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SOILS AND GEOLOGY STUDY
WATERVIEW EAST COMMERCIAL
PARCEL NO. 55092-00-002
SOUTH POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, COLORADO

Prepared for:

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Attn: Heath Herber

February 17, 2023

Respectfully Submitted,

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1.0 SUMMARY

Project Location

The project lies in portions of the NW ¼ and SW¼ of Section 9, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located at the southeast corner of South Powers Boulevard and Bradley Road approximately 2½ miles east of Security-Widefield, Colorado, just south of the Colorado Springs city limits.

Project Description

Total acreage involved in the project is approximately 22.1 acres. The proposed site development consists of commercial development and associated site improvements. The development will utilize municipal sewer and water.

Scope of Report

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

Land Use and Engineering Geology

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

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

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is in portions of the NW ¼ and SW¼ of Section 9, Township 15 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located approximately 2½ miles east of Security-Widefield, Colorado just south of the Colorado Springs city limits, at the southeastern corner of South Powers Boulevard and Bradley Road. The location of the site is as shown on the Vicinity Map, Figure 1.

The topography of the site is generally gradually to moderately sloping to the east and south along a small north-south trending ridge in the central portion of the site. No drainages were observed on the site. The site is currently undeveloped and a large stockpile of fill is located in the southern portion of the site. The site boundaries are indicated on the USGS Map, Figure 2. Previous land uses have included grazing and pasture land. The site contains primarily field grasses, weeds, cacti, and yuccas. Site photographs, taken February 6, 2023, are included in Appendix A.

Total acreage involved in the proposed development is approximately 22.1 acres. The proposed site development consists commercial development and associated site improvements. Three retail buildings, an office building, grocery store, three restaurants, a gas station, and storage facility are proposed. Three detention ponds are proposed in the northeastern, eastern, and southwestern portions of the site. Tiered retaining walls are proposed in the northeastern and southwestern portions of the site. Significant grading will be performed to develop the site. Cuts of up to 20 feet, and fills up to 35 feet are proposed. Reportedly the preliminary grading plan is a balanced site. Nine (9) Test Borings were drilled across the site to determine general soil and bedrock characteristics. The locations of the test borings are indicated on the Site Plan/Test Boring Location Map, Figure 3.

3.0 SCOPE OF THE REPORT

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

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of any bedrock features and significant surficial deposits. The Natural Resource Conservation Service (NRCS), previously the Soil Conservation Service (SCS) survey was also reviewed to evaluate the site. The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved both field reconnaissance, measurements and air photo reconnaissance and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identified pertinent geologic conditions affecting development. The field mapping was performed by personnel of Entech Engineering, Inc. on March 27, 2020.

Nine (9) Test Borings were performed on the site to determine general soil and bedrock characteristics. The locations of the test borings are indicated on the Site Plan/Test Boring Location Map, Figure 3. The Test Boring Logs are presented in Appendix B. Results of this testing will be discussed later in this report.

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

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 9 miles to the west is a major structural feature known as the Ute Pass Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southeastern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northeasterly direction (Reference 1). The rocks in the area of the site are sedimentary in nature and typically Upper Cretaceous in age. The bedrock underlying the site

consists of the Pierre Shale Formation. Overlying this formation are unconsolidated deposits of artificial fill deposits, residual soils, and eolian soils of Quaternary Age. The eolian sands deposited by the action of prevailing winds from the west and northwest. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Survey

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has mapped four soil types on the site Figure 5. In general, the soils classify as loamy sand, sandy loam, loam, and clay loam. The soils are described as follows:

Type	Description
8	Blakeland Loamy Sand, 0 to 3% slopes
56	Nelson-Tassel Fine Sandy Loams, 3 to 18% slopes
86	Stoneham Sandy Loam, 3 to 8% slopes
108	Wiley Silty Loam, 3 to 9% slopes

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

5.3 Site Stratigraphy

The Elsmere Quadrangle Geology Map showing the site is presented in (Figure 5, Reference 4). The Geology/Engineering Geology Map prepared for the site is presented in Figure 6. Three mappable units were identified on this site which are described as follows:

Qaf **Artificial Fill of Holocene Age:** These are man-made fill deposits associated with a large stockpile in the southern portion of the site. The stockpile is claystone and shale that was generated during site grading of the subdivision south and east of the parcel.

Qes **Eolian Sand of Holocene and Pleistocene Age:** These deposits are fine to medium grained soil deposited by the action of the prevailing winds from the northwest. They typically occur as large dune deposits or narrow ridges. The eolian soil types are

typically tan to brown in color and tend to have a very uniform or well-sorted gradation. These materials tend to have a relatively high permeability and low density.

Kp **Pierre Shale of Cretaceous Age:** This formation consists of olive brown to gray claystone and shale. These materials were deposited in a marine environment associated with the Cretaceous Seaway. Typically, there is a layer of residually weathered soil present above the Pierre Shale. The soils and bedrock associated with this formation are typically expansive.

The soils listed above were mapped from site-specific mapping, the *Geologic Map of the Elsmere Quadrangle* distributed by the Colorado Geological Survey in 2002 (Reference 4), the *Geologic Map of the Colorado Springs-Castle Rock Area,* distributed by the US Geological Survey in 1979 (Reference 5), and the *Geologic Map of the Pueblo 1^0 x 2^0 Quadrangle*, distributed by the US Geological Survey in 1978 (Reference 6). The Test Borings were also used in evaluating the site and are included in Appendix B. The Geology Map prepared for the site is presented in Figure 6.

5.4 Soil Conditions

Two soil types and one bedrock type were encountered in the test borings drilled for the preliminary subsurface investigation: Type 1: native silty to very silty sand (SM), Type 2: sandy clay (CL), and Type 3: native sandy claystone bedrock (CL). The soils were classified in accordance with the Unified Soil Classification System (USCS) using the laboratory testing results and the observations made during drilling.

Soil Type 1 classified as silty to very silty sand (SM). The sand was encountered in six of the seven test borings at the ground surface or 3 feet bgs and extending to depths ranging from 9 to 17 feet bgs or to the termination of borings (20 feet). Standard Penetration Testing on the sand resulted in N-values ranging from 10 to 43 bpf, indicating medium dense to dense states. Water content and grain size testing resulted in water contents of 2 to 8 percent, with 20 to 47 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits testing on the sand resulted in no values. The sand is anticipated to exhibit low to negligible expansion potential. Sulfate testing resulted in less than 0.01 percent soluble sulfate by weight, indicating negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 2 classified as native sandy clay (CL). The native clay was encountered in five of the test borings at depths ranging from the ground surface to 17 feet bgs and extending to 3 feet or to the termination of the borings (20 feet). Standard Penetration Testing on the clay resulted in N-values of 12 to 36 blows per foot, indicating firm to very stiff consistencies. Water content and grain size testing resulted in water contents of 7 to 18 percent, with 81 to 85.5 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits Testing resulted a liquid limit of 33 percent and a plastic index of 14 percent. Swell/Consolidation Testing on two samples of the sandy clay resulted in volume changes of -0.4 to 1.4 percent indicating a low consolidation potential and a low to moderate expansion potential. Sulfate testing resulted in less than 0.01 percent soluble sulfate by weight, indicating negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 3 classified as native sandy claystone bedrock (CL). The claystone was encountered in Test Boring Nos. 1, 2, and 3 at 14 to 18 feet bgs and extending to the termination of the boring (20 feet bgs). Standard Penetration Testing on the claystone resulted in N-values of 50 to greater than 50 blows per foot, indicating hard consistencies. Water content and grain size testing resulted in water contents of 10 to 14 percent moisture content, with 84 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits Testing resulted in a liquid limit of 43 and a plastic index of 24 percent. Swell/Consolidation Testing resulted in a volume change of 2.1 percent indicating a moderate potential for expansion. Sulfate testing resulted in less than 0.01 percent soluble sulfate by weight, which indicates a negligible potential for below grade concrete degradation due to sulfate attack. The claystone in this area typically has high sulfate levels.

Additional soil descriptions are presented on the enclosed drill logs. A Summary of Laboratory Test Results and the Test Boring Logs are presented in Appendix B. The soils were classified using the results of the laboratory testing, the Unified Soil Classification System (USCS), and visual classification. The soil types are expected to vary across the site. Also, stratification lines shown on the logs represent the approximate boundary between soil types and the actual transition are expected to be gradual and vary with location.

5.5 Groundwater

Groundwater was not encountered in the test borings which were drilled to depths of 20 to 30 feet. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time.

It should be noted that in the sandy materials on site, some groundwater conditions might be encountered due to the variability in the soil profile. Isolated sand and gravel layers within the soils, sometimes only a few feet in thickness and width, can carry water in the subsurface. Groundwater may also flow on top of the underlying bedrock. Builders and planners should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site and deal with each individual problem as necessary at the time of construction.

6.0 ENGINEERING GEOLOGY – IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

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

Artificial Fill

Fill was not encountered in the test borings, however, a large stockpile of fill is located in the southern portion of the site. The fill primarily consists of claystone and shale. Additionally, other areas of artificial fill may be encountered in areas other than those mapped. The fill and fill piles are considered uncontrolled for construction purposes.

Mitigation: It is anticipated the fill piles will be removed prior to construction during site grading. Any uncontrolled fill encountered beneath foundations or retaining walls will require removal and recompaction at a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698. Fill place at depths greater than 10 feet will require 100% of its maximum Standard Proctor

Dry Density, ASTM D-698. Any organic material or mulch should be removed prior to placing controlled fill.

Expansive Soils – Constraint

Expansive soils are common in the area, and were encountered in the test borings drilled on site. Swells ranged from low to moderate in the soils tested. The clay and claystone, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and dealt with on an individual basis or possibly mitigated during site grading.

Mitigation Should expansive soils be encountered beneath the foundation; mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation, which is common in the area. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. Overexcavation depths of 4 to 6 feet are anticipated for the site. Mitigation may also include moisture conditioning and recompaction of the clay soils.

Drilled piers are another option that is used in areas where highly expansive soils are encountered. Typical minimum pier depths are on the order of 25 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Final recommendations should be determined after additional investigation of the lots.

Hydrocompaction – Constraint

Areas in which hydrocompaction have been identified are acceptable as building sites. In areas identified for this hazard classification, however, we anticipate a potential for settlement movements upon saturation of these surficial soils. The low density, uniform grain sized, windblown sand deposits are particularly susceptible to this type of phenomenon. Additionally, loose or collapsible soils may be encountered on this site.

Mitigation: The potential for settlement movement is directly related to saturation of the soils below the foundation areas. Therefore, good surface and subsurface drainage is extremely critical in these areas in order to minimize the potential for saturation of these soils. The ground

surface around all permanent structures should be positively sloped away from the structure to all points, and water must not be allowed to stand or pond anywhere on the site. We recommend that the ground surface within 10 feet of the structures be sloped away with a minimum gradient of five percent. If this is not possible on the upslope side of the structures, then a well-defined swale should be created to intercept the surface water and carry it quickly and safely around and away from the structures. Roof drains should be made to discharge well away from the structures and into areas of positive drainage. Where several structures are involved, the overall drainage design should be such that water directed away from one structure is not directed against an adjacent building. Planting and watering in the immediate vicinity of the structures, as well as general lawn irrigation, should be minimized.

The majority of the soils encountered on-site do not exhibit collapsible characteristics; however, areas of soils with consolidation potential were encountered in the test borings drilled on site. Areas in the northwestern portion of the site that have been mapped as Qes (eolian sands) are known to have the potential for consolidation upon loading.

Groundwater and Floodplain Areas

No drainages were observed on the site, and the site is not mapped within floodplain zones according to the FEMA Map No. 08041CO768G, (Figure 8, Reference 7). Groundwater was not encountered in the test borings which were drilled to depths of 20 to 30 feet. Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Exact floodplain locations and drainage studies are beyond the scope of this report.

Slope Stability Analysis

Slope Stability Analyses were conducted utilizing the GSTABL7 computer program. The sections analyzed are shown on the Slope Stability Analysis Map, Figure 7. The sections were analyzed with the proposed grading. Results of the Slope Stability Analysis are included in Appendix D.

Soil strength values were estimated using conservative values based on testing of similar soils in the area and engineering judgment. The values are similar to nearby studies as shown in Appendix E. Soil strength values used for the analysis were as follows.

Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)
Structural Fill	32	50
Sand	32	50
Clay	22	250
Claystone	12	500

Factors of safety were calculated by the Modified Bishop Method for Circular Failure Surface for failures through the proposed fill slopes in the northeastern portion of the site, and through the tiered retaining wall and detention pond in the southwestern portion of the site utilizing a liner for the detention pond. Although groundwater was not encountered, the sections were analyzed with an elevated water table.

Factors of safety of 1.7 to 2.7 were obtained for the proposed fill slopes in the northeastern portion of the site. A factor of safety of 1.3 was obtained for the proposed detention pond with tiered retaining wall in the southwestern portion of the site. **Retaining walls should be designed for global slope stability. All slopes should be evaluated for local and global stability for final designs.** Results of the slope stability analysis are presented in Appendix D. A factor of safety of 1.5 is recommended for areas of critical structures such as buildings, and factor of safety of 1.3 for not critical structures such as roadways and parking areas. Preliminary analysis of the proposed development show that adequate factors of safety can be achieved.

Proper control of drainage at both the surface and in the subsurface is extremely important to slope performance. Areas of ponded water at the surface should be avoided. We recommend surface drainage be directed away from the slopes to prevent saturation of the slopes that could create unstable conditions. Utility trenches, basement excavations and other subsurface features should not be permitted to become water traps which may promote saturation of the subsurface materials. Additional moisture may create unstable conditions on the slopes. Drainage should be directed away from these slopes to avoid saturation of the materials. Downspouts and other concentrated flows should be piped down the slopes. Discharges and flows onto the slopes should not be permitted.

6.1 Relevance of Geologic Conditions to Land Use Planning

The proposed development will consist of commercial development. It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problems affecting development will be those associated with the artificial fill, hydrocompaction, and expansive soils on-site that can be mitigated with special designs. Other hazards on site may be satisfactorily mitigated through proper engineering design and construction practices.

The upper materials are typically at loose to medium states and firm to very stiff consistencies. Expansive soils were encountered in some of the test borings that will require mitigation. Loose soils if encountered at foundation depth will require recompaction. Foundations anticipated for the site are standard spread footings in conjunction with overexcavation in areas of expansive soils or loose soils. Excavation of the sand and clay soils is anticipated to be moderate with rubber-tired equipment. Excavation of claystone and shale may be difficult and require track-mounted equipment. Expansive soils will require special foundation design and/or overexcavation. These soils will not prohibit development.

Areas of fill exist on the site. These are areas associated a large fill stockpile in the southern portion of the site. We would anticipate that the fill piles would be removed during site grading. Any uncontrolled fill encountered beneath foundations will require removal and recompaction at a minimum of 95% of its maximum Standard Proctor Dry Density, ASTM D-698. Fill placed at depths greater than 10 feet will require 100% of its maximum Standard Proctor Dry Density, ASTM D-698 (clay soils), and 98% of its maximum Modified Proctor Dry Density, ASTM D-1557 (granular soils). Any organic material or mulch should be removed prior to placing controlled fill.

Areas of hydrocompaction have been identified on this site where there is the potential for settlement movements upon saturation of the surficial soils. Good surface and subsurface drainage are critical in these areas and the ground surface should be positively sloped away from structures at all points. Roof drains should be made to discharge well away from structures and planting and watering in the immediate vicinity of structures should be minimized. In summary, development of the site can be achieved if the items mentioned above are mitigated.

These above constraints can be mitigated through proper design and construction or through avoidance. Additional subsurface soil investigation is recommended for each building site prior to construction. Observation and testing of overlot fill/grading is recommended.

Factors of safety were calculated by the Modified Bishop Method for Circular Failure Surface for failures through the proposed fill slopes in the northeastern portion of the site, and through the tiered retaining wall and detention pond in the southwestern portion of the site utilizing a liner for the detention pond. Although groundwater was not encountered, the sections were analyzed with an elevated water table.

Factors of safety of 1.7 to 2.7 were obtained for the proposed fill slopes in the northeastern portion of the site. A factor of safety of 1.3 was obtained for the proposed detention pond with tiered retaining wall in the southwestern portion of the site. **Retaining walls should be designed for global slope stability. All slopes should be evaluated for local and global stability for final designs.** Results of the slope stability analysis are presented in Appendix D. A factor of safety of 1.5 is recommended for areas of critical structures such as buildings, and factor of safety of 1.3 for not critical structures such as roadways and parking areas. Preliminary analysis of the proposed development show that adequate factors of safety can be achieved.

7.0 ECONOMIC MINERAL RESOURCES

According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 8), the area is not mapped with any aggregate deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 9), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 10), the area of the site has been mapped as "Fair" for industrial minerals. However, considering the clayey silty nature of the soils, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 10), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as "Poor" for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on-site (Reference 10).

The site has been mapped as "Fair" for oil and gas resources (Reference 10). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area may lack the geologic structure for trapping oil or gas; therefore, it may not be considered a significant resource. Hydraulic fracturing is a new method that is being used to extract oil and gas from rocks. It utilizes pressurized fluid to extract oil and gas from rocks that would not normally be productive. The area of the site has not been explored to determine if the rocks underlying the site would be commercially viable utilizing hydraulic fracturing. The practice of hydraulic fracturing has come under review due to concerns about environmental impacts, health and safety.

8.0 EROSION CONTROL

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

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

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

9.0 ROADWAY AND EMBANKMENT CONSTRUCTION RECOMMENDATIONS

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

Swell/Consolidation testing was conducted on the site subgrade soils which showed swells ranging between -0.4 and 2.1 percent. Many samples were above the level in which mitigation is required (2.0 percent) with a majority of the soils exceeding the swell threshold. These results indicate that soil mitigation due to expansive soils may be required for the roadways. Overexcavation and cement-stabilization are suitable mitigation methods for the expansive soils in the roadways. Additional investigation for the proposed roadways will be required once site grading has been completed and utilities have been installed.

Any areas to receive fill should have all topsoil, organic material or debris removed. Prior to fill placement Entech should observe the subgrade. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1. The subgrade should be scarified and moisture conditioned to within 2 percent of optimum moisture content and compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557, prior to placing new fill. Areas receiving fill may require stabilization with rock or fabric if shallow groundwater conditions are encountered.

New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 for sandy soils, and clay soils should be compacted to a minimum of 95 percent of its maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 4 percent of optimum moisture content. **Fill placed at depths greater than 10 feet will require 100% of its maximum Standard Proctor Dry Density, ASTM D-698 (clay soils), and 98% of its maximum Modified Proctor Dry Density, ASTM D-1557 (granular soils).** These materials should be placed at a moisture content conducive to compaction, usually 0 to ±2 percent of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction. Entech should approve any import materials prior to placing or hauling them to the site. Additional investigation will be required for pavement designs once roadway grading is completed and utilities are installed.

10.0 CLOSURE

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

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

This report has been prepared for Waterview Commercial Investors, LLC for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

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

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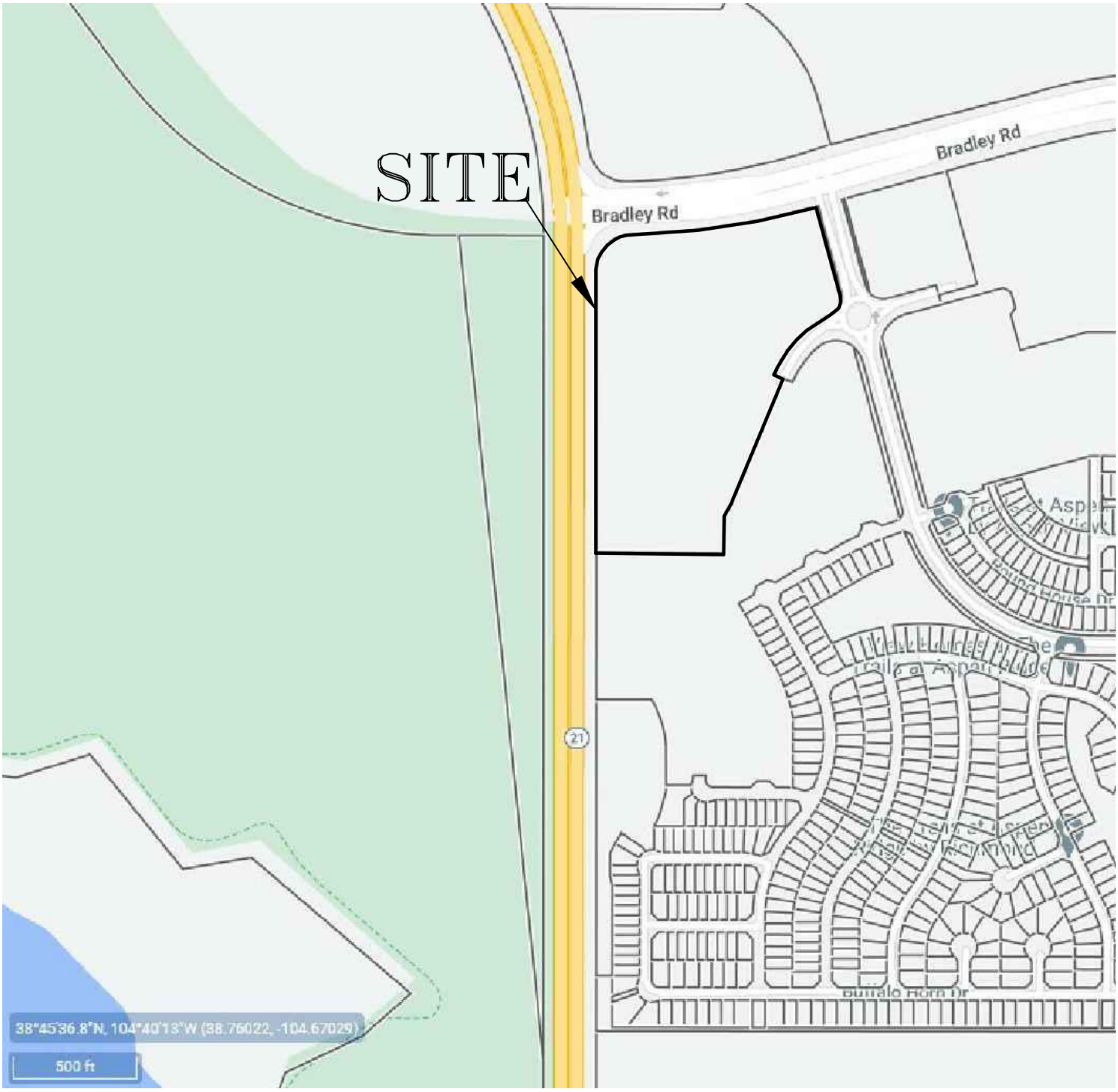
FIGURES



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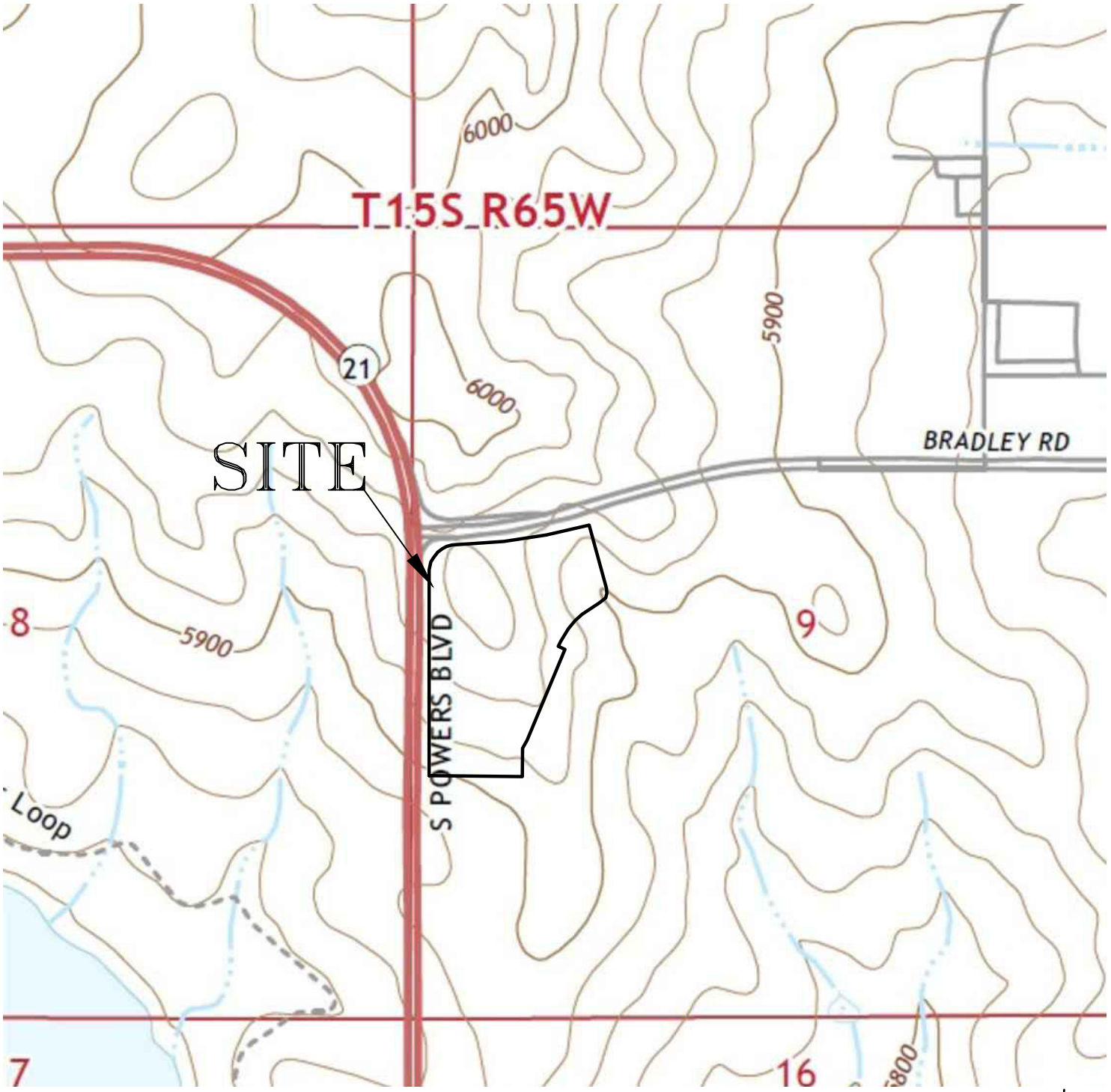
VICINITY MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/8/23		

JOB NO.: 220689

FIG NO.: 1



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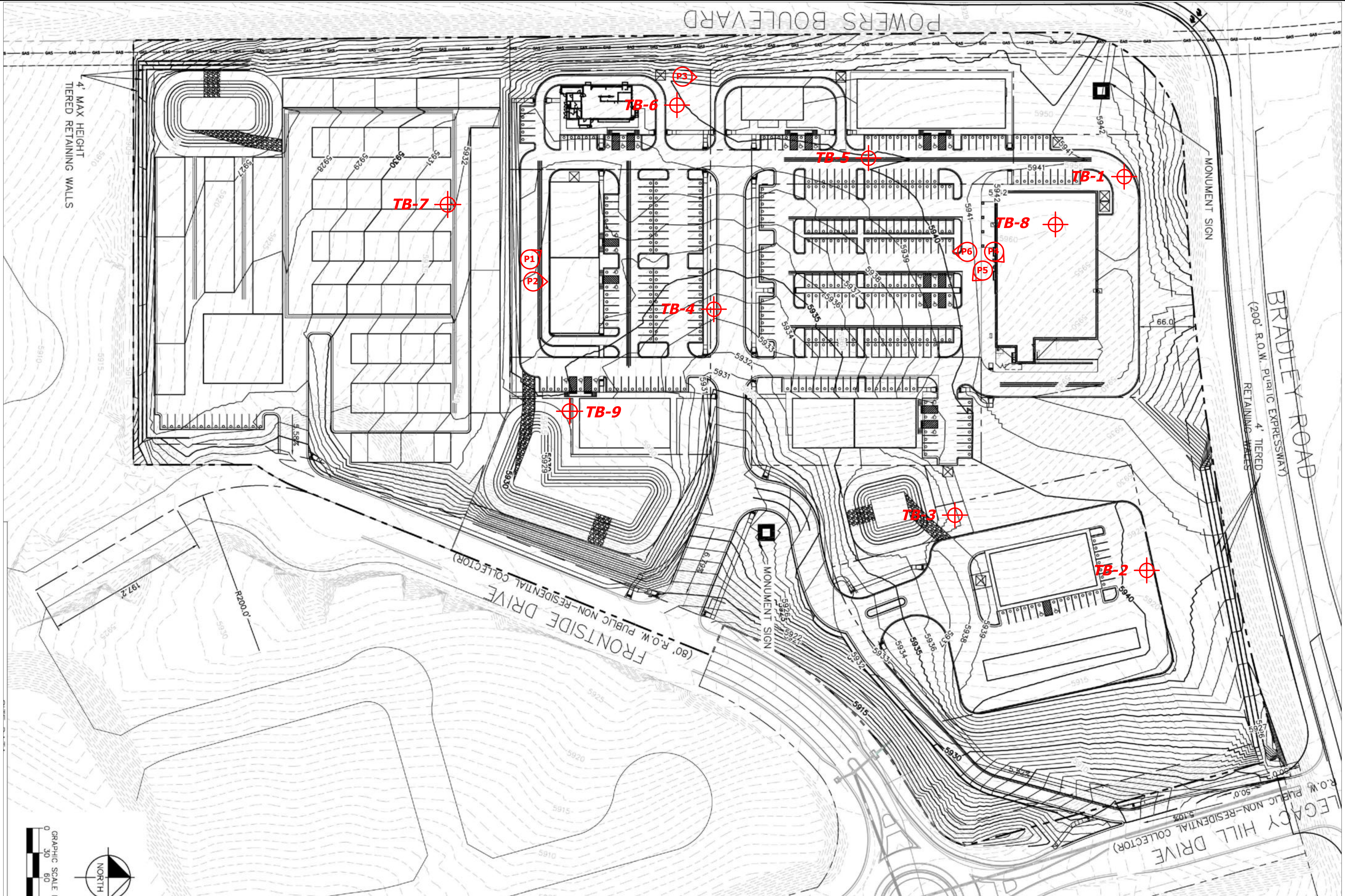
USGS MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/8/23		

JOB NO.: 220689

FIG NO.: 2



TB - APPROXIMATE TEST BORING LOCATION AND NUMBER

(P1) - APPROXIMATE PHOTOGRAPH LOCATION AND NUMBER

REVISION	BY

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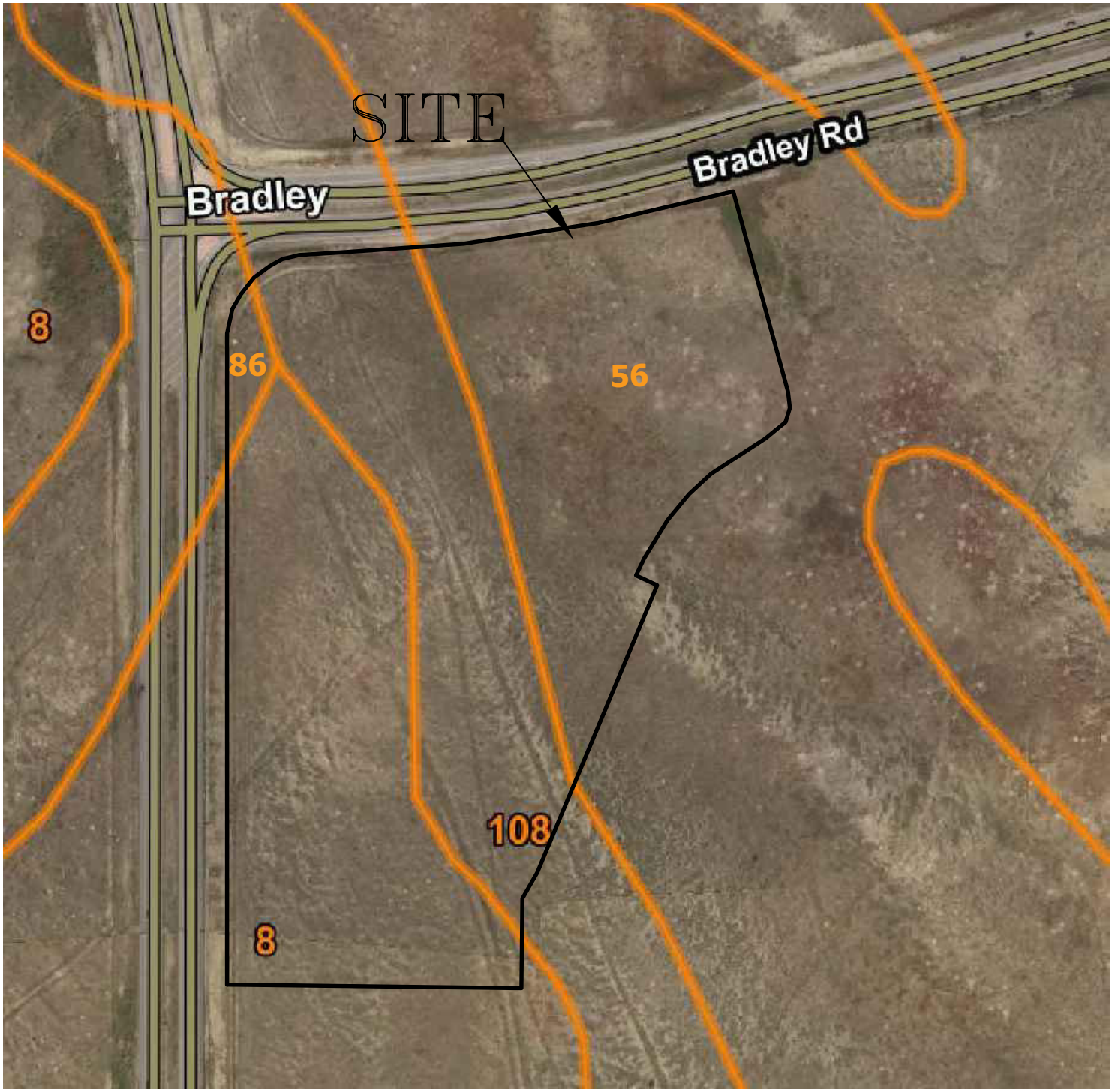
SITE PLAN/TEST BORING LOCATION MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC

DRAWN LLL
CHECKED
DATE 2/8/23
SCALE AS SHOWN
JOB NO. 220689
FIGURE No. 3



N

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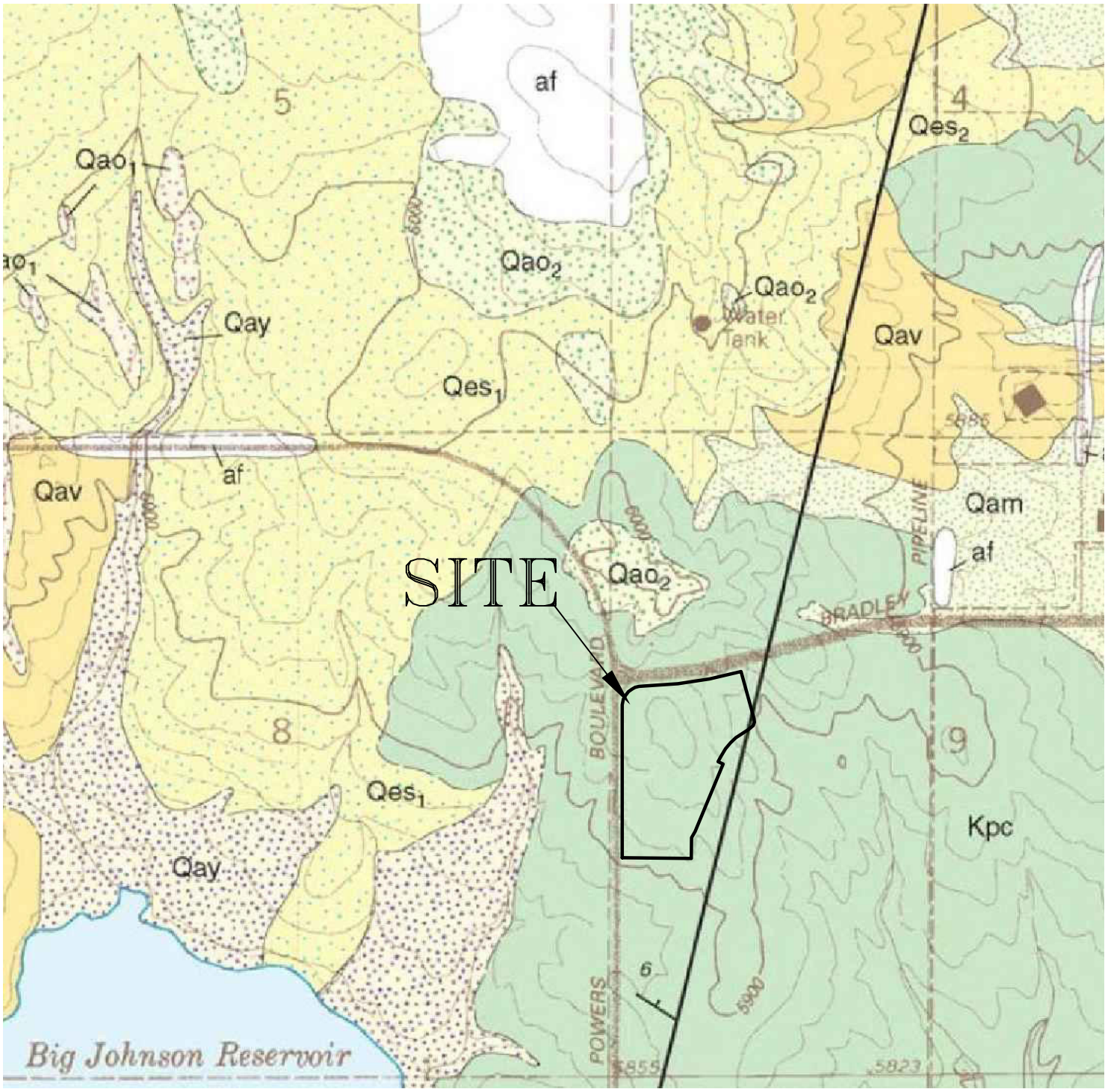
SOIL SURVERY MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/8/23		

JOB NO.: 220689

FIG NO.: 4



N

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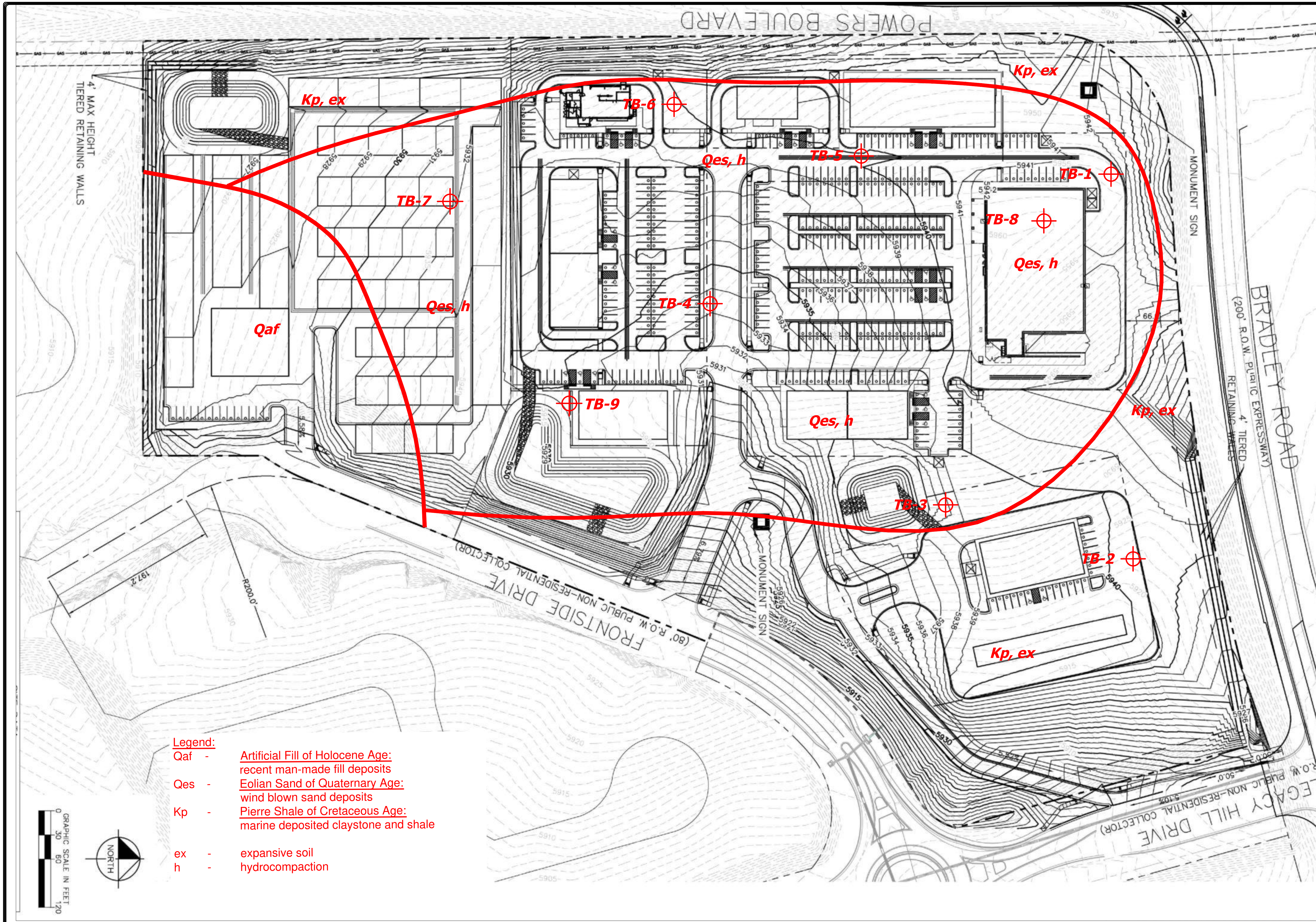
ELSMERE QUADRANGLE GEOLOGY MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/8/23		

JOB NO.: 220689

FIG NO.: 5



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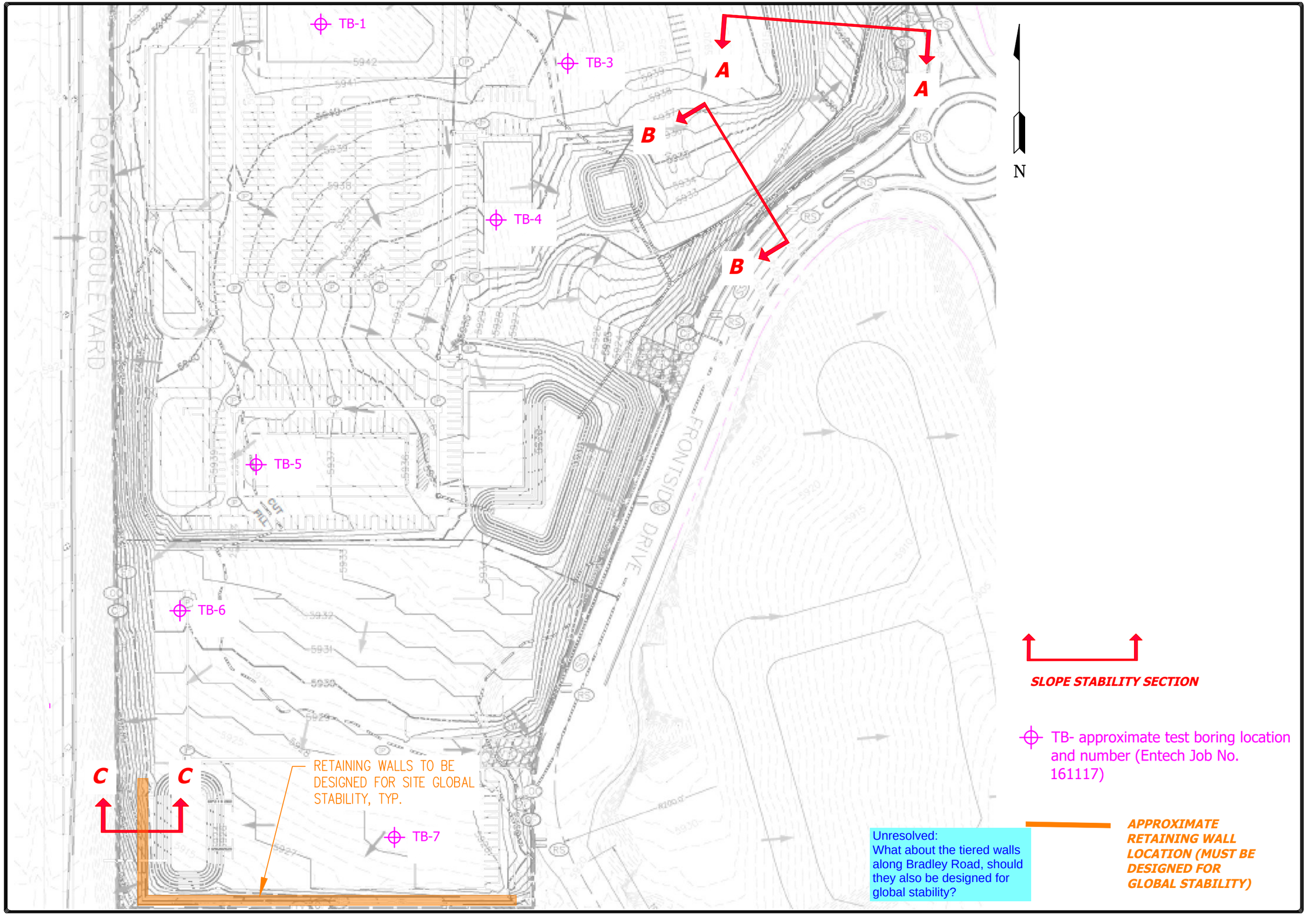
GEOLOGY/ENGINEERING GEOLOGY MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC.

DRAWN LLL
CHECKED
DATE 2/8/23
SCALE AS SHOWN
JOB NO. 220689
FIGURE No. 6



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SLOPE SECTION MAP
WATERVIEW EAST DEVELOPMENT
COLORADO SPRINGS, CO.
FOR: WATERVIEW COMMERCIAL
INVESTORS, LLC

DRAWN	AMN
CHECKED	AMN
DATE	02/14/23
SCALE	AS SHOWN
JOB NO.	220689
FIGURE No.	7

N

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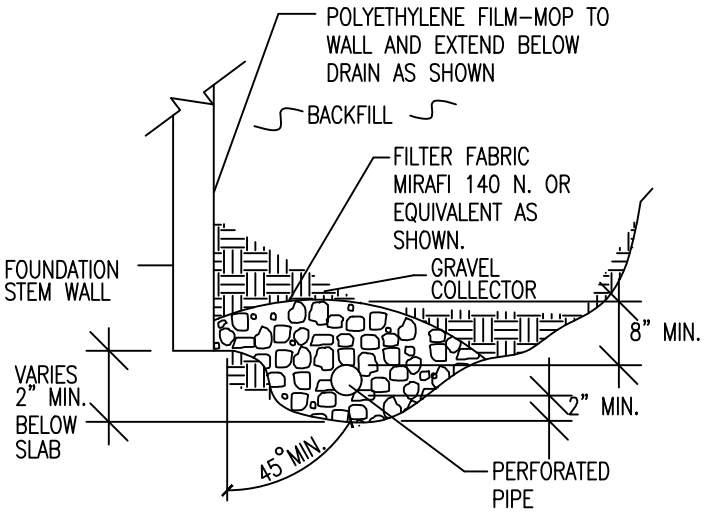
COLORADO SPRINGS, CO. 80907 (719) 531-5599

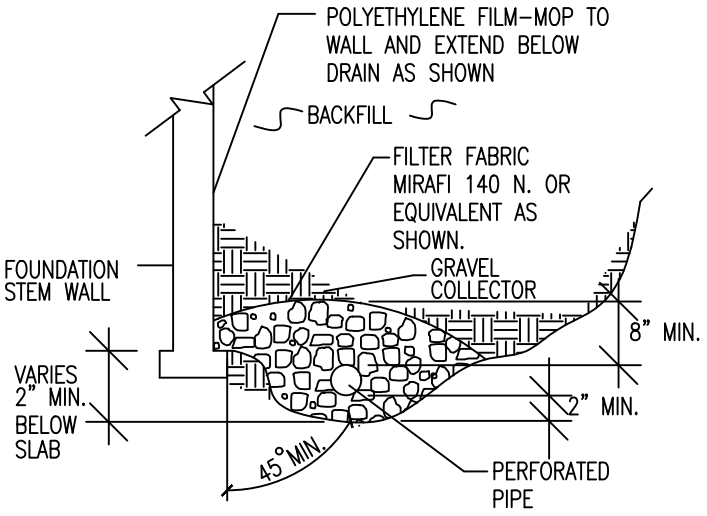
FLOODPLAIN MAP
WATERVIEW EAST COMMERCIAL
POWERS BOULEVARD AND BRADLEY ROAD
EL PASO COUNTY, CO.
FOR: WATERVIEW EAST COMMERCIAL INVESTORS, LLC

DRAWN:	DATE:	CHECKED:	DATE:
LLL	2/8/23		

JOB NO.: 220689

FIG NO.: 8





NOTES:

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

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

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

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

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

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

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PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:

JOB NO.: 220689

FIG NO.: 9

APPENDIX A: Site Photographs

1

Looking northwest from the south-central portion of the site.

February 6, 2023

2

Looking north from the south-central portion of the site.

February 6, 2023

Job No. 220689

3

Looking north from the western side of the site.

February 6, 2023

4

Looking northeast from the northern portion of the site.

February 6, 2023

Job No. 220689

5

Looking southeast from the northern portion of the site.

February 6, 2023

6

Looking south from the northern portion of the site.

February 6, 2023

Job No. 220689

APPENDIX B: Entech Engineering, Inc. Preliminary Subsurface Soil Investigation, Entech Job No. 220689

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT WATERVIEW COMMERCIAL
PROJECT WATERVIEW EAST DEV.
JOB NO. 220689

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	3	2-3			21.7	NV	NP	<0.01			SM	SAND,S ILTY
1	4	5			47.1						SM	SAND, VERY SILTY
1	5	10			20.2						SM	SAND, SILTY
1	7	2-3			11.1						SM-SW	SAND, SLIGHTLY SILTY
1	9	10			16.2						SM	SAND, SILTY
2	2	5	9.7	89.9	81.7	33	14	<0.01		-0.4	CL	CLAY, SANDY
2	6	20	21.9	100.5	81.4					1.4	CL	CLAY, SANDY
2	7	2-3			85.5						CL	CLAY, SANDY
2	8	25	18.2	104.9	84.2					0.0	CL	CLAY, SANDY
2	9	30	16.0	109.9	89.2					1.4	CL	CLAY, SANDY
3	1	15	13.9	109.6	84.4	43	24	<0.01		2.1	CL	CLAYSTONE, SANDY

TEST BORING NO. 1
DATE DRILLED 4/11/2022
Job # 220689

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 18', 4/14/22						
SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, DENSE, DRY TO MOIST				35	2.1	1
	5			31	4.9	1
CLAY, SANDY, BROWN, VERY STIFF, MOIST	10			34	8.4	2
CLAYSTONE, SANDY, BROWN, HARD, MOIST	15			50 11"	11.1	3
	20			50	12.3	3

TEST BORING NO. 2
DATE DRILLED 4/11/2022
CLIENT WATERVIEW COMMERCIAL
LOCATION WATERVIEW EAST DEV.

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 17', 4/14/22						
CLAY, SANDY, DARK BROWN, STIFF TO FIRM, MOIST				15	6.9	2
	5			22	7.1	2
	10			13	11.5	2
	15			17	13.8	2
CLAYSTONE, SANDY, BROWN, HARD, MOIST	20			50 2"	10.3	3

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: SW	DATE: 4-26-22

JOB NO.: 220689
FIG NO.: A-1

TEST BORING NO. 3
DATE DRILLED 4/11/2022
Job # 220689

REMARKS

DRY TO 18', 4/14/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			10	2.8	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
5			14	4.2	1	
10			36	12.3	2	CLAY, SANDY, GRAY BROWN, VERY STIFF, MOIST
15			50/9"	13.4	3	CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST
20			50	13.7	3	

TEST BORING NO. 4
DATE DRILLED 4/11/2022
CLIENT WATERVIEW COMMERCIAL
LOCATION WATERVIEW EAST DEV.

REMARKS

DRY TO 18', 4/14/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			21	5.3	1	SAND, VERY SILTY TO SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST
5			12	5.1	1	
10			28	3.0	1	
15			16	3.4	1	
20			19	3.5	1	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED: SW	DATE: 4-26-22

JOB NO.: 220689
FIG NO.: A- 2

TEST BORING NO. 5
DATE DRILLED 4/11/2022
Job # 220689

REMARKS

DRY TO 19', 4/14/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			29	2.4	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
5			25	2.0	1	
10			21	2.6	1	
15			16	3.5	1	
20			17	5.5	1	

TEST BORING NO. 6
DATE DRILLED 4/11/2022
CLIENT WATERVIEW COMMERCIAL
LOCATION WATERVIEW EAST DEV.

REMARKS

DRY TO 19', 4/14/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			17	4.2	1	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST
5			17	3.7	1	
10			25	3.6	1	
15			43	4.3	1	
20			26	17.3	2	CLAY, SANDY, BROWN, STIFF, MOIST

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COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED: SW	DATE: 4-26-22

JOB NO: 220689
FIG NO: A-3

TEST BORING NO. 7
DATE DRILLED 4/11/2022
Job # 220689

REMARKS

DRY TO 18.5', 4/14/22

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			12	18.5	2
5			22	6.0	1
10			23	3.0	1
15			40	3.9	1
20			32	8.6	1

CLAY, SANDY, TAN, FIRM, MOIST

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

TEST BORING NO. 8
DATE DRILLED 2/6/2023
CLIENT WATERVIEW COMMERCIAL
LOCATION WATERVIEW EAST DEV.

REMARKS

DRY TO 29.5', 2/7/23

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			15	3.1	1
5			13	2.7	1
10			11	3.8	1
15			16	3.0	1
20			12	6.7	1
25			16	18.5	2
30			14	19.8	2

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

CLAY, SANDY, BROWN, STIFF TO FIRM, MOIST

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COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	3/10/23

JOB NO.: 220689
FIG NO.: A- 4

TEST BORING NO. 9
DATE DRILLED 2/6/2023
Job # 220689

REMARKS

DRY TO 29.5', 2/7/23

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			25	2.0	1
5			14	2.6	1
10			16	6.2	1
15			20	5.5	1
20			22	7.3	1
25			22	14.0	2
30			36	15.7	2

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

CLAY, SANDY, BROWN, STIFF TO VERY STIFF, MOIST

TEST BORING NO.
DATE DRILLED
CLIENT WATERVIEW COMMERCIAL
LOCATION WATERVIEW EAST DEV.

REMARKS

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

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COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	2/10/23

JOB NO.: 220689
FIG NO.: A- 5

APPENDIX C: Soil Survey Descriptions

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Flats, hills
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

El Paso County Area, Colorado

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

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

Pleasant

Percent of map unit: 1 percent
Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

El Paso County Area, Colorado

86—Stoneham sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b2
Elevation: 5,100 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Stoneham

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loamy alluvium

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 8 inches: sandy clay loam
Btk - 8 to 11 inches: sandy clay loam
Ck - 11 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Ecological site: R067BY024CO - Sandy Plains
Other vegetative classification: SANDY PLAINS (069AY026CO)
Hydric soil rating: No

Minor Components

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

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

El Paso County Area, Colorado

108—Wiley silt loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 367b
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wiley

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty eolian deposits

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 16 inches: silt loam
Bk - 16 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains

Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

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

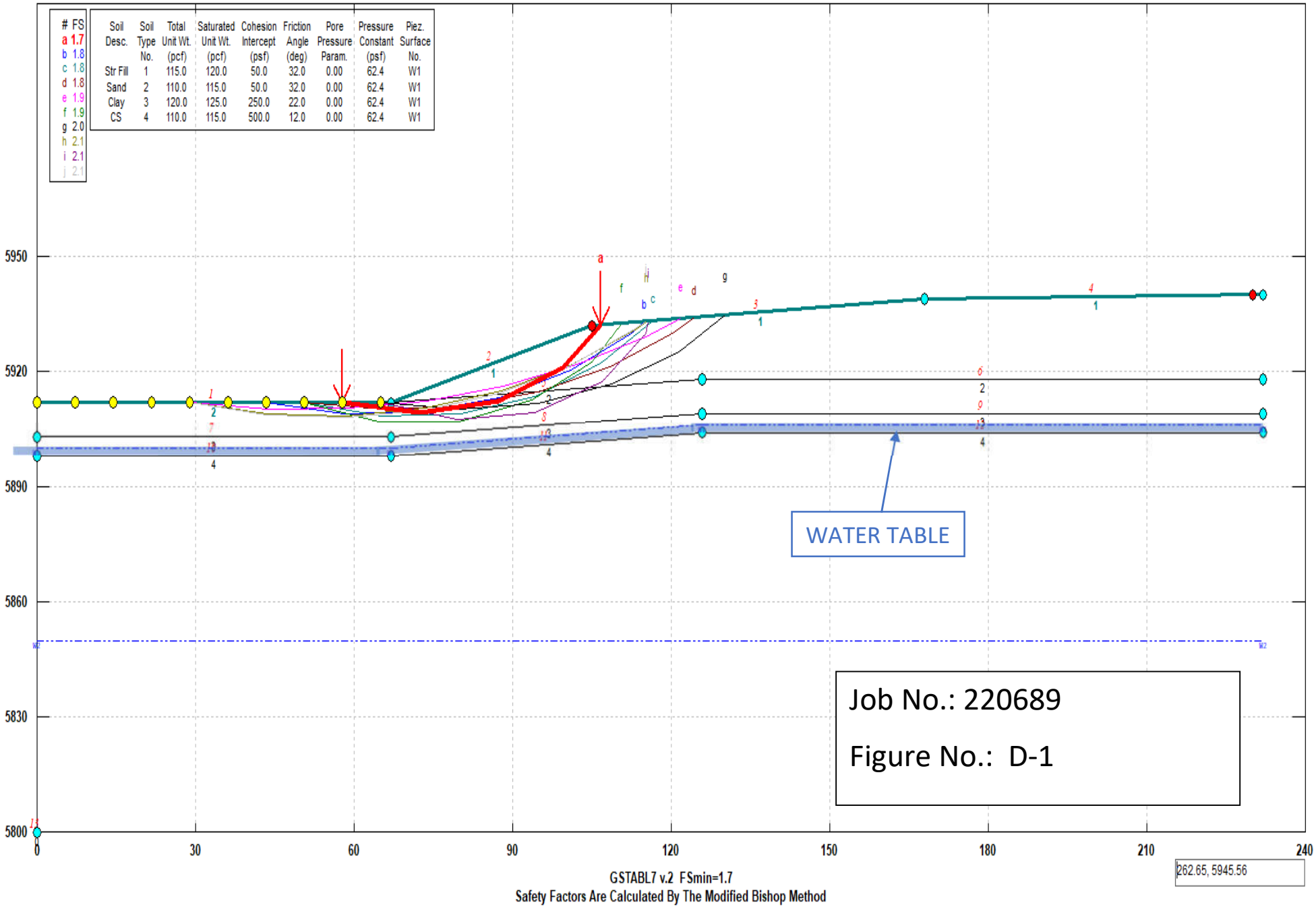
Pleasant
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

APPENDIX D: Slope Stability Analysis

WATERVIEW COMMERCIAL – WATERVIEW EAST – A-A PROPOSED



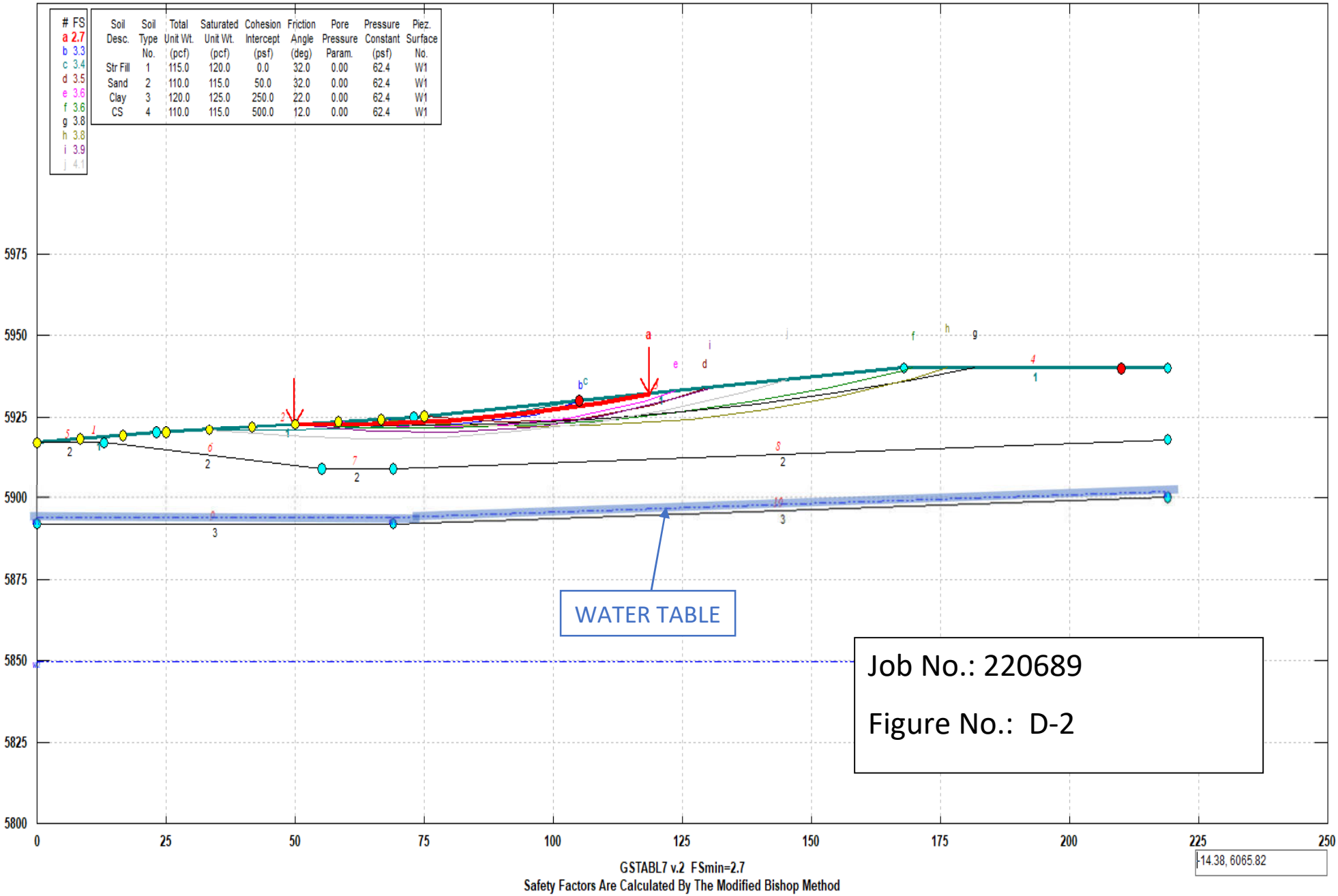
Job No.: 220689

Figure No.: D-1

GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

WATERVIEW COMMERCIAL – WATERVIEW EAST – B-B PROPOSED

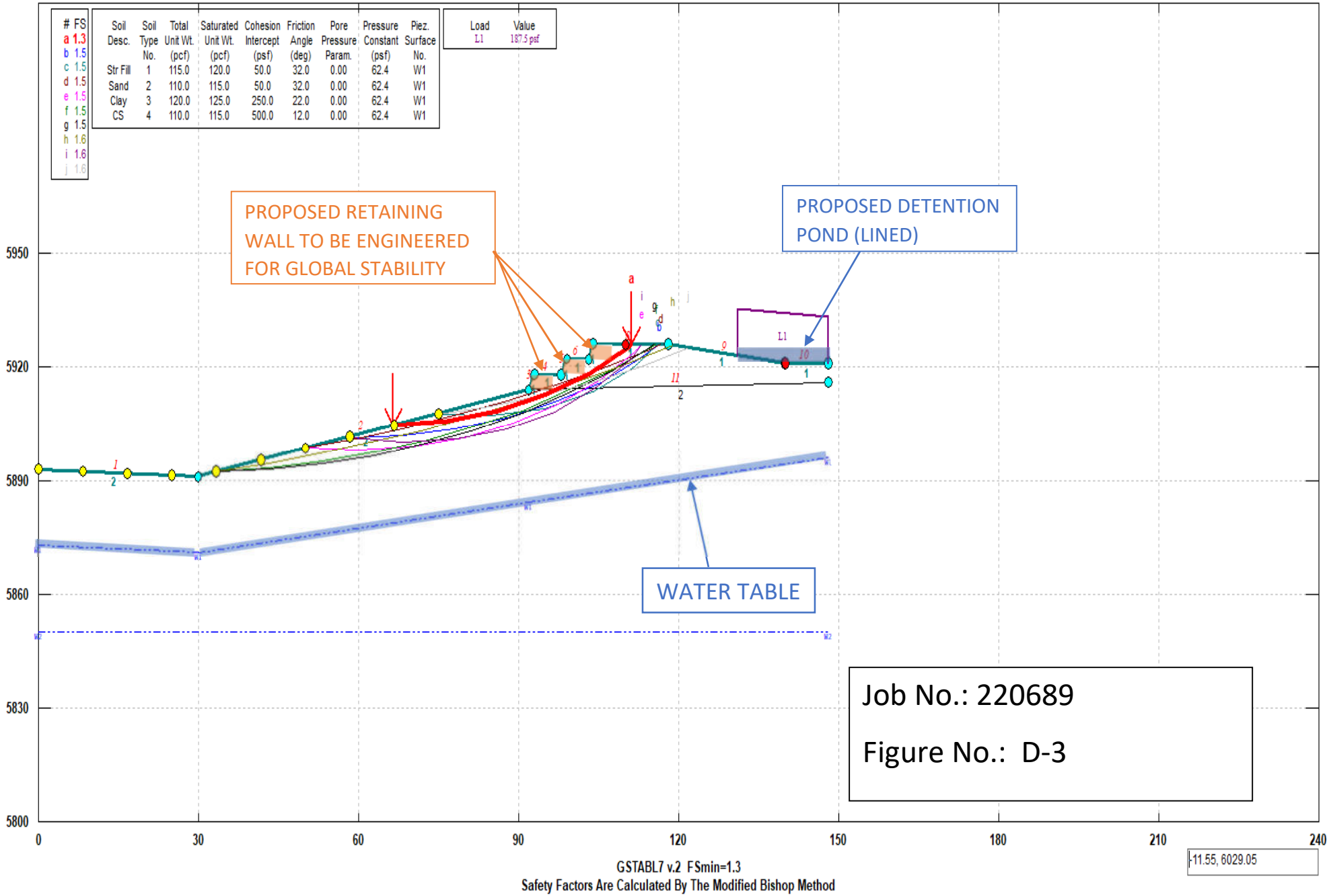


Job No.: 220689

Figure No.: D-2

GSTABL7 v.2 FSmin=2.7
Safety Factors Are Calculated By The Modified Bishop Method

WATERVIEW COMMERCIAL – WATERVIEW EAST – C-C PROPOSED



Job No.: 220689

Figure No.: D-3

APPENDIX E: Soil Strength Values

Structural Fill

SOIL STRENGTH PARAMETERS

(CTL THOMPSON)

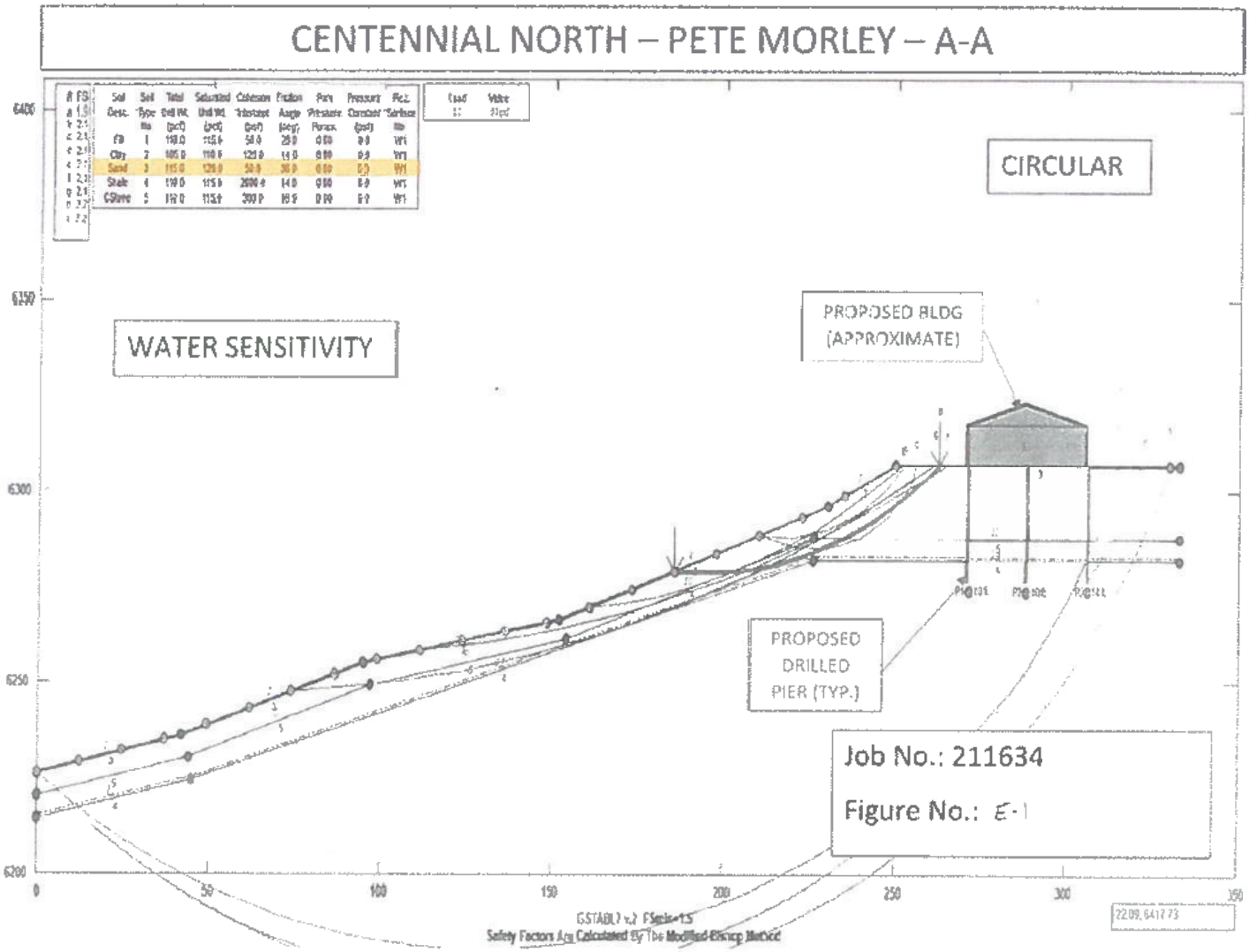
Soil Type	Angle of Internal Friction (degrees)	Cohesion (psf)	Unit Weight (pcf)
Controlled Fill	34	150	130
Debris Containing Uncontrolled Fill	30	50	120
Substantial Debris Laden Fill	31*	100*	125
Clay and Claystone Fill	16	250	125
Sand and Gravel	34	0	125
Weathered Claystone	16	500	125
Weathered Claystone - Failure	11	0	125
Shale	12	5000	135
New Fill (Clayey Sand)	34	150	130
New Fill (Clay and Claystone)	16	500	125

*multiple trial

NORTH FILLMORE 51 ACRES
TURTLE CREEK GRANDVIEW OFFICE, LLC
CTLIT PROJECT NO. CS19060-145

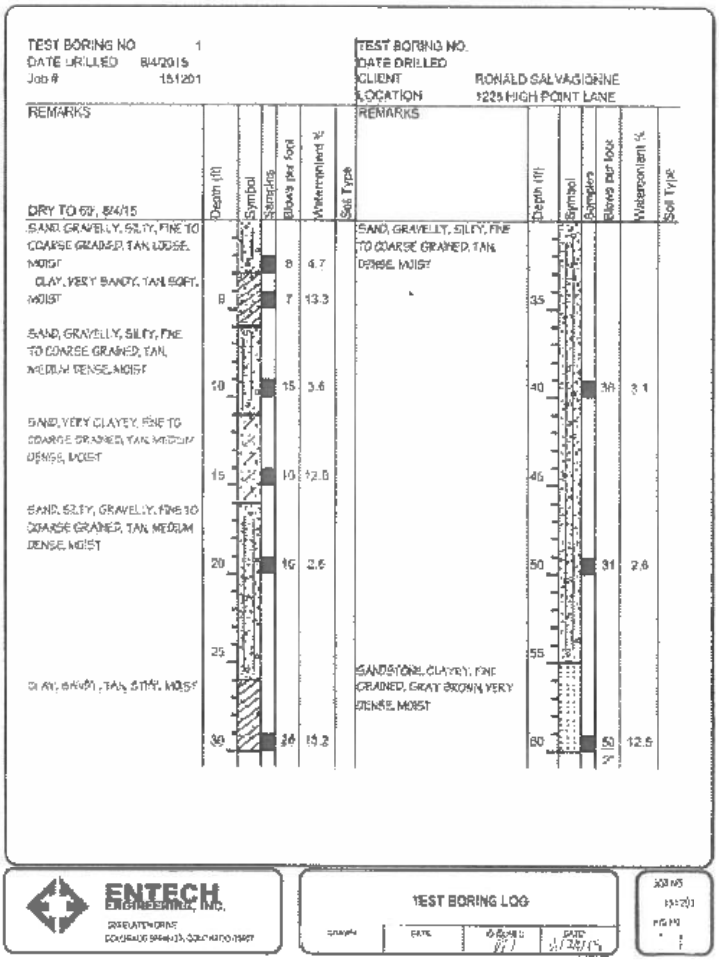
November 22, 2019
CTL Thompson, Inc.
Geologic Hazards Evaluation and Preliminary Geotechnical Investigation
Approximately 51 Acres, NE of West Fillmore Street and Centennial Boulevard
Colorado Springs, Colorado
CTL Project No. CS-19060-145

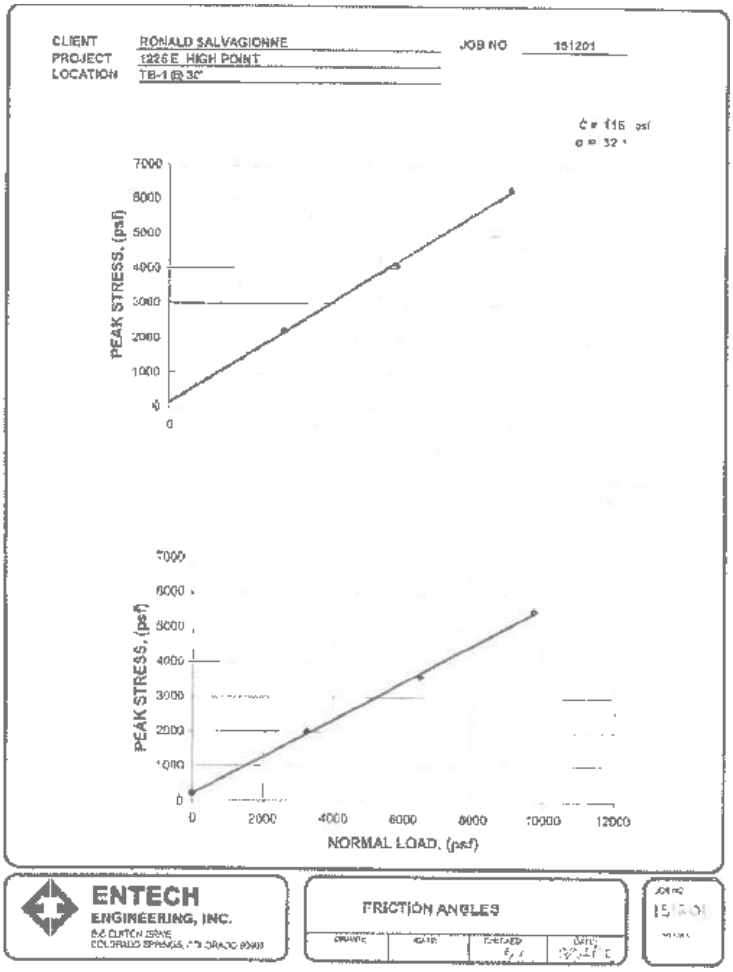
Silty Sand



August 19, 2021
Revised October 21, 2022
Entech Engineering, Inc.
Geologic Hazard Study
Centennial North
Tax Schedule No. 73363-01-015
Colorado Springs, Colorado
Entech Job No. 211634

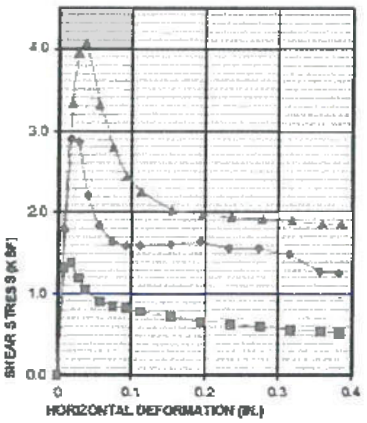
Sandy Clay





August 28, 2015
Revised December 3, 2015
Entech Engineering, Inc.
Geologic Hazard Investigation and Slope Stability Analysis
Tax Schedule No. 74121-03-048
Lot 42 High Point Gardens
1225 East High Point Lane
Colorado Springs, Colorado
Entech Job No. 211634

Claystone

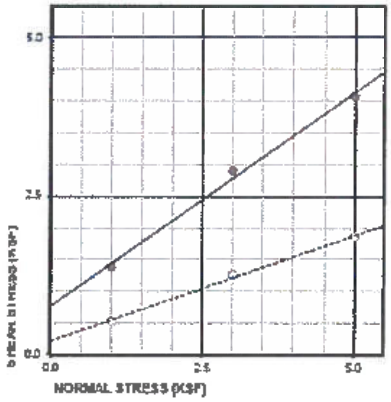


Sample No.	Boring No.	Depth (FT)	Moisture Content (%) Before	Moisture Content (%) After	Dry Density (PCF)
1 ■	TH-11	9'&14'	19.2	26.9	109.7
2 ●	TH-11	9'&14'	19.2	24.3	110.5
3 ▲	TH-11	9&14'	19.2	22.4	108.3

LL: 48 PI: 31 -200: 96 Clay Content, % 44

Thickness (in): 1.0 Diameter (in): 1.935

Shearing Rate (in/min): 0.0016



Sample No.	Normal Stress (KSF)	Peak Shear Stress (KSF) ●	Large Displacement Shear Stress (KSF) O	Large Displacement Displacement (IN.) O
1 ■	1	1.38	0.52	0.38
2 ●	3	2.9	1.26	0.38
3 ▲	5	4.07	1.85	0.39

Peak ϕ (DEG):	34
Large Displacement ϕ (DEG):	18
Peak C (PSF):	770
Large Displacement C (PSF):	220

ample Description: Interbedded Claystone/Sandstone, Hard, M. Moist, Brown, L. Brown, Rust

ample Type: California

emarks:

Direct Shear Test Results

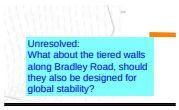
TITAN PEAK, LLC
ALLASO PEAK, FILING 1
CTLIT PROJECT NO. CS19492-125

FIG. B-40

February 4, 2022
CTL Thompson, Inc.
Geotechnical Investigation and Geologic Hazard Evaluation
Allaso Peak, Filing 1, Apartments
Centennial Boulevard and West Van Buren Street
Colorado Springs, Colorado
CTL Project No. CS-19492-125

V3_Geotech Report.pdf Markup Summary

Text Box (1)



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Author: CDurham
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Unresolved:
What about the tiered walls along Bradley Road, should they also be designed for global stability?