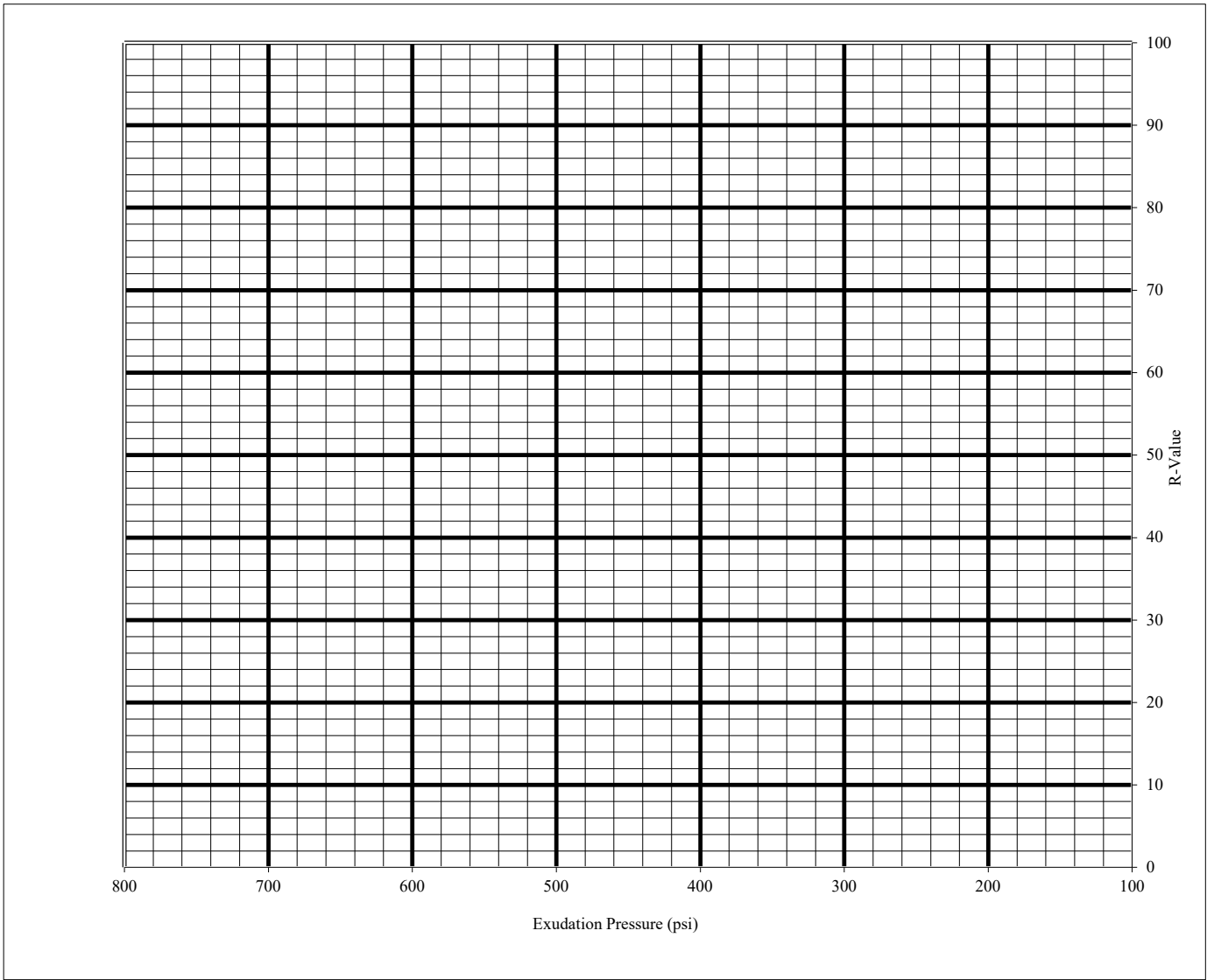
Vivid Engineering Group  
R-Value Test Report



Project Number: D25-2-928  
 Sample Id: N/A  
 Location: P-3, B-2, B-9, B-15  
 Date Sampled: 7/16/2025

Project Name: Bent Grass  
 Depth (ft): 0-4'  
 Sample Description: grayish brown clay  
 Date Tested: 8/5/2025

R-Value at 300 psi exudation pressure = <5



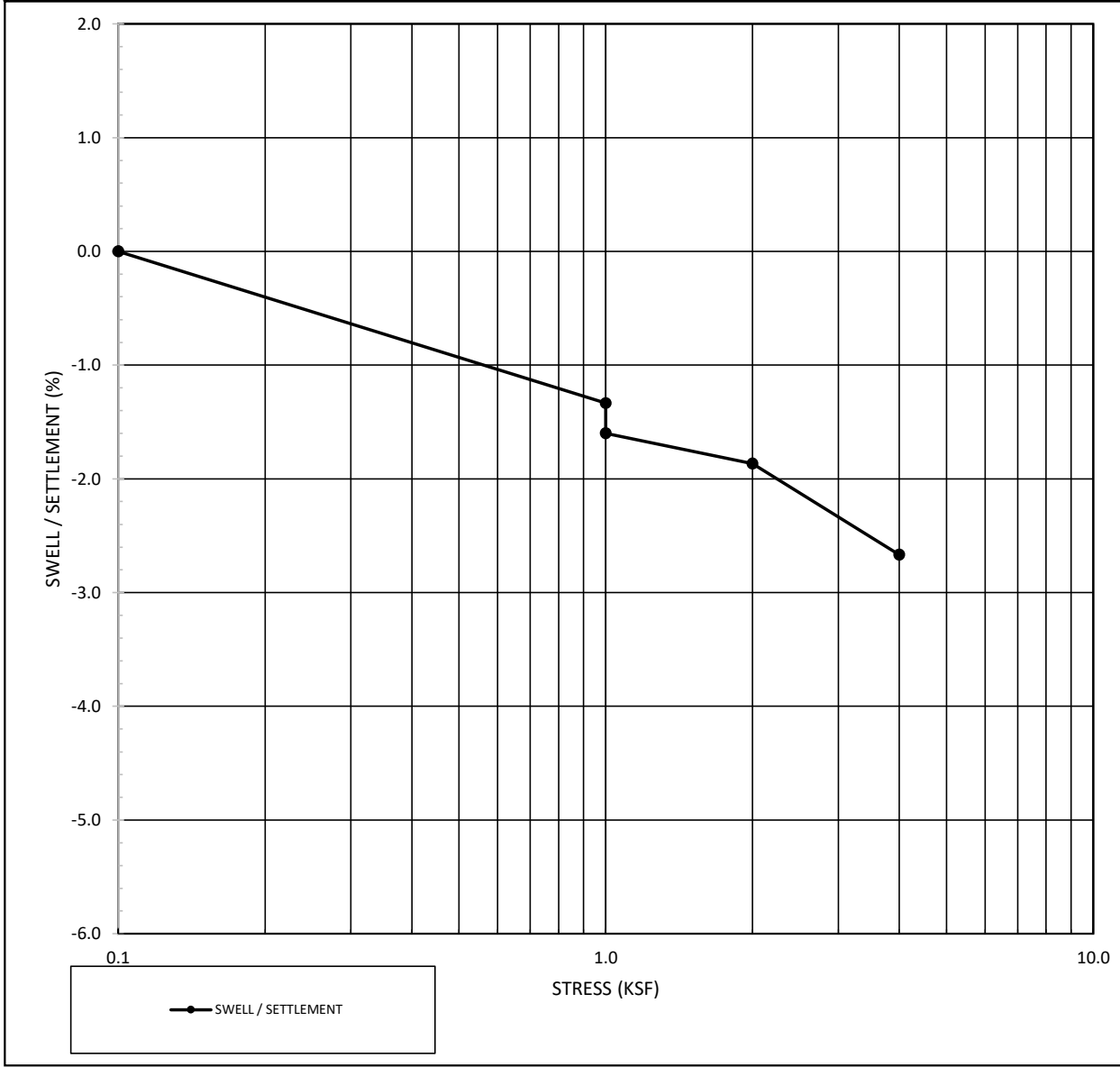
Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1								0
2								0
3								0

Sampled by: NAD

Tested by: CV

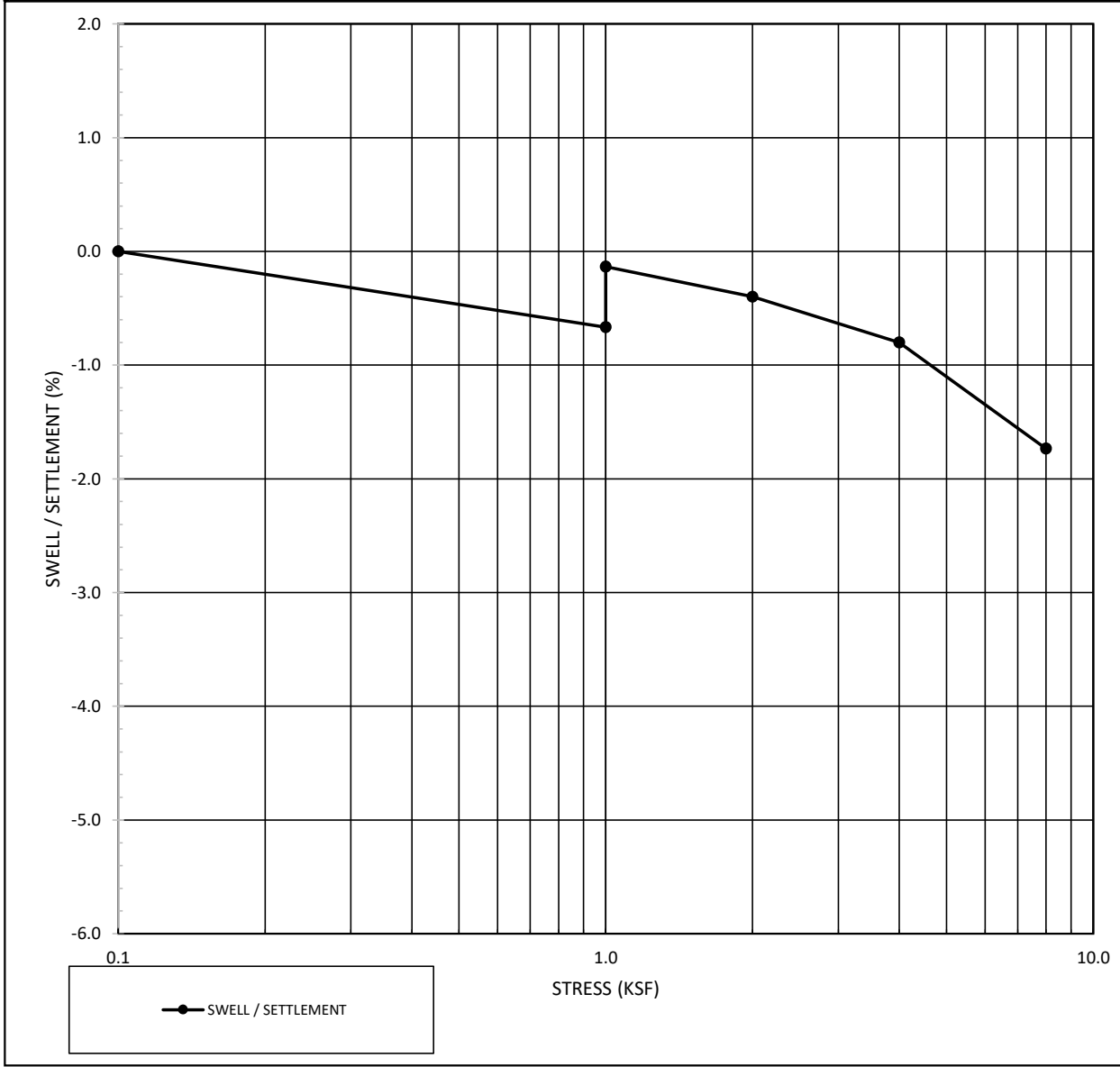
Checked by: \_\_\_\_\_

<b>Project Name:</b>	Bent Grass	<b>Date</b>	7/21/2025
<b>Project No.:</b>	D25-2-928		
<b>Boring ID.:</b>	B-5	<b>Sample Depth (ft)</b>	14
<b>Sample Description:</b>	Grey Slightly Moist Sand, Slight Clay, Slight Gravel		
		<b>Compression @ Wetting Weight:</b>	<b>-0.3</b> %



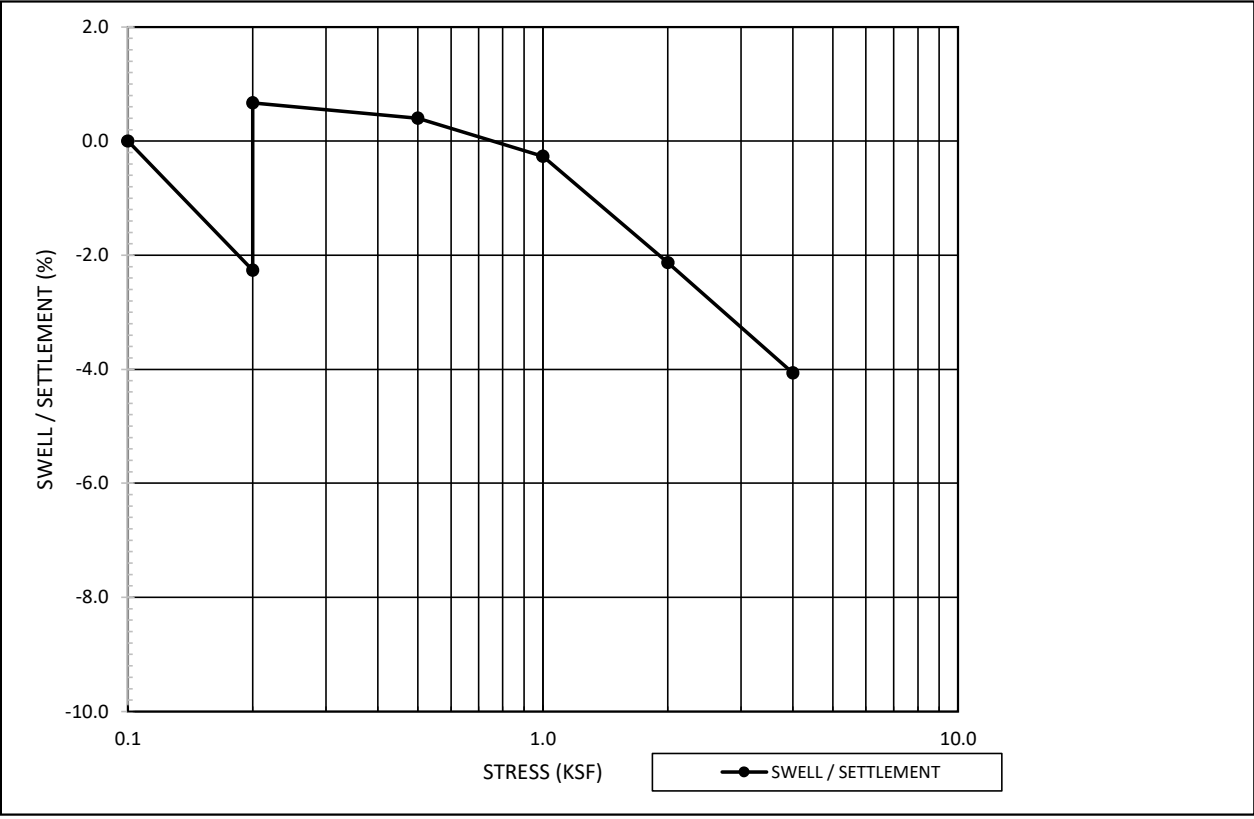
<b>Initial Condition</b>	
Moisture Content %	14.4
Dry Density (pcf)	111.8
<b>Post-Swell Condition</b>	
Moisture Content %	16.5

Project Name:	Bent Grass	Date	7/23/2025
Project No.:	D25-2-928		
Boring ID.:	B-14	Sample Depth (ft)	9
Sample Description:	Clay, Sandy, Moist, Grey		
		Swell @ Wetting Weight:	<b>0.5</b> %



<b>Initial Condition</b>	
Moisture Content %	<b>14.6</b>
Dry Density (pcf)	<b>113.7</b>
<b>Post-Swell Condition</b>	
Moisture Content %	<b>16.9</b>

Project Name:	BENT GRAS	Date	7/31/2025
Project No.:	D25-2-928		
Boring ID.:	P-3	Sample Depth (ft)	4
Sample Description:	MOIST DARK BROWN CLAY & SAND		
		Swell @ Wetting Weight:	2.9 %



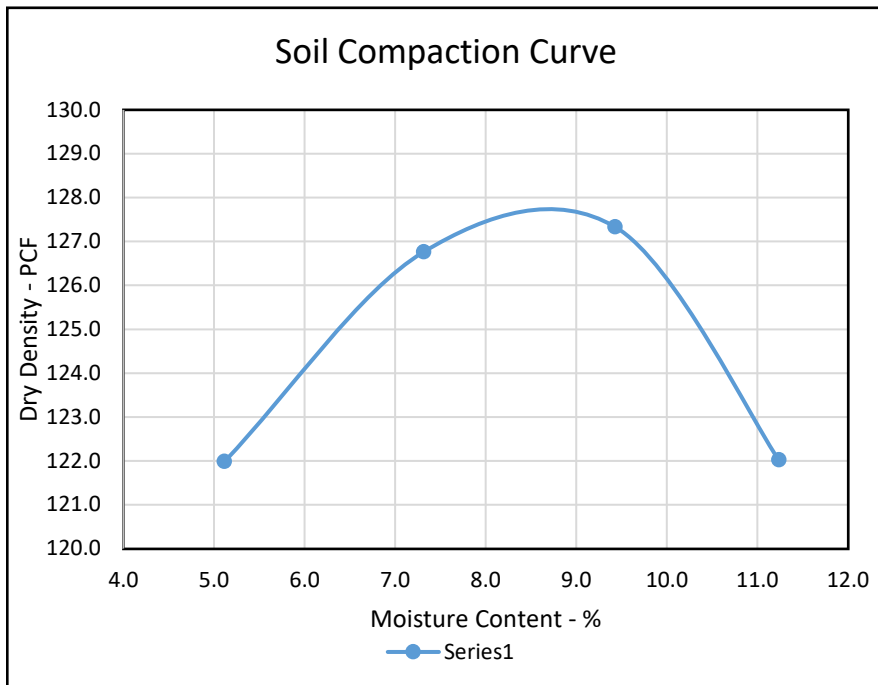
<b>Initial Condition</b>	
Moisture Content %	30.2
Dry Density (pcf)	91.6
<b>Post-Swell Condition</b>	
Moisture Content %	32.1

# VIVID Engineering Group, Inc.

## Moisture-Density (Proctor) of Soils

Report Number:	D25-2-928 - Proctor	Sample No.:	
Date:	7/30/2025	Project No.:	D25-2-928
Project:	Bent Grass	Sample Location:	B-1,4,6,7,10, 12, 13 + P-2,4,6
Sample Date:	7/29/2025	Soil Description:	Brown Dry Sand Gravel Clay
Sample Depth:	0-4	Test By:	A Jones
Sampled By:	NAD		

Test Procedure							
ASTM Designation:	D698	<input type="checkbox"/>	D1557	<input checked="" type="checkbox"/>	Method	A	
AASHTO Designation:	T99	<input type="checkbox"/>	T180	<input type="checkbox"/>	Method		
Oversize Correction:	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>			
Max. Particle Size:	No.4	<input checked="" type="checkbox"/>	3/8"	<input type="checkbox"/>	3/4"	<input type="checkbox"/>	
Type of Hammer:	Man.	<input checked="" type="checkbox"/>	Mech.	<input type="checkbox"/>			
Sample Preparation:	Dry	<input type="checkbox"/>	Moist	<input checked="" type="checkbox"/>			
	1	2	3	4	5	6	7
Soil & Mold	13.91	14.17	14.28	14.16			
Mold Tare	9.64	9.64	9.64	9.64			
Soil Wet	4.2700	4.5300	4.6400	4.5200			
Mold Factor	30.03	30.03	30.03	30.03			
Wet Density	128.23	136.04	139.34	135.74			
Tare Can No.	WART	YEET	FOOT	KNEE			
MOIST-Wet Wt+Tare	1340.4	965.8	1077.2	1256.9			
MOIST-Dry Wt+Tare	1282.2	908.5	995.0	1144.6			
Tare	144.2	124.9	123.1	144.9			
H2O Loss	58.2	57.3	82.2	112.3			
% Moisture	5.1	7.3	9.4	11.2			
Dry Density	122.0	126.8	127.3	122.0			



Rock Correction	
% Coarse	<input type="checkbox"/>
% Fine	<input type="checkbox"/>
Coarse SPG	<input type="checkbox"/>
Coarse % Moist.	<input type="checkbox"/>
Soil Classification:	<input type="text"/>
Moist. Spec:	<input type="text"/>
Test Results	
Max. Density	127.8
Optimum Moisture	8.8
<b>321</b>	
(If Applicable)	
Max. Density	<input type="text"/>
Optimum Moisture	<input type="text"/>
Review	
Reviewed By	<input type="text"/>
Date	<input type="text"/>

Results relate only to the items observed or tested. This test report shall not be reproduced, except in full, with the written approval of VIVID Engineering Group, Inc. and report shall be signed or otherwise approved by authorized staff members only.



ADVANCED TERRA TESTING  
833 PARFET ST UNIT A  
LAKEWOOD, CO  
303-232-8308 www.terratesting.com

Wednesday, August 13, 2025

Project Number: 2973-027  
Company: Vivid Engineering Group  
Address:  
City:  
State:

RE: Soil Testing  
Bent Grass Meadows  
D25-2-928

Dear Mary Ray,

With this letter you will find a report on Soil samples assigned on 7/16/2025.

Testing was performed in accordance with standardized test methods, accepted industry practices as well as specific instructions received from you, our client. Advanced Terra Testing accepts no responsibility and makes no claims to the use or purpose of the material being tested. Furthermore, the results herein are based solely on the material received and tested. Please note that all material will be disposed of after thirty days unless other arrangements are made.

We respectfully request that sample reports be considered proprietary information and are not to be reproduced, except in full and only with prior written approval of Advanced Terra Testing. We are pleased to have been given the opportunity to perform high quality laboratory testing for your project. We sincerely hope the results herein provide you with all the information required. If you have questions or need anything further, please reach out and we will be happy to assist you.

Respectfully,  
Brandon Ferro

**Direct Shear**

**ASTM D 3080**

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		

**Direct Shear Results**

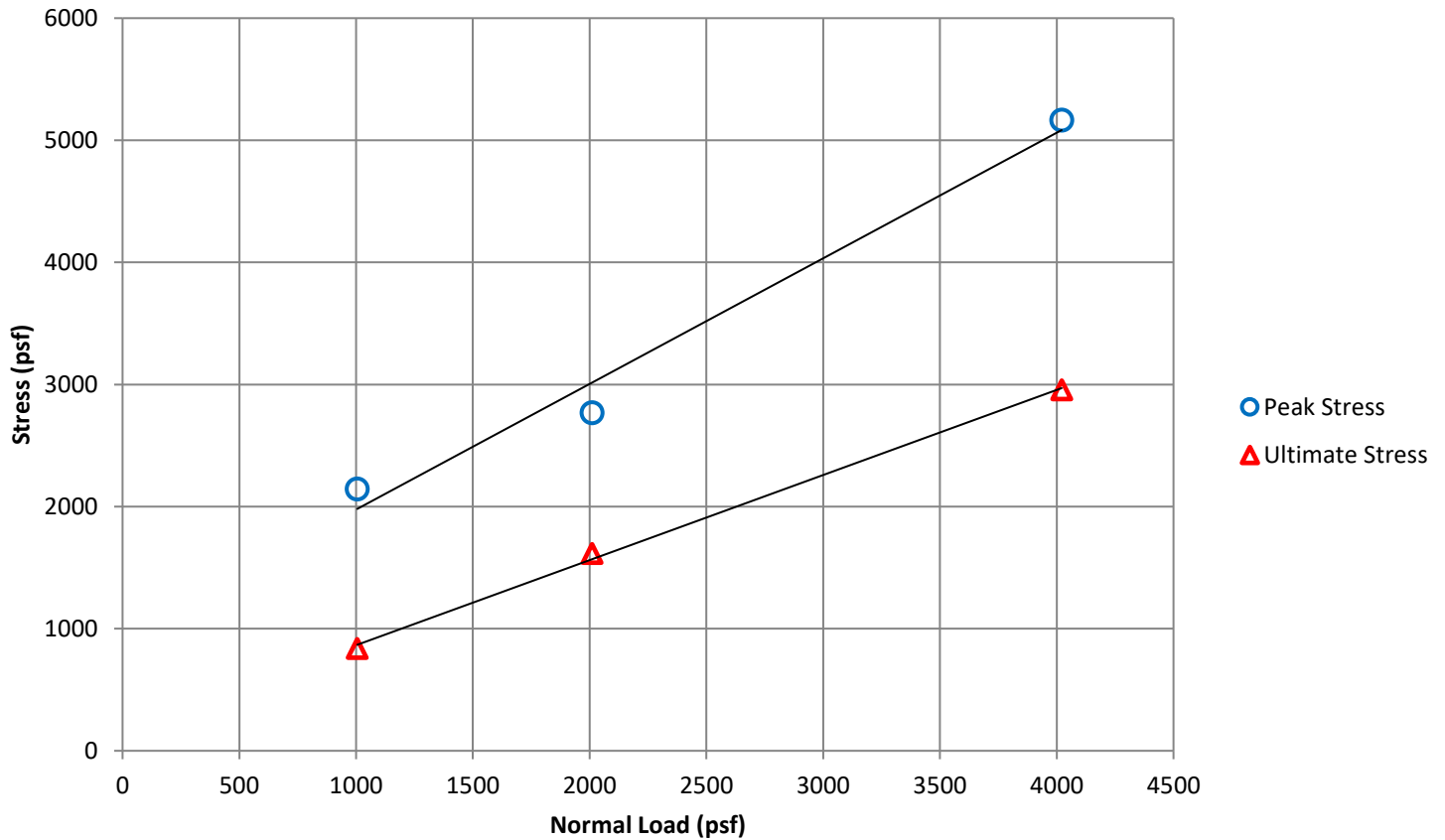
Point:	A	B	C
Normal Load (psf):	4021	2010	1005
Normal Load (kPa):	192.5	96.2	48.1
Peak Strength (psf):	5165	2769	2145
Ultimate Strength (psf):	2955	1615	838
Peak Strength (kPa):	247.3	132.6	102.7
Ultimate Strength (kPa):	141.5	77.3	40.1

**Peak Strength**

**Ultimate Strength**

Friction Angle:	45.8	Friction Angle:	34.9
Cohesion (psf):	947	Cohesion (psf):	168
Cohesion (kPa):	45.5	Cohesion (kPa):	8.1

**Normal Load vs. Stress**



**Direct Shear**

**ASTM D 3080**

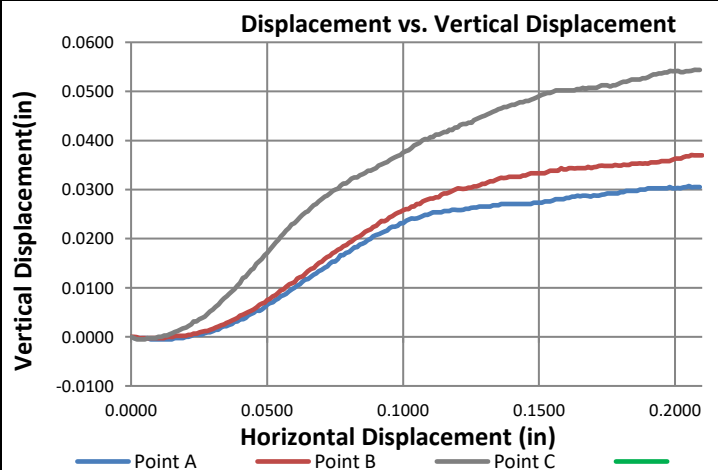
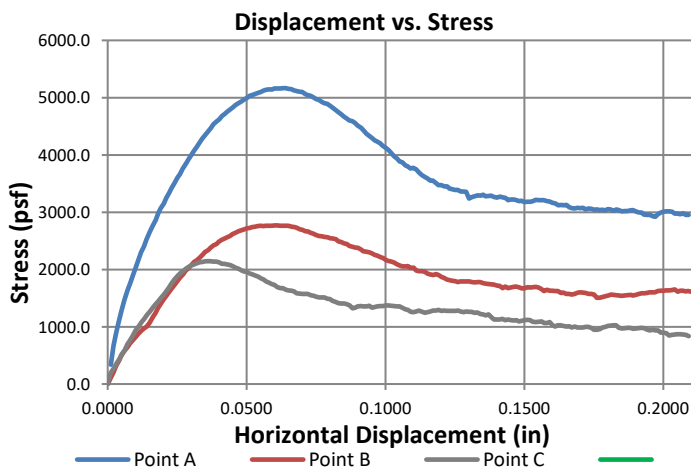
CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		

**Test Parameters**

Displacement Rate (in/min): 0.0064      Displacement Rate (cm/min): 0.016256

Raw Data Files: 2973-027\_B-3\_9\_DS\_A\_08-08.txt, 2973-027\_B-3\_9\_DS\_B\_08-11.txt, 2973-027\_B-3\_9\_DS\_C\_08-11.txt,

Before Test Mass of Wet Soil and Ring (g):	133.81	131.59	135.75
After Test Mass of Wet Soil and Pan (g):	108.07	106.67	112.36
Mass of Ring (g):	27.97	27.98	27.18
Mass of Wet Soil and Pan (g):	11.51	32.65	44.59
Mass of Dry Soil and Pan (g):	10.80	30.23	41.18
Mass of Pan (g):	3.13	3.55	3.10
Diameter (in):	1.94	1.94	1.94
Initial Height (in):	1.00	1.00	1.00
Height Change (in):	0.01513	0.01195	0.0059
Area (in <sup>2</sup> ):	2.95	2.95	2.95
Initial Wet Density (pcf):	136.7	133.8	140.2
Initial Dry Density (pcf):	125.0	122.7	128.7
Initial Wet Density (kg/m <sup>3</sup> ):	2190	2143	2246
Initial Dry Density (kg/m <sup>3</sup> ):	2002	1965	2062
Initial Moisture (%):	9.3	9.1	8.9
Final Wet Density (pcf):	141.7	139.4	146.0
Final Dry Density (pcf):	126.9	124.2	129.5
Final Wet Density (kg/m <sup>3</sup> ):	2270	2233	2338
Final Dry Density (kg/m <sup>3</sup> ):	2033	1989	2074
Final Moisture (%):	11.6	12.3	12.7



**NOTES:** Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

**Direct Shear Data  
ASTM D3080**

CLIENT Vivid Engineering Group  
 JOB NO. 2973-027  
 PROJECT Bent Grass Meadows  
 PROJECT NO. D25-2-928  
 LOCATION Colorado Springs, CO  
 DATE TESTED 08/07/25  
 TECHNICIAN AC

BORING NO. B-3  
 DEPTH 9'  
 SAMPLE NO. --  
 DATE SAMPLED --  
 DESCRIPTION Intact Specimens

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)
0.0011	338.0	-0.0003	0.0000	0.0	0.0000	0.0000	0.0	0.0000
0.0021	667.7	-0.0003	0.0010	102.5	0.0000	0.0010	195.6	-0.0003
0.0030	888.6	-0.0003	0.0021	203.6	0.0000	0.0022	277.2	-0.0005
0.0040	1103.6	-0.0003	0.0031	318.4	-0.0003	0.0031	352.6	-0.0005
0.0050	1285.5	-0.0003	0.0041	403.3	-0.0003	0.0042	433.9	-0.0005
0.0060	1469.1	-0.0003	0.0050	499.7	-0.0003	0.0050	520.4	-0.0005
0.0072	1639.5	-0.0005	0.0061	585.2	-0.0003	0.0061	591.8	-0.0003
0.0081	1757.9	-0.0005	0.0071	645.8	-0.0003	0.0071	688.2	-0.0003
0.0091	1902.8	-0.0005	0.0081	713.7	-0.0003	0.0080	759.9	-0.0003
0.0102	2043.3	-0.0005	0.0091	767.9	-0.0003	0.0090	841.2	-0.0003
0.0111	2169.9	-0.0005	0.0100	820.9	-0.0003	0.0100	935.3	0.0000
0.0120	2300.4	-0.0005	0.0111	882.0	-0.0003	0.0112	1009.5	0.0000
0.0131	2400.8	-0.0005	0.0121	932.2	-0.0003	0.0122	1075.3	0.0003
0.0140	2522.0	-0.0005	0.0130	967.6	0.0000	0.0132	1135.1	0.0003
0.0150	2640.3	-0.0005	0.0140	1003.8	0.0000	0.0142	1210.6	0.0005
0.0160	2747.6	-0.0003	0.0151	1071.5	0.0000	0.0151	1259.6	0.0007
0.0173	2861.6	-0.0003	0.0162	1171.7	0.0002	0.0161	1327.5	0.0010
0.0182	2968.4	-0.0003	0.0171	1239.5	0.0002	0.0170	1385.2	0.0012
0.0191	3065.8	-0.0003	0.0181	1324.9	0.0002	0.0181	1438.7	0.0014
0.0202	3151.3	0.0000	0.0191	1393.5	0.0002	0.0190	1495.8	0.0017
0.0211	3247.5	0.0000	0.0201	1471.5	0.0002	0.0202	1567.2	0.0019
0.0221	3341.3	0.0002	0.0211	1542.2	0.0004	0.0210	1610.3	0.0022
0.0231	3425.7	0.0005	0.0220	1602.5	0.0004	0.0222	1689.5	0.0026
0.0241	3509.3	0.0005	0.0230	1668.5	0.0006	0.0230	1761.2	0.0032
0.0250	3598.2	0.0005	0.0242	1743.0	0.0006	0.0241	1829.0	0.0032
0.0260	3668.2	0.0005	0.0252	1808.1	0.0009	0.0251	1885.4	0.0036
0.0270	3756.6	0.0007	0.0261	1858.0	0.0010	0.0261	1935.3	0.0039
0.0282	3852.8	0.0009	0.0272	1922.1	0.0012	0.0271	1967.4	0.0041
0.0290	3917.1	0.0010	0.0281	1976.1	0.0012	0.0280	2007.2	0.0046
0.0301	3999.6	0.0012	0.0291	2027.3	0.0014	0.0290	2042.3	0.0051
0.0311	4078.8	0.0014	0.0301	2078.9	0.0017	0.0300	2068.0	0.0056
0.0320	4140.6	0.0014	0.0311	2129.6	0.0019	0.0310	2089.3	0.0061
0.0331	4214.8	0.0019	0.0321	2161.4	0.0021	0.0322	2107.4	0.0066
0.0341	4285.7	0.0022	0.0331	2202.9	0.0024	0.0332	2125.5	0.0073
0.0350	4343.0	0.0022	0.0342	2258.0	0.0026	0.0342	2132.6	0.0078
0.0361	4407.1	0.0024	0.0350	2304.0	0.0028	0.0352	2143.0	0.0083
0.0371	4465.1	0.0026	0.0362	2339.8	0.0031	0.0361	2144.9	0.0088
0.0380	4535.8	0.0031	0.0371	2382.2	0.0033	0.0371	2142.0	0.0093
0.0391	4578.7	0.0031	0.0381	2421.1	0.0036	0.0380	2139.5	0.0098
0.0402	4625.4	0.0036	0.0391	2447.5	0.0039	0.0390	2135.7	0.0104
0.0412	4679.1	0.0036	0.0400	2486.4	0.0043	0.0400	2125.1	0.0110
0.0421	4710.7	0.0039	0.0411	2515.2	0.0045	0.0411	2100.3	0.0120
0.0431	4757.4	0.0044	0.0421	2540.6	0.0048	0.0420	2100.3	0.0122

**Direct Shear Data  
ASTM D3080**

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		

Point A			Point B			Point C		
Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)
0.0440	4789.9	0.0046	0.0430	2561.4	0.0050	0.0431	2089.3	0.0129
0.0451	4828.6	0.0049	0.0440	2586.6	0.0053	0.0441	2073.7	0.0136
0.0460	4867.9	0.0053	0.0450	2615.8	0.0055	0.0450	2061.0	0.0139
0.0472	4906.8	0.0053	0.0462	2647.9	0.0060	0.0460	2032.7	0.0149
0.0480	4929.4	0.0056	0.0472	2668.8	0.0065	0.0470	2014.3	0.0153
0.0492	4971.2	0.0061	0.0482	2687.2	0.0068	0.0481	1989.3	0.0158
0.0502	4996.9	0.0066	0.0492	2700.9	0.0070	0.0491	1966.9	0.0166
0.0510	5029.4	0.0068	0.0501	2719.5	0.0075	0.0500	1957.0	0.0171
0.0521	5050.1	0.0071	0.0510	2726.3	0.0077	0.0510	1928.7	0.0178
0.0531	5064.7	0.0075	0.0520	2740.5	0.0082	0.0521	1913.9	0.0185
0.0541	5082.2	0.0078	0.0530	2744.3	0.0085	0.0532	1892.7	0.0192
0.0551	5100.1	0.0083	0.0540	2755.3	0.0089	0.0541	1874.3	0.0198
0.0561	5121.8	0.0085	0.0550	2762.2	0.0094	0.0551	1849.8	0.0205
0.0570	5135.9	0.0088	0.0560	2755.3	0.0097	0.0561	1825.3	0.0210
0.0580	5143.0	0.0093	0.0570	2765.0	0.0102	0.0570	1789.4	0.0216
0.0592	5142.8	0.0098	0.0582	2761.7	0.0107	0.0581	1767.3	0.0222
0.0600	5157.6	0.0100	0.0591	2765.0	0.0109	0.0590	1746.1	0.0229
0.0612	5157.6	0.0104	0.0601	2768.8	0.0112	0.0600	1731.5	0.0232
0.0621	5161.4	0.0107	0.0611	2769.2	0.0119	0.0610	1689.5	0.0237
0.0630	5165.1	0.0112	0.0621	2765.5	0.0121	0.0622	1674.4	0.0244
0.0641	5164.9	0.0117	0.0631	2765.5	0.0124	0.0630	1674.4	0.0249
0.0650	5153.8	0.0117	0.0641	2765.2	0.0129	0.0642	1646.1	0.0254
0.0661	5150.1	0.0122	0.0650	2765.2	0.0134	0.0650	1635.8	0.0256
0.0671	5128.8	0.0127	0.0662	2748.0	0.0138	0.0661	1628.7	0.0262
0.0680	5114.2	0.0129	0.0672	2740.5	0.0140	0.0671	1616.9	0.0268
0.0690	5104.3	0.0134	0.0680	2727.1	0.0145	0.0680	1585.8	0.0270
0.0701	5100.3	0.0136	0.0691	2700.9	0.0151	0.0690	1578.3	0.0276
0.0712	5061.4	0.0141	0.0702	2691.9	0.0153	0.0700	1575.0	0.0281
0.0721	5042.6	0.0144	0.0711	2668.8	0.0158	0.0712	1571.2	0.0286
0.0730	5029.1	0.0149	0.0721	2660.8	0.0162	0.0720	1574.5	0.0288
0.0741	5004.9	0.0153	0.0731	2640.6	0.0165	0.0731	1550.0	0.0292
0.0750	4978.5	0.0153	0.0740	2625.5	0.0170	0.0742	1542.4	0.0297
0.0761	4961.3	0.0158	0.0750	2601.0	0.0173	0.0751	1521.7	0.0300
0.0770	4925.7	0.0166	0.0760	2583.3	0.0178	0.0761	1510.4	0.0302
0.0780	4900.5	0.0166	0.0771	2579.5	0.0180	0.0770	1514.1	0.0308
0.0790	4889.8	0.0171	0.0781	2568.9	0.0184	0.0781	1514.1	0.0312
0.0802	4850.2	0.0173	0.0792	2561.4	0.0187	0.0790	1488.7	0.0312
0.0811	4822.0	0.0178	0.0801	2548.2	0.0192	0.0800	1484.4	0.0317
0.0821	4778.6	0.0183	0.0811	2540.6	0.0194	0.0810	1450.0	0.0322
0.0831	4742.8	0.0183	0.0821	2529.3	0.0200	0.0820	1431.2	0.0324
0.0841	4707.2	0.0188	0.0830	2490.2	0.0202	0.0831	1410.2	0.0324
0.0851	4668.8	0.0190	0.0841	2476.0	0.0205	0.0842	1406.7	0.0329
0.0861	4632.5	0.0193	0.0850	2453.9	0.0209	0.0851	1406.7	0.0331

**Direct Shear Data  
ASTM D3080**

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		

Point A			Point B			Point C			
Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	
0.0870	4600.2	0.0197	0.0860	2444.0	0.0214	0.0861	1395.8	0.0334	
0.0881	4589.8	0.0200	0.0870	2411.5	0.0216	0.0871	1373.9	0.0339	
0.0890	4557.3	0.0205	0.0882	2393.5	0.0219	0.0881	1323.7	0.0339	
0.0900	4514.6	0.0207	0.0890	2383.4	0.0224	0.0890	1332.7	0.0341	
0.0912	4471.7	0.0210	0.0901	2376.1	0.0227	0.0900	1353.2	0.0344	
0.0922	4425.0	0.0212	0.0912	2347.3	0.0231	0.0910	1359.5	0.0349	
0.0932	4367.5	0.0215	0.0921	2315.5	0.0236	0.0921	1356.7	0.0352	
0.0941	4335.5	0.0217	0.0931	2312.0	0.0236	0.0932	1356.0	0.0354	
0.0952	4296.4	0.0221	0.0941	2300.0	0.0238	0.0942	1365.2	0.0356	
0.0961	4253.2	0.0224	0.0950	2282.3	0.0243	0.0952	1335.0	0.0361	
0.0970	4231.8	0.0224	0.0961	2254.0	0.0246	0.0961	1342.6	0.0363	
0.0980	4207.3	0.0227	0.0972	2237.0	0.0250	0.0970	1353.2	0.0366	
0.0990	4160.1	0.0232	0.0982	2218.2	0.0253	0.0980	1361.9	0.0368	
0.1000	4124.3	0.0232	0.0992	2201.2	0.0255	0.0990	1360.0	0.0371	
0.1012	4081.9	0.0237	0.1002	2165.4	0.0258	0.1001	1370.4	0.0375	
0.1022	4024.4	0.0239	0.1011	2147.0	0.0260	0.1010	1370.8	0.0378	
0.1031	3977.9	0.0241	0.1021	2140.2	0.0260	0.1020	1367.1	0.0380	
0.1042	3938.3	0.0241	0.1031	2118.2	0.0265	0.1032	1363.3	0.0385	
0.1051	3884.6	0.0241	0.1040	2093.3	0.0265	0.1041	1356.5	0.0390	
0.1061	3867.6	0.0244	0.1050	2068.7	0.0270	0.1051	1353.4	0.0393	
0.1071	3816.9	0.0246	0.1061	2054.1	0.0270	0.1060	1331.2	0.0395	
0.1080	3799.5	0.0249	0.1073	2054.1	0.0276	0.1071	1306.7	0.0400	
0.1090	3763.2	0.0249	0.1081	2061.4	0.0278	0.1081	1291.6	0.0403	
0.1100	3777.3	0.0251	0.1090	2025.8	0.0280	0.1091	1259.1	0.0402	
0.1110	3745.3	0.0254	0.1101	2029.6	0.0282	0.1100	1255.8	0.0407	
0.1121	3692.3	0.0254	0.1110	1982.7	0.0282	0.1110	1267.1	0.0407	
0.1132	3648.9	0.0254	0.1121	1968.8	0.0285	0.1120	1281.3	0.0412	
0.1141	3616.1	0.0254	0.1131	1972.1	0.0285	0.1132	1260.1	0.0412	
0.1151	3591.1	0.0256	0.1141	1961.7	0.0290	0.1142	1245.2	0.0415	
0.1161	3551.5	0.0256	0.1150	1932.7	0.0292	0.1151	1255.8	0.0417	
0.1170	3548.7	0.0256	0.1160	1914.8	0.0292	0.1162	1267.1	0.0417	
0.1181	3513.1	0.0259	0.1172	1901.2	0.0295	0.1171	1284.8	0.0422	
0.1190	3473.8	0.0259	0.1182	1918.4	0.0297	0.1180	1284.6	0.0422	
0.1200	3473.5	0.0258	0.1191	1900.5	0.0300	0.1191	1291.9	0.0426	
0.1212	3451.6	0.0258	0.1201	1871.5	0.0302	0.1200	1278.2	0.0426	
0.1222	3448.3	0.0259	0.1211	1850.5	0.0302	0.1210	1282.2	0.0431	
0.1230	3412.0	0.0261	0.1221	1822.2	0.0301	0.1221	1277.7	0.0434	
0.1241	3398.3	0.0261	0.1231	1814.7	0.0302	0.1233	1278.0	0.0434	
0.1250	3390.8	0.0263	0.1240	1804.5	0.0304	0.1240	1277.7	0.0436	
0.1261	3387.0	0.0263	0.1250	1797.0	0.0304	0.1252	1277.5	0.0436	
0.1270	3358.7	0.0263	0.1260	1778.8	0.0306	0.1261	1281.7	0.0442	
0.1280	3362.5	0.0265	0.1270	1793.7	0.0306	0.1271	1263.4	0.0444	
0.1290	3355.0	0.0265	0.1282	1793.9	0.0309	0.1281	1252.0	0.0446	

**Direct Shear Data  
ASTM D3080**

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		

Point A			Point B			Point C			
Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	
0.1300	3237.6	0.0265	0.1291	1790.1	0.0312	0.1290	1267.1	0.0448	
0.1312	3266.3	0.0265	0.1302	1790.1	0.0312	0.1301	1259.6	0.0451	
0.1320	3279.5	0.0265	0.1311	1778.8	0.0314	0.1310	1259.8	0.0453	
0.1331	3294.6	0.0268	0.1321	1775.1	0.0317	0.1320	1242.6	0.0456	
0.1342	3287.1	0.0268	0.1331	1782.6	0.0317	0.1330	1248.7	0.0458	
0.1351	3304.3	0.0268	0.1341	1782.6	0.0319	0.1342	1220.0	0.0461	
0.1361	3279.5	0.0270	0.1351	1761.9	0.0322	0.1350	1216.7	0.0464	
0.1370	3283.3	0.0270	0.1360	1750.5	0.0324	0.1361	1199.2	0.0465	
0.1380	3287.3	0.0270	0.1370	1746.8	0.0324	0.1371	1217.2	0.0468	
0.1390	3265.9	0.0270	0.1380	1739.2	0.0324	0.1381	1167.2	0.0468	
0.1401	3255.0	0.0270	0.1390	1732.9	0.0326	0.1391	1127.6	0.0470	
0.1412	3272.7	0.0270	0.1402	1720.4	0.0326	0.1401	1127.6	0.0473	
0.1421	3261.4	0.0270	0.1411	1711.0	0.0326	0.1410	1127.6	0.0473	
0.1432	3248.9	0.0270	0.1421	1675.1	0.0326	0.1420	1135.1	0.0475	
0.1441	3208.1	0.0270	0.1431	1699.6	0.0326	0.1430	1117.0	0.0478	
0.1451	3219.2	0.0270	0.1441	1675.6	0.0328	0.1441	1123.8	0.0478	
0.1461	3223.0	0.0270	0.1450	1682.7	0.0328	0.1451	1113.7	0.0480	
0.1471	3211.9	0.0270	0.1460	1696.6	0.0331	0.1460	1108.0	0.0480	
0.1481	3194.7	0.0273	0.1470	1700.3	0.0333	0.1471	1113.4	0.0483	
0.1490	3198.2	0.0273	0.1482	1682.7	0.0333	0.1480	1091.8	0.0485	
0.1500	3176.3	0.0273	0.1492	1668.3	0.0333	0.1491	1106.4	0.0488	
0.1510	3183.4	0.0273	0.1502	1675.1	0.0333	0.1500	1113.7	0.0490	
0.1522	3183.4	0.0276	0.1512	1690.2	0.0333	0.1511	1120.8	0.0493	
0.1531	3190.9	0.0276	0.1521	1686.4	0.0333	0.1520	1113.9	0.0495	
0.1540	3215.4	0.0276	0.1531	1690.2	0.0336	0.1530	1088.0	0.0497	
0.1551	3211.7	0.0278	0.1541	1694.0	0.0339	0.1540	1080.5	0.0497	
0.1561	3208.1	0.0281	0.1550	1682.7	0.0339	0.1552	1085.2	0.0500	
0.1570	3211.9	0.0281	0.1560	1661.0	0.0339	0.1562	1095.5	0.0502	
0.1581	3194.7	0.0281	0.1570	1621.6	0.0339	0.1571	1063.5	0.0502	
0.1590	3187.1	0.0281	0.1582	1647.1	0.0343	0.1581	1063.5	0.0502	
0.1600	3165.7	0.0283	0.1590	1629.9	0.0341	0.1591	1080.9	0.0502	
0.1610	3155.1	0.0283	0.1600	1629.9	0.0341	0.1600	1031.4	0.0502	
0.1622	3122.8	0.0285	0.1610	1626.1	0.0343	0.1610	1002.4	0.0502	
0.1632	3126.8	0.0286	0.1621	1621.9	0.0344	0.1620	1023.9	0.0502	
0.1642	3123.0	0.0287	0.1631	1588.9	0.0343	0.1630	1023.9	0.0502	
0.1652	3126.3	0.0286	0.1640	1595.0	0.0343	0.1640	1016.8	0.0505	
0.1661	3087.2	0.0288	0.1650	1575.2	0.0344	0.1651	1003.1	0.0505	
0.1671	3072.1	0.0287	0.1660	1575.2	0.0344	0.1661	1009.7	0.0507	
0.1680	3065.8	0.0287	0.1671	1564.6	0.0344	0.1671	984.5	0.0505	
0.1691	3076.4	0.0286	0.1680	1575.2	0.0346	0.1681	1002.7	0.0507	
0.1700	3069.3	0.0288	0.1692	1592.9	0.0344	0.1691	984.3	0.0507	
0.1711	3075.9	0.0288	0.1701	1599.9	0.0346	0.1701	988.1	0.0507	
0.1720	3047.6	0.0288	0.1711	1593.1	0.0346	0.1711	988.1	0.0507	

**Direct Shear Data  
ASTM D3080**

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		

Point A			Point B			Point C			
Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	Displacement (in)	Stress (psf)	Vertical Displacement (in)	
0.1732	3066.9	0.0290	0.1720	1590.0	0.0348	0.1720	995.6	0.0510	
0.1741	3058.7	0.0290	0.1731	1575.2	0.0349	0.1730	995.6	0.0512	
0.1751	3043.8	0.0292	0.1741	1571.4	0.0348	0.1742	976.7	0.0512	
0.1761	3047.6	0.0292	0.1751	1560.8	0.0348	0.1750	948.9	0.0512	
0.1771	3036.8	0.0292	0.1760	1507.3	0.0348	0.1762	948.9	0.0510	
0.1781	3043.8	0.0292	0.1770	1507.3	0.0348	0.1772	959.8	0.0512	
0.1790	3029.0	0.0292	0.1780	1514.8	0.0350	0.1781	988.1	0.0512	
0.1800	3054.4	0.0295	0.1792	1531.8	0.0349	0.1791	999.1	0.0515	
0.1810	3047.6	0.0295	0.1802	1546.9	0.0349	0.1801	1013.3	0.0517	
0.1820	3025.5	0.0297	0.1812	1564.3	0.0351	0.1811	1020.1	0.0520	
0.1832	3047.6	0.0297	0.1821	1556.8	0.0350	0.1821	1027.7	0.0519	
0.1842	3033.0	0.0297	0.1831	1553.3	0.0350	0.1830	1023.9	0.0522	
0.1852	3015.6	0.0297	0.1841	1546.9	0.0353	0.1840	980.5	0.0524	
0.1861	3022.4	0.0297	0.1851	1539.4	0.0353	0.1852	967.3	0.0524	
0.1871	3021.9	0.0300	0.1861	1543.1	0.0353	0.1862	973.7	0.0524	
0.1881	3033.0	0.0300	0.1870	1550.4	0.0353	0.1871	981.7	0.0524	
0.1890	3036.3	0.0300	0.1882	1554.0	0.0353	0.1880	981.0	0.0527	
0.1900	3015.1	0.0303	0.1890	1546.9	0.0353	0.1891	966.8	0.0527	
0.1910	3000.7	0.0303	0.1901	1557.5	0.0353	0.1901	970.1	0.0529	
0.1922	2990.3	0.0302	0.1912	1571.9	0.0355	0.1911	977.9	0.0532	
0.1930	2961.1	0.0302	0.1921	1582.7	0.0355	0.1920	980.8	0.0534	
0.1940	2955.0	0.0303	0.1931	1586.5	0.0355	0.1930	977.7	0.0534	
0.1951	2954.3	0.0303	0.1941	1589.3	0.0356	0.1940	952.5	0.0536	
0.1961	2929.3	0.0303	0.1950	1600.2	0.0358	0.1950	938.6	0.0537	
0.1971	2919.2	0.0302	0.1961	1599.9	0.0358	0.1962	946.1	0.0539	
0.1980	2965.1	0.0305	0.1970	1599.7	0.0358	0.1972	938.3	0.0539	
0.1991	2993.6	0.0303	0.1980	1621.4	0.0358	0.1982	938.6	0.0542	
0.2001	3008.0	0.0303	0.1990	1629.2	0.0361	0.1990	895.7	0.0541	
0.2011	3015.6	0.0303	0.2002	1628.9	0.0363	0.2001	895.7	0.0541	
0.2020	3015.6	0.0303	0.2010	1632.7	0.0363	0.2011	888.4	0.0542	
0.2031	3008.0	0.0305	0.2021	1632.5	0.0363	0.2020	844.8	0.0539	
0.2042	2976.0	0.0305	0.2030	1639.5	0.0366	0.2031	859.4	0.0539	
0.2052	2976.0	0.0307	0.2041	1650.6	0.0368	0.2040	863.4	0.0541	
0.2061	2964.6	0.0305	0.2051	1613.6	0.0368	0.2050	866.9	0.0541	
0.2071	2979.5	0.0305	0.2060	1629.2	0.0370	0.2060	870.0	0.0542	
0.2081	2955.2	0.0305	0.2070	1628.9	0.0370	0.2072	863.4	0.0544	
0.2091	2954.7	0.0305	0.2080	1618.6	0.0370	0.2082	856.1	0.0544	
			0.2090	1625.4	0.0370	0.2091	837.7	0.0544	
			0.2100	1614.8	0.0370				



ADVANCED TERRA TESTING

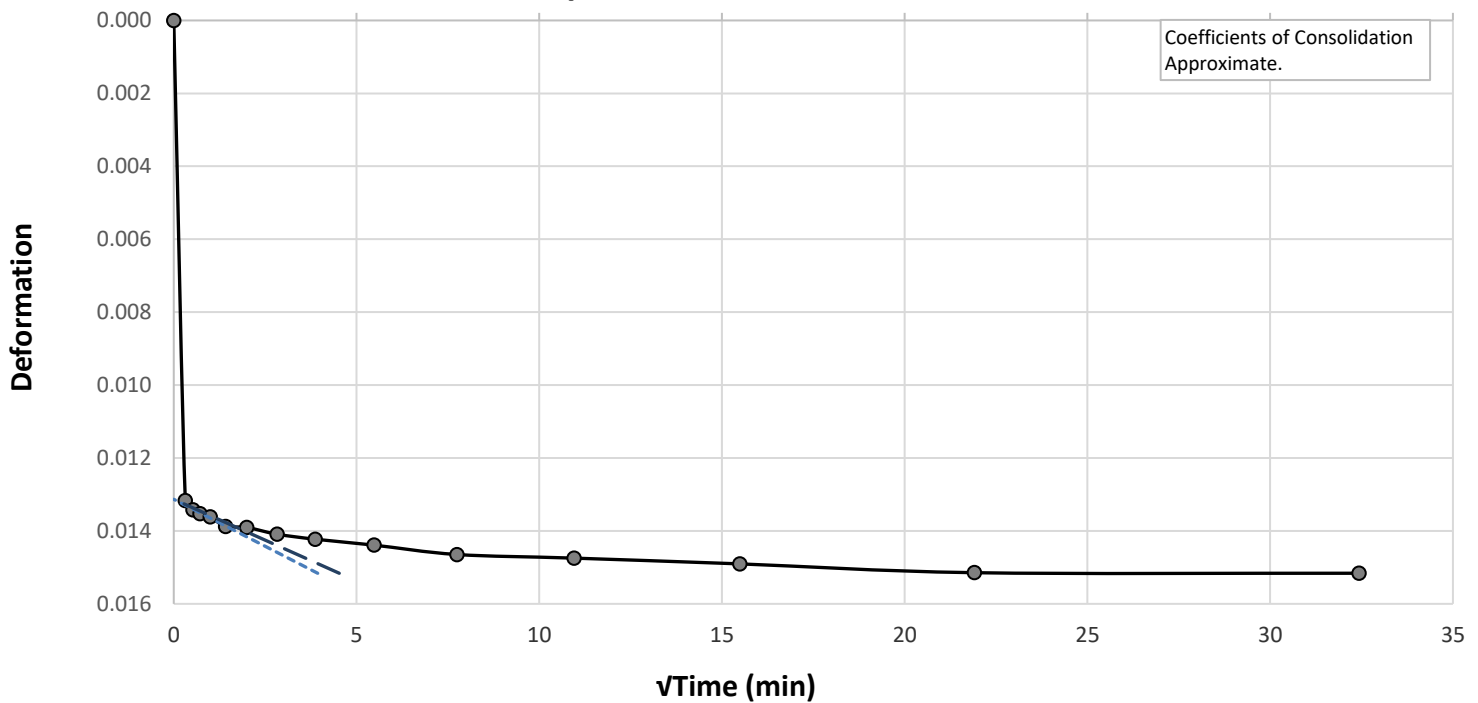
### DS Shear Rate

### ASTM D 2435

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25	STANDARD	ASTM D3080
TECHNICIAN	AC		

Coefficient of Consolidation (cm <sup>2</sup> /s)	Shear Rate (in/min)	Load (psf)	Elapsed Time (min)	Elapsed Time $\sqrt{min}$	Dial Reading (in)	Deformation (in)	Strain (%)
0.00799	0.0064	4000	0	0.00	0.0000	0.0000	0.0
T50 (min)	T90 (min)	Distance to Failure (in):	0.1	0.32	0.0132	0.0132	1.3
0.880	2.85	0.21	0.28	0.53	0.0134	0.0134	1.3
			0.52	0.72	0.0135	0.0135	1.4
NOTES:			1	1.00	0.0136	0.0136	1.4
			2	1.41	0.0139	0.0139	1.4
			4	2.00	0.0139	0.0139	1.4
			8	2.83	0.0141	0.0141	1.4
			15	3.87	0.0142	0.0142	1.4
			30	5.48	0.0144	0.0144	1.4
			60	7.75	0.0146	0.0146	1.5
			120	10.95	0.0147	0.0147	1.5
			240	15.49	0.0149	0.0149	1.5
			480	21.91	0.0151	0.0151	1.5
			1052	32.43	0.0152	0.0152	1.5

Square Root of Time Versus Strain



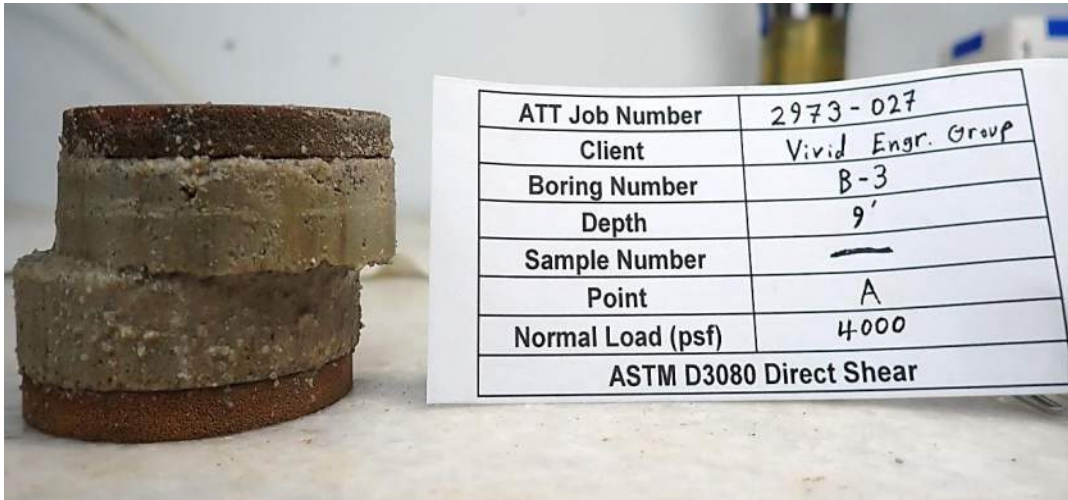
Data entry by: AC Date: 08/13/25  
 Checked by: BDF Date: 08/13/25



**Direct Shear  
ASTM D3080  
(Point A Picture 1)**

ADVANCED TERRA TESTING

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		



NOTES

Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

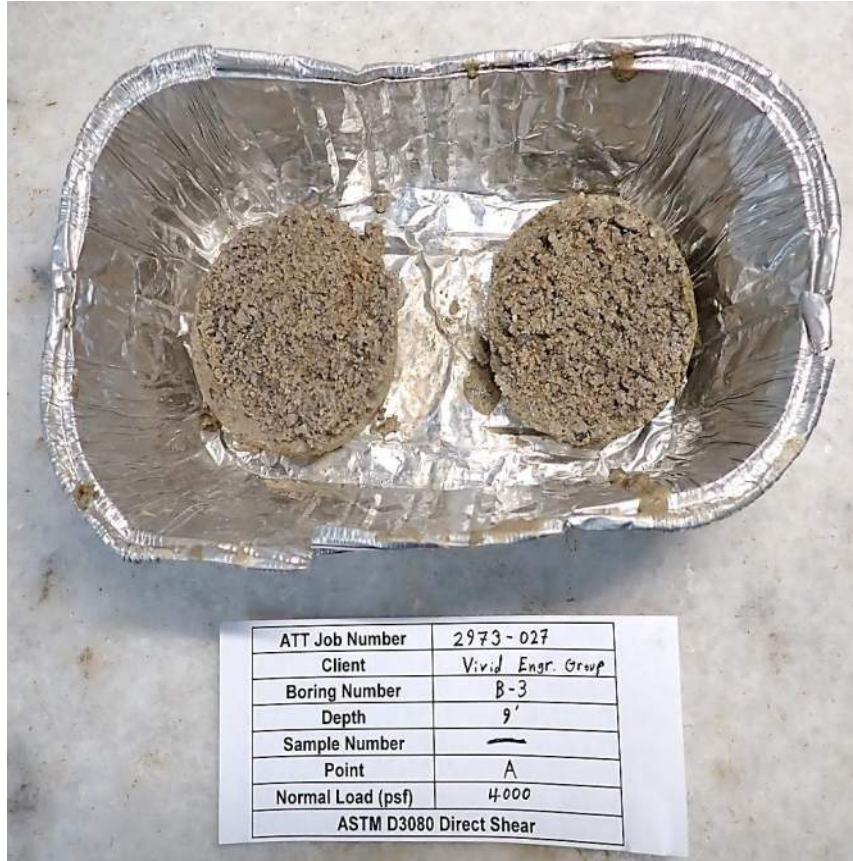
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**Direct Shear  
ASTM D3080  
(Point A Picture 2)**

ADVANCED TERRA TESTING

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		



NOTES

Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

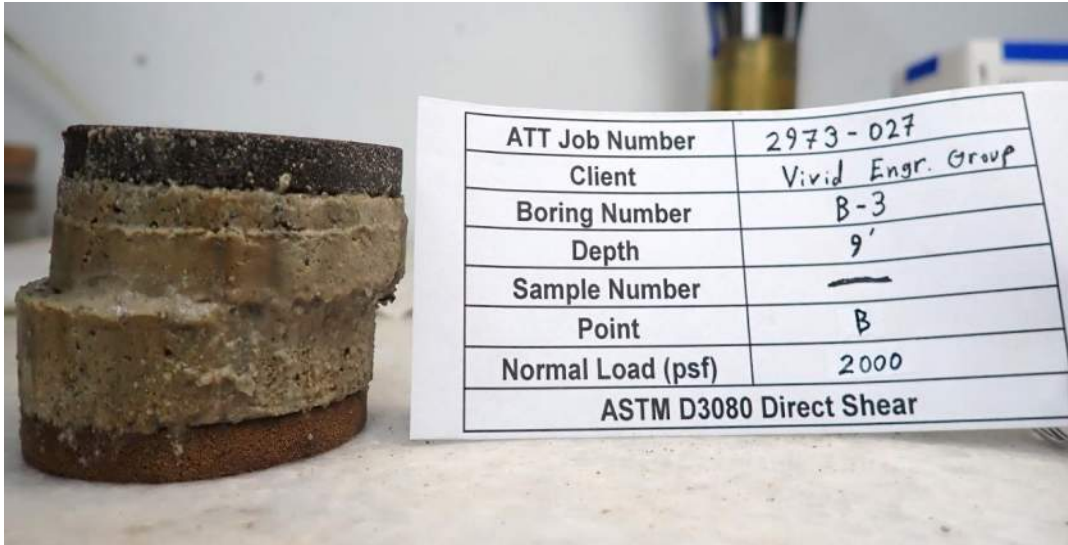
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**Direct Shear  
ASTM D3080  
(Point B Picture 1)**

ADVANCED TERRA TESTING

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		



NOTES

Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

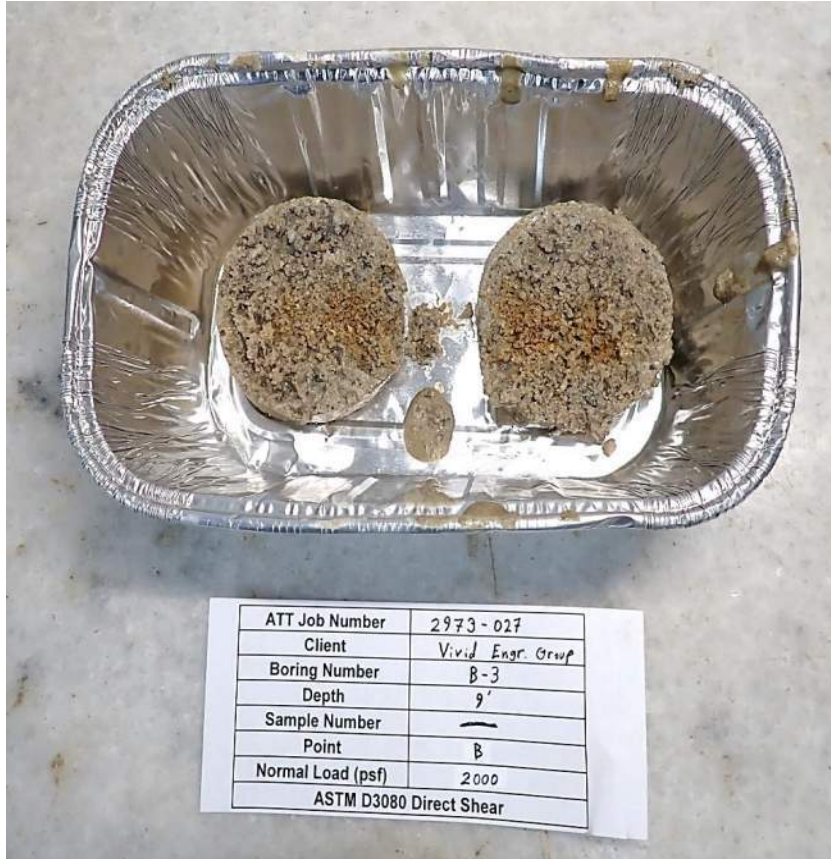
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ADVANCED TERRA TESTING

**Direct Shear  
ASTM D3080  
(Point B Picture 2)**

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		



**NOTES**

Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

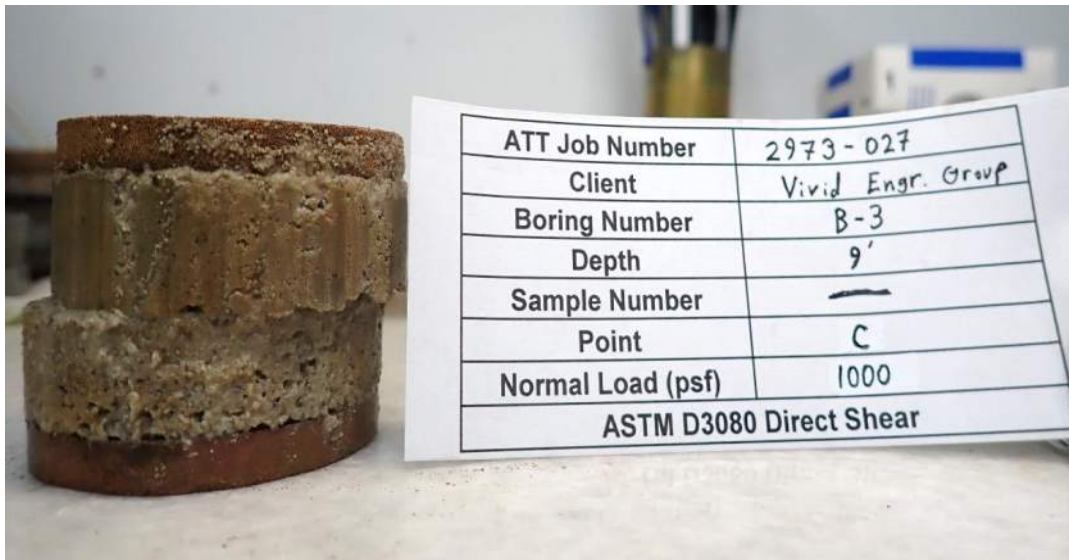
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**Direct Shear  
ASTM D3080  
(Point C Picture 1)**

ADVANCED TERRA TESTING

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		



NOTES

Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

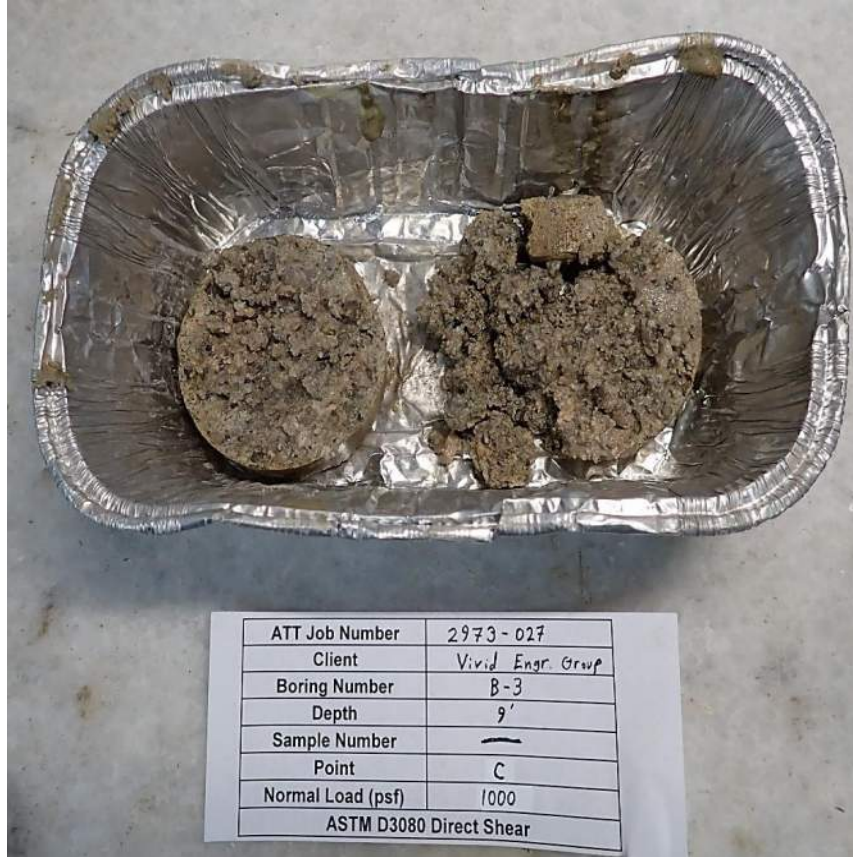
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**Direct Shear  
ASTM D3080  
(Point C Picture 2)**

ADVANCED TERRA TESTING

CLIENT	Vivid Engineering Group	BORING NO.	B-3
JOB NO.	2973-027	DEPTH	9'
PROJECT	Bent Grass Meadows	SAMPLE NO.	--
PROJECT NO.	D25-2-928	DATE SAMPLED	--
LOCATION	Colorado Springs, CO	DESCRIPTION	Intact Specimens
DATE TESTED	08/07/25		
TECHNICIAN	AC		



NOTES

Peak parameters reflect short-term conditions at small strains and should not be used for long-term stability. Ultimate parameters are recommended for design. Apparent cohesion values for granular soils may reduce over time; a conservative approach is to assume  $c'=0$ .

Picture File: P8123769.JPG  
File name: 2973027\_\_Direct Shear ASTM D3080\_0.xlsm

**Appendix C**  
**Analytical Laboratory Test Results**

# Corrosion Test Results



Project Name: Bent Grass  
 Project No. D25-2-928

Tested By: LV  
 Date Sampled: 7/15/2025  
 Date Tested: 7/22/2025

Sample ID: B-2 @ 4'

Matrix: Soil

Test	Results	Method
Chloride - Water Soluble	0.001 %	AASHTO T291-91/ASTM D4327
pH	8.6 units	AASHTO T289-91
Redox Potential	77.1 mv	ASTM D1498
Electrical Resistivity	2750 ohm-cm	AASHTO T288-91
Sulfate - Water Soluble	0.004 %	CDOT CP-L 2103/ASTM D4327
Sulfide	Positive -	AWWA C105

Sample ID: B-6/B-7 @ 19'

Matrix: Soil

Test	Results	Method
Chloride - Water Soluble	0.001 %	AASHTO T291-91/ASTM D4327
pH	7.6 units	AASHTO T289-91
Redox Potential	67.6 mv	ASTM D1498
Electrical Resistivity	1250 ohm-cm	AASHTO T288-91
Sulfate - Water Soluble	<0.001 %	CDOT CP-L 2103/ASTM D4327
Sulfide	Trace -	AWWA C105

**Appendix D**

**Site Photos**



SITE CONDITIONS AT BORING B-11 - LOOKING EAST



SITE CONDITIONS AT BORING B-6 - LOOKING NORTHWEST



SITE PHOTOS

FIGURE

! " ## \$  
 \$ % " "  
 (\$ ) " \$ ~

D-1



**SITE CONDITIONS AT BORING P-6 - LOOKING SOUTH**



**PIEZOMETER INSTALL AT BORING P-6**



**SITE PHOTOS**

FIGURE

**D-2**



**SITE CONDITIONS AT BORING P-2 - LOOKING WEST**



**SITE CONDITIONS AT BORING P-3 - LOOKING NORTHWEST**



**SITE PHOTOS**

FIGURE

**D-3**



**SITE CONDITIONS AT BORING B-15 - LOOKING NORTH**



**SITE CONDITIONS AT BORING P-5 - LOOKING NORTH**



**SITE PHOTOS**

FIGURE

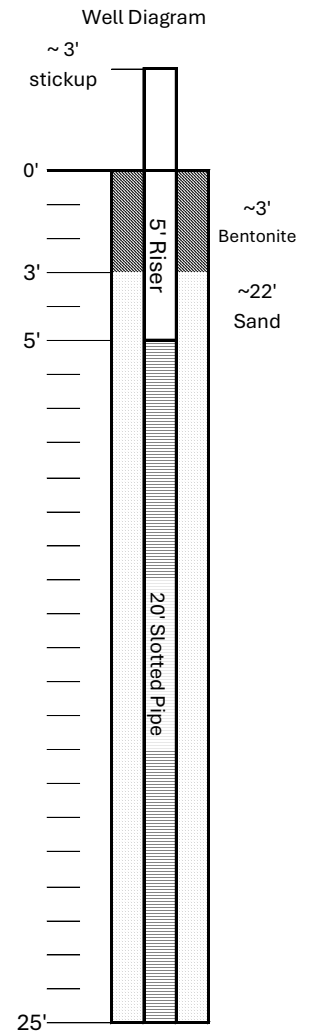
~ " ~ ~ ~ ! " ## ~ \$  
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**D-4**

**Appendix E**  
**Groundwater Measurements**

Piezometer Designation	Date of Reading	Depth to Water (ft)	Reader Initials
P-1	7/17/2025	5	DC
	9/2/2025	4	SAM
	10/30/2025	4	DC
	11/26/2025	3.8	DC
	12/23/2025	3.5	SAM
	1/22/2026	3.5	SAM
	2/17/2026	3.5	SAM
P-2	7/17/2025	8	DC
	9/2/2025	7	SAM
	10/30/2025	7	DC
	11/26/2025	6.8	DC
	12/23/2025	6.5	SAM
	1/22/2026	6.5	SAM
	2/17/2026	6.8	SAM
P-3	7/17/2025	6	DC
	9/2/2025	4	SAM
	10/30/2025	6	DC
	11/26/2025	5.8	DC
	12/23/2025	6.5	SAM
	1/22/2026	6	SAM
	2/17/2026	6	SAM

Piezometer Designation	Date of Reading	Depth to Water (ft)	Reader Initials
P-4	7/17/2025	9.25	DC
	9/2/2025	8	SAM
	10/30/2025	8	DC
	11/26/2025	7.8	DC
	12/23/2025	8	SAM
	1/22/2026	7.8	SAM
	2/17/2026	8.1	SAM
P-5	7/17/2025	8.5	DC
	9/2/2025	7.3	SAM
	10/30/2025	7.5	DC
	11/26/2025	7.2	DC
	12/23/2025	7.5	SAM
	1/22/2026	7.5	SAM
	2/17/2026	7.6	SAM
P-6	7/17/2025	8.5	DC
	9/2/2025	8.3	SAM
	10/30/2025	7	DC
	11/26/2025	5.9	DC
	12/23/2025	6	SAM
	1/22/2026	6	SAM
	2/17/2026	6.6	SAM



## **Appendix F**

### **Important Information About This Geotechnical Engineering Report**

# Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

## Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

## You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

### Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

### This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

### This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

### Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

*conspicuously that you’ve included the material for information purposes only.* To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

### Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

### Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



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