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SOIL, GEOLOGY AND GEOLOGIC HAZARD STUDY
7020 WYOMING LANE
TAX SCHEDULE NO. 53080-00-105
EL PASO COUNTY, COLORADO

Prepared for

Phoenix Holdings
4900 O'Hear Avenue, Suite 100
North Charleston, SC 29405

Attn: Sarah Chitsaz

June 25, 2021

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford, P.G.
Geologist

Reviewed by

COLORADO LICENSED
JOSEPH COLLIN GOODE
23725
PROFESSIONAL ENGINEER

6.25.21

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

LLL

Encl.

Entech Job No. 210932
AAProjects/2021/210932 soil geo

CITY OF COLORADO SPRINGS

APPLICATION FORM FOR GEOLOGIC HAZARD REPORT

Applicant: Phoenix Holdings Telephone 719-330-0259 Fax

Address: 4900 O'Hear Ave, Suite 100 Zip Code 29405 e-mail sarah@phoenixholdings.co

Premises Involved: Development Plan/Subdivision Plat Name: 7020 Wyoming Lane

Tax Schedule No(s). 53080-00-105
(This can be obtained from the El Paso County Tax Assessor located at 27 E. Vermijo Avenue on the 2nd Floor; phone: 520-6600 or at their web site http://www.land.elpasoco.com)

GEOLOGIC HAZARD REPORT REQUIRED: (FIVE (5) PRELIMINARY COPIES)

An application review fee will be required to accompany these applications (make checks payable to City of Colorado Springs). The fee schedule is as follows:

Review of Geologic Hazard Reports	City Planning Fee: $300 plus any Colorado Geological Survey Review Cost Over $300
	City Engineering Fee: $284

The following documents have been included and considered as part of this report (checked off by individual(s) preparing the geologic report):

Development Plan: _____

Landscape Plan (if applicable): _____

Grading Plan: _____

Drainage Report (necessary if debris and/or mud flow hazard is present): _____

ENGINEERS STATEMENT

I hereby attest that I am qualified to prepare a Geologic Hazard Study in accordance with the provisions of Section 504 of the Geologic Hazards Ordinance of Colorado Springs. I am qualified as:

_____X_____ Professional Geologist as defined by CRS 34-1-201(3); or,

_____ Professional Engineer as defined by Board Policy Statement 50.2 - "Engineering in Natural Hazard Areas" of the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors. Board authority as defined by CRS 12-25-107(1).

Submitted by: _____ Date: 6/25/2021
Logan L. Langford, P.G., Entech Engineering, Inc.

This Geologic Hazard Study is filed in accordance with the Zoning Code of the Code of the City of Colorado Springs, 2001, as amended.

_____ _____
City Engineer Date City Planning Director Date

Table of Contents

1.0 SUMMARY

Project Location:

The project lies in portions of the NE¼ and SE¼ of Section 8 of Township 13 South, Range 65 West of the 6th Principal Meridian. The site is located north and southwest of California Drive and Wyoming Lane, just east of Colorado Springs, Colorado in El Paso County. The site lies immediately east of the Colorado Springs city limits, and it is our understanding that the property is to be annexed into the city.

Project Description:

Total acreage involved in the project is approximately 22 acres. The proposed development is single-family residential with associated site improvements.

Scope of Report:

The report presents the results of our geologic investigation and treatment of engineering geologic hazard study for the sketch plan submitted. This report presents the results of our geologic reconnaissance, a review of available maps, aerial photographs and our conclusions with respect to the impacts of the geologic conditions on development.

Land Use and Engineering Geology:

This site was found to be suitable for the proposed development. Geologic conditions will impose some constraints on development. These include areas of artificial fill, loose soils, potentially seasonal shallow groundwater areas, areas of ponded water, and floodplains. Site conditions will be discussed in greater detail in this report. All recommendations are subject to the limitations discussed in the report.

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in portions of the NE¼ and SE¼ of Section 8 of Township 13 South, Range 65 West of the 6th Principal Meridian, El Paso County, Colorado. The site is located north and south of Woodmen Road, east of Brule Road, and west of Golden Sage Road, immediately north of the Colorado Springs city limits, and approximately one mile west of Falcon, in El Paso County, Colorado. It is our understanding the site is to be annexed into the city of Colorado Springs. The location of the site is shown on the Vicinity Map, Figure 1.

The topography of the site is generally gently sloping to the south with some moderate slopes along the drainage in the northern portion of the site. A tributary to Sand Creek is located along the northern side of the site, and Sand Creek is located along the southern side of the site. Drainages on-site flow in southwesterly directions. Water was observed flowing in of the drainages at the time of this investigation, and areas of ponded water were observed in the northwestern portion of the site. The approximate boundaries of the site are indicated on the USGS Map, Figure 2. Previous site uses have included rural residential, grazing and pasture land. Vegetation on site consists primarily of field grasses and weeds, with some trees around some of the existing structures on the site. Site photographs are included in Appendix A. The approximate locations and directions of the photographs are indicated on Figure 3.

Total acreage involved in the proposed development is approximately 22 acres. The proposed development consists of single-family residential with associated site improvements. The area will be serviced by central water and sewer. Preliminary development and grading plans were not available at the time of this report.

3.0 SCOPE OF THE REPORT

The scope of this report will include the following:

- 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 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 field reconnaissance, measurements and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identifies pertinent geologic conditions affecting development.

Eight (8) test borings were drilled as a part of the preliminary subsurface soil investigation for the site to determine general soil conditions. The borings were drilled with a power driven continuous flight auger drill rig to depths of 20 feet. Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a 2-inch O.D. Split Barrel Sampler and a California Sampler. Results of the penetration tests are shown on the drilling logs to the right of the sampling point. The location of the test borings is shown on the Site Map/Test Boring Location Map, Figure 3. The drilling logs are included in Appendix B.

Laboratory testing was performed to classify and determine the soils engineering characteristic. Laboratory tests included moisture content, ASTM D-2216, grain size analysis, ASTM D-422, and Atterberg Limits, ASTM D-4318. Swell/Consolidation Testing, ASTM D-4546, was conducted on select samples to evaluate the expansive/compressive characteristics of the soils. Results of the laboratory testing are included in Appendix B. A Summary of Laboratory Test Results is presented in Table 1.

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 10½ miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be gently dipping in a northerly direction (Reference 1). Bedrock in the area of the site is sedimentary in nature, and typically Tertiary to Cretaceous in age. The bedrock underlying the site itself is the Dawson Formation. Overlying the Dawson are unconsolidated deposits of artificial, and alluvial soils. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Service

The Natural Resource Conservation Service (Reference 2), previously the Soil Conservation Service (Reference 3) has mapped two soil types on the site (Figure 4). In general, the soils consist of loamy sand and gravelly sandy loam. Soils are described as follows:

Type	Description
9	Blakeland Fluvaquentic Haplaquolls, 1-9% slopes
10	Blendon sandy loam, 0-3% slopes

Complete descriptions of the soils are presented in Appendix C. The soils have generally been described to have rapid to very rapid permeabilities. The majority of the soils have been described by the Soil Conservation Service as good potential for urban development. Limitations include the hazard of flooding on some areas of Soil Types 9 and 10. 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 slight to moderate erosion hazards. The soil blowing hazard is severe if vegetation is removed.

5.3 Site Stratigraphy

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

- **Qaf** **Artificial Fill of Quaternary Age:** These are man-made fill deposits associated with earthen dams and erosion berms on-site.

- **Qay** **Young Alluvium, undivided of Quaternary Age:** These are recent stream deposits in the northern drainage that exist on-site. These materials consist of silty sands and may contain lenses of silt, clay or gravel. Areas of organic soils will also be encountered. This deposit correlates with the Piney Creek Alluvium.

- **Qam** **Middle Alluvium of Quaternary Age:** These materials consist of lower stream terrace deposits. The alluvium typically consists of silty to clayey gravelly sands. This deposit correlates with the Broadway Alluvium.

- **TKda** **Dawson Arkose Formation of Tertiary to Cretaceous Age:** The bedrock underlying the site is the Dawson Formation. This formation consists of arkosic sandstone with interbedded lenses on fine grained sandstone, claystone or siltstone. Typically, it is buff to light brown and light gray in color. Overlying the Dawson is a variable layer of residual soil derived from the in-situ weathering of the bedrock materials.

The soils listed above were mapped from the *Geologic Map of the Falcon NW Quadrangle* by Madole in 2003 (Figure 5, Reference 4), the *Geologic Map of the Pueblo 1°x2° Quadrangle, South-Central* distributed by the US Geological Survey in 1978 (Reference 5) and site-specific mapping of the site. The test borings from the preliminary subsurface investigation were also used in evaluating the site. The test boring logs are included in Appendix B.

5.4 Soil Conditions

The soils encountered in the test borings can be grouped into three general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 classified as a slightly silty to silty sand (SM). The sand was encountered in all of the test borings at the existing ground surface and extending to depths ranging from 9 to 19 feet bgs, and the termination of Test Boring No. 2 (20 feet). Standard Penetration testing on the sand resulted in N-values of 2 to 28 bpf, indicating very loose to medium dense states. The majority of the sands were encountered at medium dense states. Water content and grain testing resulted in water contents of 1 to 13 percent, with approximately 6 to 28 percent of the soil size particles passing the No. 200 sieve. Atterberg limits testing on the sand resulted non-plastic results. Sulfate testing resulted in less than 0.01 percent soluble sulfate by weight, indicating a negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 2 classified as a sandy clay (CH, CL). The clay was encountered in four of the test borings at depths ranging from 7 to 14 feet bgs and extending to depths ranging from 9 to 14 feet bgs. Standard Penetration Testing conducted on the clay resulted in N-values of 5 to 41 bpf, which indicates soft to very stiff consistencies. Water content and grain size testing resulted in water contents of 28 to 29 percent with approximately 83 to 95 percent of the soil size particles passing the No. 200 Sieve. Atterberg limits testing on the clay resulted a liquid limit of 70 and plastic index of 51. FHA Swell Testing resulted in an expansion pressure of 670 psf. Swell/Consolidation Testing resulted in a volume changes of 1 to 2.7 percent. These results indicate a low to moderate expansion potential. Sulfate testing resulted in 0.02 percent soluble sulfate by weight, indicating the clay exhibits negligible potential for below grade concrete degradation due to sulfate attack.

Soil Type 3 classified as very sandy to sandy siltstone (ML). The siltstone was encountered in five of the test borings at depths ranging from 9 to 19 feet bgs and extending to the termination of the borings (20 feet). Standard Penetration Testing conducted on the siltstone resulted in N-values of 20 to greater than bpf, which indicates stiff to hard consistencies. Water content and grain size testing resulted in water content of 18 to 26 percent with approximately 57 to 90 percent of the soil size particles passing the No. 200 Sieve. Atterberg limits testing resulted in liquid limits

of 42 and 45 and a plastic indexes of 15 and 16. Swell/Consolidation Testing resulted in volume change of 0.4 percent, indicating low expansion potential. Highly expansive claystone is commonly interbedded with the bedrock in the area. Sulfate testing resulted in less than 0.01 to 0.02 percent soluble sulfate by weight, indicating the siltstone exhibits negligible potential for below grade concrete degradation due to sulfate attack.

A Summary of Laboratory Results is presented in Table 1. Laboratory results are included in Appendix C. A summary of the depth to bedrock is included in Table 2.

5.5 Groundwater

Groundwater was encountered in all of the test borings at depths of 8 to 16 feet. The shallower water was encountered near the drainages (Test Boring Nos. 1 and 7). Depending on site grading groundwater should not affect shallow foundations on the majority of the site. Groundwater may be encountered in deeper utility excavations. Unstable conditions should be expected where excavations approach the groundwater levels. Stabilization using geo grids or shot rock may be necessary. It should be noted that groundwater levels could change due to seasonal variations, changes in land runoff characteristics and future development of nearby areas. Areas of seasonal and potentially seasonal groundwater, springs, and ponded water have been mapped on the site and are discussed in the following section.

Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Isolated sand layers within the variable soil profile, sometimes only a few feet in thickness and width, can carry water in the subsurface. Water may also flow on top of the sandstone. Contractors should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site. Grading in areas of shallow water should be minimized.

6.0 ENGINEERING GEOLOGY - IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, 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 and planners should be cognizant during the planning, design and construction stages of the project. The hazards identified on this site include artificial fill, loose soils, potentially seasonal shallow groundwater areas, and areas of flowing and ponded water. The following hazards have been addressed as a part of this investigation:

Artificial Fill

Areas of artificial fill were observed on the site. The majority of the fill is associated with earthen dams and erosion berms. The earthen dams lie within areas designated as open space or easements and will be avoided by construction. The majority of the erosion berms are shallow and may be penetrated by foundations or will likely be removed during site grading. Should any uncontrolled fill be encountered beneath foundations, removal and recompaction at 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 will be required.

Expansive Soils

While the majority of the soils encountered in the test borings drilled on-site have low expansion potential, expansive clays and claystone are common in the area and may be encountered in the subsurface on this site. The expansive soils on-site are highly sporadic, therefore, none have been indicated on the map. Expansive clays 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.

Mitigation: Should expansive soils be encountered beneath foundations; mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation which is common in the area. 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 on building loads. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Subsidence Area

Based on a review of the *Mining Report for the Colorado Springs Coal Field* (Reference 6), a Subsidence Investigation Report for the Colorado Springs area by Dames and Moore, 1985 (Reference 7), and the *Evaluation of Mineral and Mineral Fuel Potential of El Paso County* (Reference 8), the site is not undermined. The closest underground mines in the area are 8 miles to the south and southwest and the site is not mapped within any potential subsidence zones.

Slope Stability and Landslide Hazard

The slopes on-site are gently to moderately sloping and do not exhibit any past or potential unstable slopes or landslides. Grading plans were not available at the time of this investigation. Slopes should be no steeper than 3:1, if regraded unless specifically evaluated. All topsoil and organics should be removed prior to any regrading or fill placement. All new fill should be properly benched into native slopes and compacted at a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557.

Rockfall Hazards

Based on our site observation, no rock outcrops or areas of rockfall hazard were observed on this site.

Areas of Erosion

No significant areas of erosion were observed during our site investigation.

Mitigation: Due to the nature of the soils on this site, virtually all the soils are subject to erosion by wind and water. Other minor areas of erosion were observed on site other than those mapped, particularly where some rill erosion has occurred. Areas of erosion can occur across the entire site, particularly if the soils are disturbed during construction. Vegetation reduces the potential for erosion. The areas identified where erosion is actually taking place may require check dams,

regrading and revegetation using channel lining mats to anchor vegetation. Further recommendations for erosion control are discussed under Section 9.0 "Erosion Control" of this report. Recommendations pertaining to revegetation may require input from a qualified landscape architect and/or the Natural Resource Conservation Service (previously Soil Conservation Service).

Debris Fans

Based on site observations, debris fans were not observed in this area. Areas of recent sediment deposits were observed in some of the drainages on the site. The drainage areas are discussed below.

Groundwater and Drainage Areas

Groundwater was encountered in five of the test borings at depths ranging from 8 to 16 feet. Areas within the drainages on-site have been identified as seasonal and potentially seasonal shallow groundwater. Only minor areas with water flowing in the drainages were noted at the time of this investigation, however, an area of ponded water was observed in the northwestern portion of the site. Sand Creek in the southern portion of the has been mapped within floodplain zones according to the FEMA Map No. 08041CO535G, Figure 7 (Reference 9). Exact floodplain location and drainage studies are beyond the scope of this report. Groundwater areas are discussed as follows:

- *Potentially Seasonal Shallow Groundwater*

  In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and possible frost heave potential, depending on the soil conditions. The majority of the areas mapped with this designation lie within drainages designated as open space and will be avoided by development. Where structures encroach on, or lie within these areas, the following mitigation is recommended:

  Mitigation: In these locations, foundations in areas subject to severe frost heave potential should penetrate sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 30 inches is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the intrusion of

water into areas located below grade. A typical perimeter drain detail is presented in Figure 8. Where shallow groundwater is encountered, additional drains, such as capillary breaks and/or interceptor drains may be necessary. Unstable conditions should be expected where excavations approach the groundwater level. The used of shot rock or geo-grids may be necessary to stabilize excavations. Additionally, swales should be created to intercept surface runoff and carry it safely around and away from structures. It is anticipated that the drainages can be avoided or site grading will mitigate the drainages and raise foundations further above the groundwater level. The water table may be of sufficient depth to minimize the effects on buildings. Additional investigation is recommended after development and grading plans are finalized.

- *Areas of Ponded Water*

These are areas where there is standing water observed in drainages or ponded water behind earthen dams. The majority of these areas lie within the drainages designated as open space and will be avoided by construction. Where construction is proposed, the following mitigation is recommended:

Mitigation: The pond is located behind an earthen dam in the northwestern portion of the site and can be avoided by the proposed development. All soft and organic soils should be removed prior to fill placement. Any drainage into these areas should be rerouted in a non-erosive manner where it does not create areas of ponded water around proposed structures. The same mitigation techniques for the seasonal shallow groundwater areas are recommended for these areas as well.

Collapsible Soils

Areas of loose or potentially collapsible soils were encountered in some of the test borings drilled on-site. Should loose or collapsible soils be encountered beneath foundations, removal and recompaction with thorough moisture conditioning at 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 will be necessary. Typically, the overexcavation extends to a depth of 2 to 3 feet. Specific recommendations should be made after additional investigation of each building site.

Faults

The closest fault is the Rampart Range Fault, located 10½ miles to the west. No faults are mapped on the site itself. Previously Colorado was mapped entirely within Seismic Zone 1, a very low seismic risk. Additionally, the International Residential Code (IRC), 2003, currently places this area in Seismic Design Category B, also a low seismic risk. According to a report by the Colorado Geological Survey by Kirkman and Rogers, 1981, (Reference 10) this area should be designed for Zone 2 due to more recent data on the potential for movement in this area, and any resultant earthquakes.

Dipping Bedrock

The bedrock underlying the site is the Dawson Formation of Tertiary to Cretaceous Age. The Dawson in this area is gently dipping a northerly direction according to the *Geologic Structure Map of the Pueblo 1x2 Quadrangle, South-Central Colorado* (1978) (Reference 1). The bedrock encountered in the test borings and observed on-site did not exhibit steeply dipping characteristics; therefore, mitigation is not necessary.

Radioactivity

Radon levels for the area have been reported by the Colorado Geologic Survey in the Open-File, Report No. 91-4 (Reference 11). Radon levels ranging from 0 to 20 pci/l have been measured in the area. The following is a table of radon levels in this area.

0<4 pci/l	50.00%
4<10 pci/l	50.00%
10<20 pci/l	0.00%
>20 pci/l	0.00%

Only two readings have been taken in the area. The minimal information from this report is not sufficient to determine if radon levels are higher for this site. An occurrence of radioactive minerals has been identified approximately 7 miles northwest of the site (Reference 12). This occurrence is associated with a limonite deposit in the Dawson Formation. No known occurrences exist on the site, however, radon gas originating in the bedrock underlying the site could migrate up into the upper soil profile.

Mitigation: The potential exists for radon gas to build up in areas of the site. Build-ups of radon gas can be mitigated by providing increased ventilation of basements and crawlspaces and sealing of joints. Specific requirements for mitigation should be based on-site specific testing after the site is constructed.

7.0 EROSION CONTROL

The soil types observed on the site are mildly to moderately 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 reestablished, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on-site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap.

In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

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

8.0 ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 13), the area is mapped as upland deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 14), areas of the site are mapped as A3 – Alluvial fan: sand resource. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 8), the area of the site has been mapped as "Good" for industrial minerals. The sands associated with the alluvial deposits are considered a sand resource. Considering the abundance of similar materials through the region and close proximity to developed land, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 8), 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. The *El Paso County Aggregate Resource Map* (Reference 13) has mapped coal resources in the Falcon area approximately ½ mile south of the site; however, the coal resources are estimated at 1,500 feet below the surface (Reference 8). At this depth, mining the coal would not be economical at this time. No metallic mineral resources have been mapped on the site (Reference 8).

The site has been mapped as "Fair" for oil and gas resources (Reference 8). 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 would not be considered a significant resource. Hydraulic fracturing is a new method that is being used 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.

9.0 RELEVANCE OF GEOLOGIC AND SITE CONDITIONS TO LAND USE PLANNING

We understand that the development will be residential. 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 hazards associated with the site are those associated with the drainage areas and potential seasonal shallow groundwater conditions. These can be satisfactorily mitigated by either avoidance, regrading, or through proper engineering design, construction and drainage systems. Constraints identified on the site such as artificial fill, collapsible soils, shallow water, and expansive soils can also be mitigated through proper engineering design and construction.

The upper materials are typically at medium dense to dense states. The medium dense to dense granular soils encountered in the upper soil profiles of the test borings should provide good support for foundations. Loose soils, where encountered, will require removal and recompaction. Expansive soils, although sporadic, were encountered. Expansive clayey sandstone, claystone, and silstone are common in the Dawson Formation, and may require mitigation. Foundations anticipated for the site are standard spread footings possibly in conjunction with overexcavation in areas of expansive soils or loose soils. Areas of artificial fill, if encountered beneath foundations will require penetration or recompaction. Expansive layers may also be encountered in the soil and bedrock on this site. Expansive soils, if encountered, will require special foundation design and/or overexcavation. These soils will not prohibit development.

Areas of potentially seasonal shallow groundwater, flowing/ponded water, and floodplains exist on this site. The floodplains, and areas of ponded water can to be avoided by development and preserved as open space in drainage easements. Finished floor levels must be a minimum of one foot above the floodplain level. Where structures encroach on areas of potential shallow groundwater or construction and regrading is proposed, drains may be necessary. Typical drain details are included in Figures 8 through 10. Exact floodplain locations and drainage studies are beyond the scope of this report.

Areas of perched groundwater may be encountered on this site in areas other than those mapped. Permeable sands exist on the site that may carry water in the subsurface perched on less permeable bedrock. Groundwater was encountered at depths ranging from 6 to 18 feet in five of the test borings drilled on the site. Site grading in areas of shallow water should be kept to a minium. Fluctuation in groundwater conditions may occur due to variations in rainfall, soil conditions and development of surrounding areas. Builders should be cognizant of the potential for the occurrence of subsurface water features during construction and deal with each individual problem as necessary at the time of construction. Subsurface drains and dewatering systems may be necessary in some areas where seepage and perched water occurs. Unstable conditions should be expected where excavations approach the groundwater level. Stabilization using geofabric or shot rock may be necessary.

In summary, development of the site can be achieved if the items discussed above are mitigated. These items can be mitigated through proper design and construction or by avoidance. Additional investigation is recommended as grading and development plans are prepared, prior to construction.

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 geologic hazards identified on the site can either be avoided by development or satisfactorily mitigated through proper engineering design and construction practices. The report was prepared for the proposed master plan. Additional soils investigation is recommended as the development and grading plans are prepared to provide more detailed information on soil, groundwater and bedrock.

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. Discrepancies should be reported to Entech Engineering, Inc. soon after they are discovered so that the evaluation and recommendations presented can be reviewed and revised if necessary. Planning and design personnel should be made familiar with the contents of this report.

This report has been prepared for Phoenix Holdings 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 this report has provided you with all the information you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

BIBLIOGRAPHY

1. Scott, Glen R.; Taylor, Richard B.; Epis, Rudy C. and Wobus, Reinhard A. 1978. *Geologic Structure Map of the Pueblo 1x2 Quadrangle, South-Central Colorado.* U.S. Geologic Survey Map 1-1022

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT PHOENIX HOLDINGS
PROJECT 7020 WYOMING LANE
JOB NO. 210932

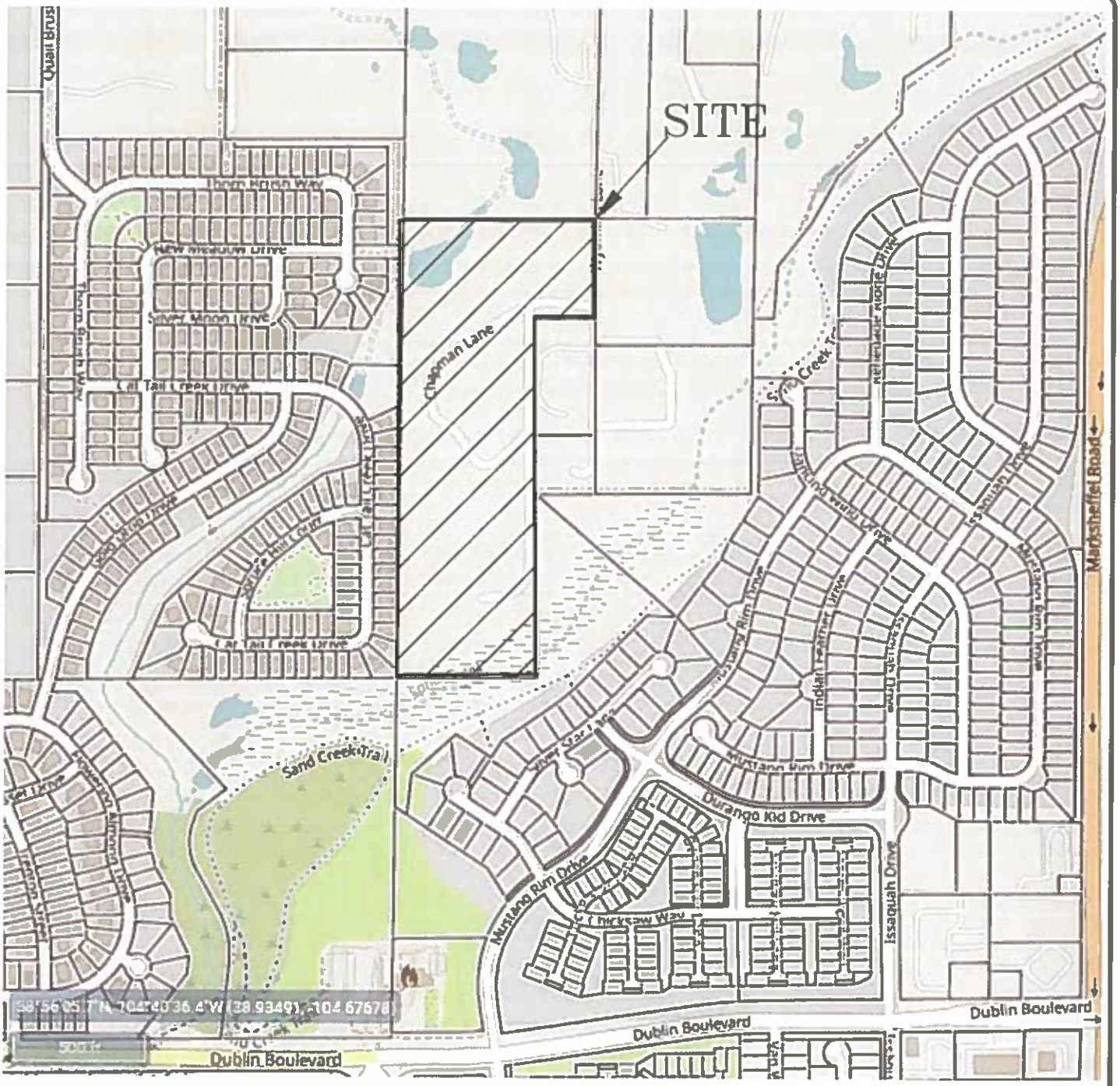
SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			5.9	NV	NP	<0.01			SM-SW	SAND, SLIGHTLY SILTY
1	3	5			8.7						SM-SW	SAND, SLIGHTLY SILTY
1	5	5			21.6						SM	SAND, SILTY
1	7	2-3			28.3						SM	SAND, SILTY
2	2	10	39.2	81.6	94.5	57	28	0.02		1.0	CH	CLAY, SANDY
2	4	10			82.9				670		CL	CLAY, SANDY
2	8	10	25.5	95.8	93.2					2.7	CL	CLAY, SANDY
3	1	20			89.5	45	16	0.02			ML	SILTSTONE, SANDY
3	4	15	22.5	105.9	78.5	42	15	<0.01		0.4	ML	SILTSTONE, SANDY
3	6	15			57.3						ML	SILTSTONE, VERY SANDY

Table 2: Summary of Depth to Bedrock and Groundwater

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	19*	11
2	>20	9
3	>20	12
4	14	12
5	>20	16
6	13	11
7	9	8
8	14	14

* Highly Weathered Bedrock

FIGURES



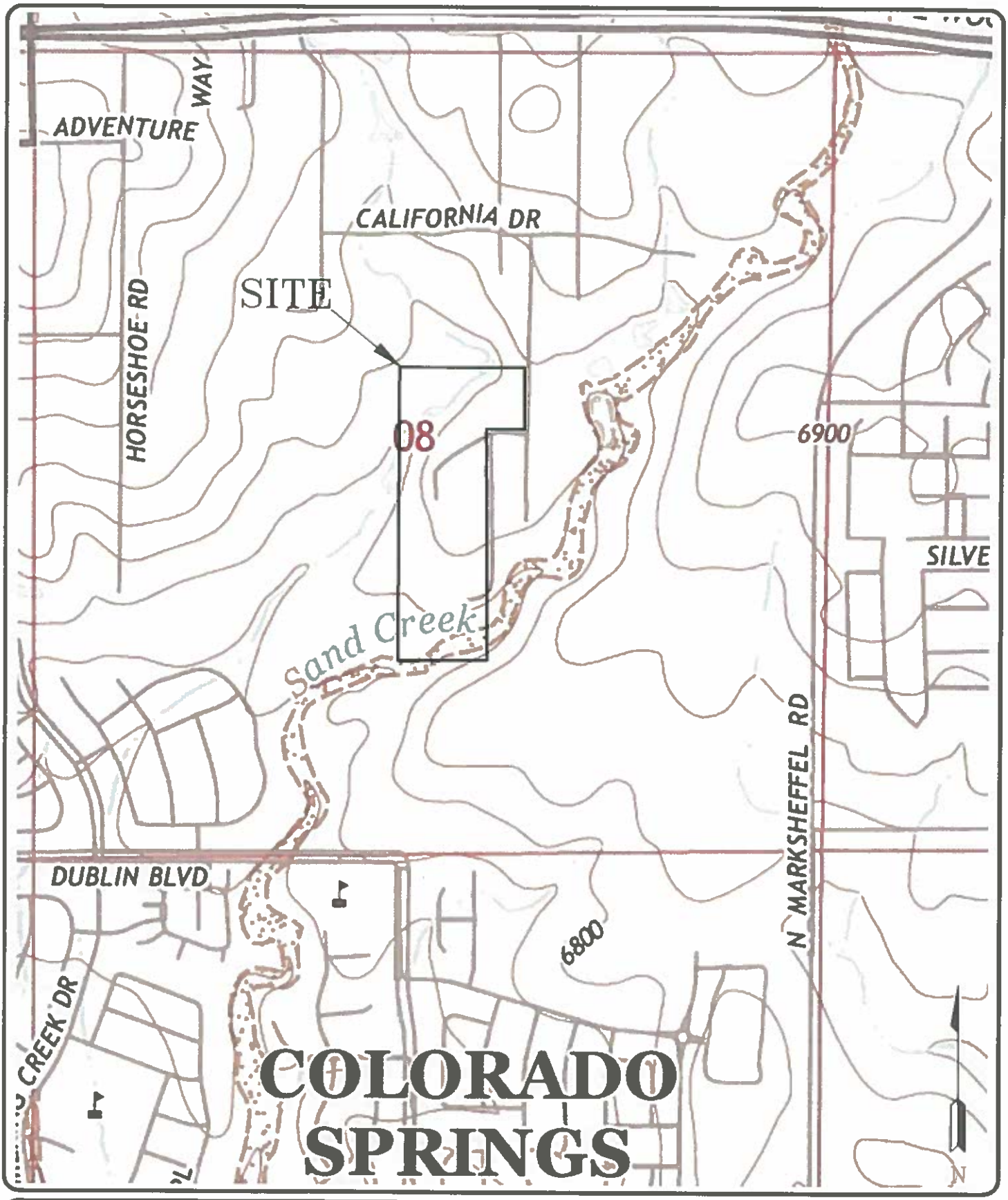
ENTECH ENGINEERING, INC.
303 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

VICINITY MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	5/13/21		

JOB NO.: 210932

FIG NO.: 1



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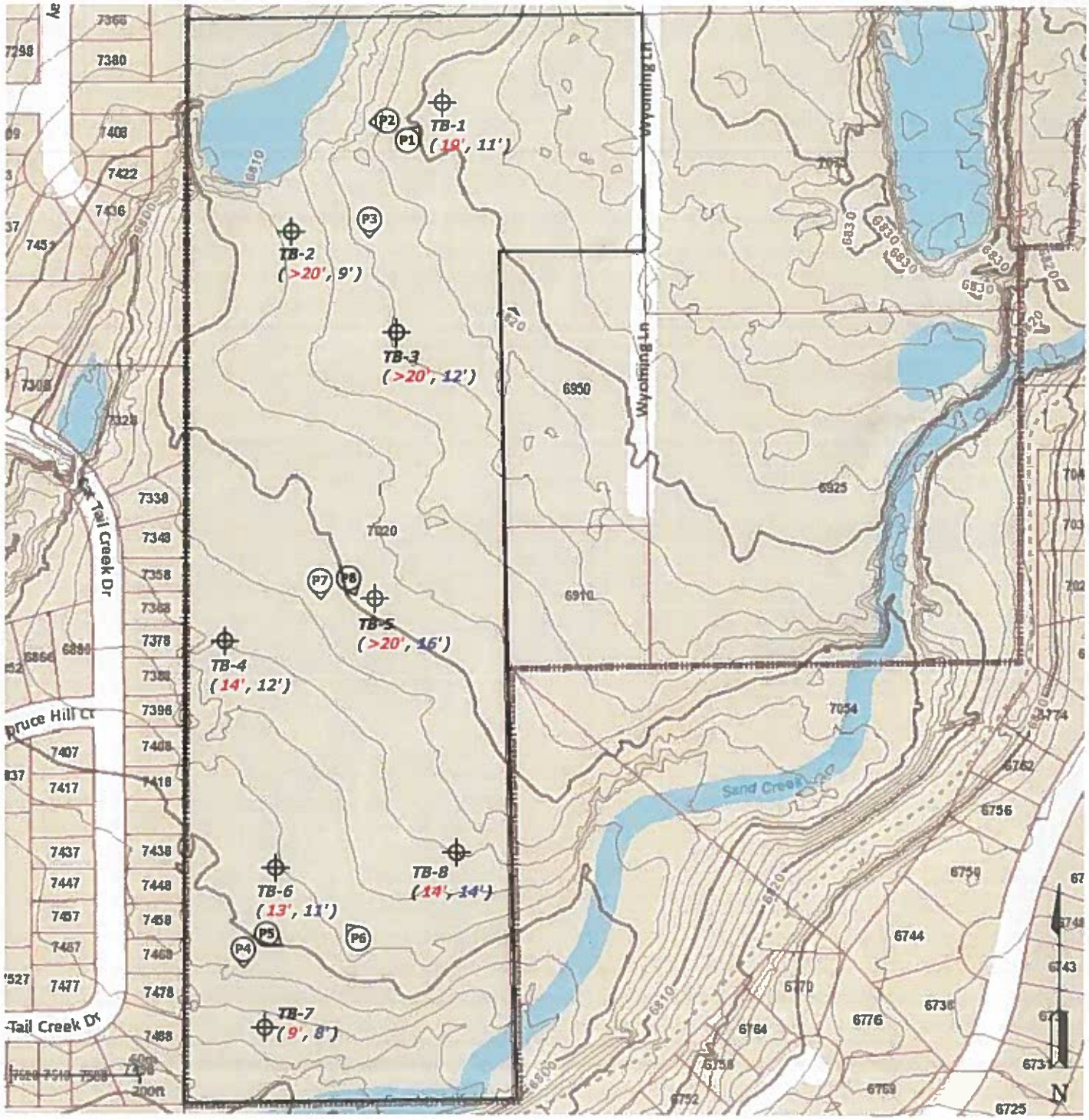
COLORADO SPRINGS, CO. 80907 (719) 531-5599

USGS MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	6/2/21		

JOB NO.: 210932

FIG NO.: 2



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER
(bedrock depth, ground wwater depth)

(P2) - APPROXIMATE TEST PIT LOCATION AND NUMBER

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SITE MAP/TEST BORING LOCATION MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	6/2/21		

JOB NO.: 210932

FIG NO.: 3

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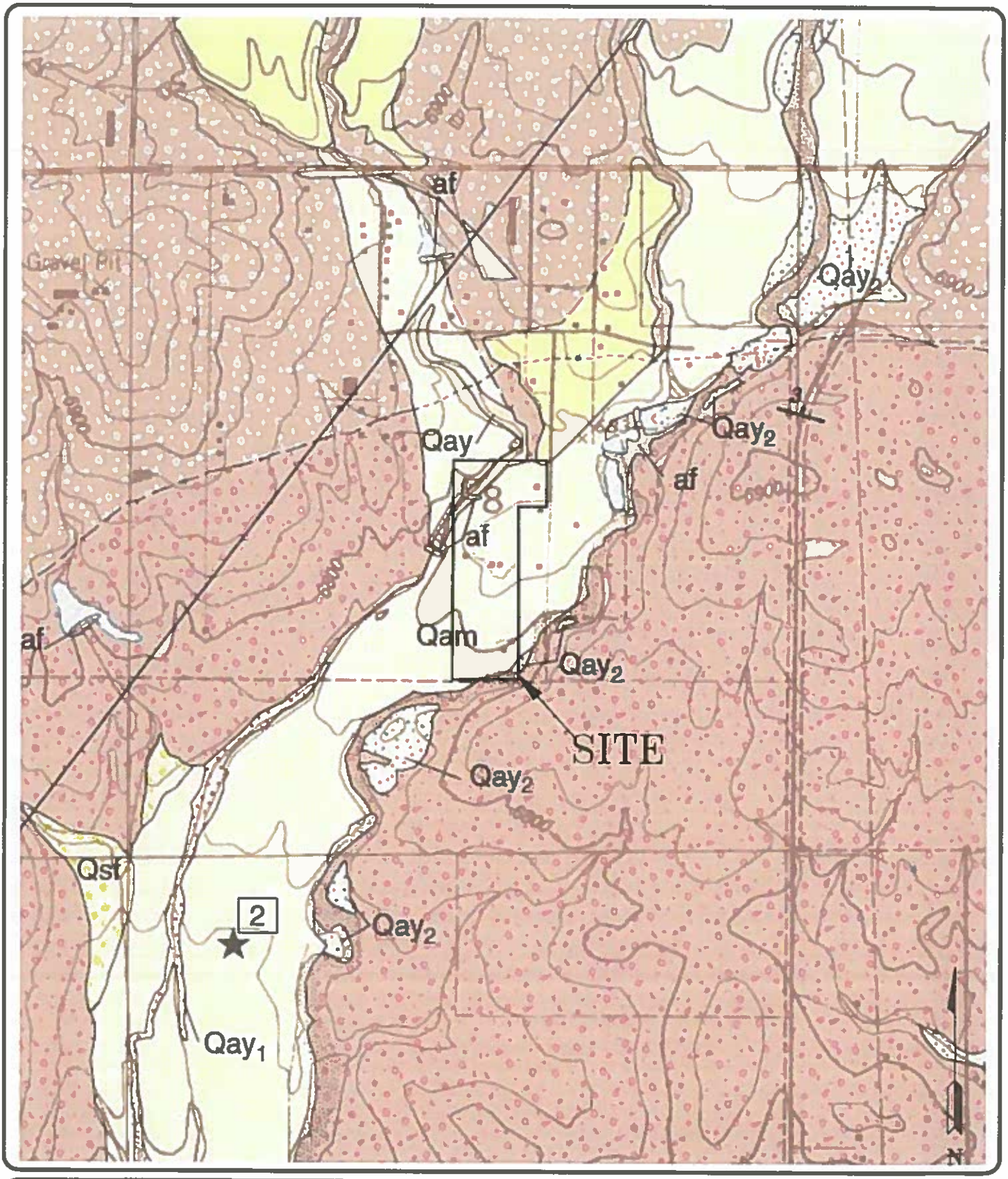
SOIL SURVEY MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	6/2/21		

JOB NO.: 210932

FIG NO.: 4



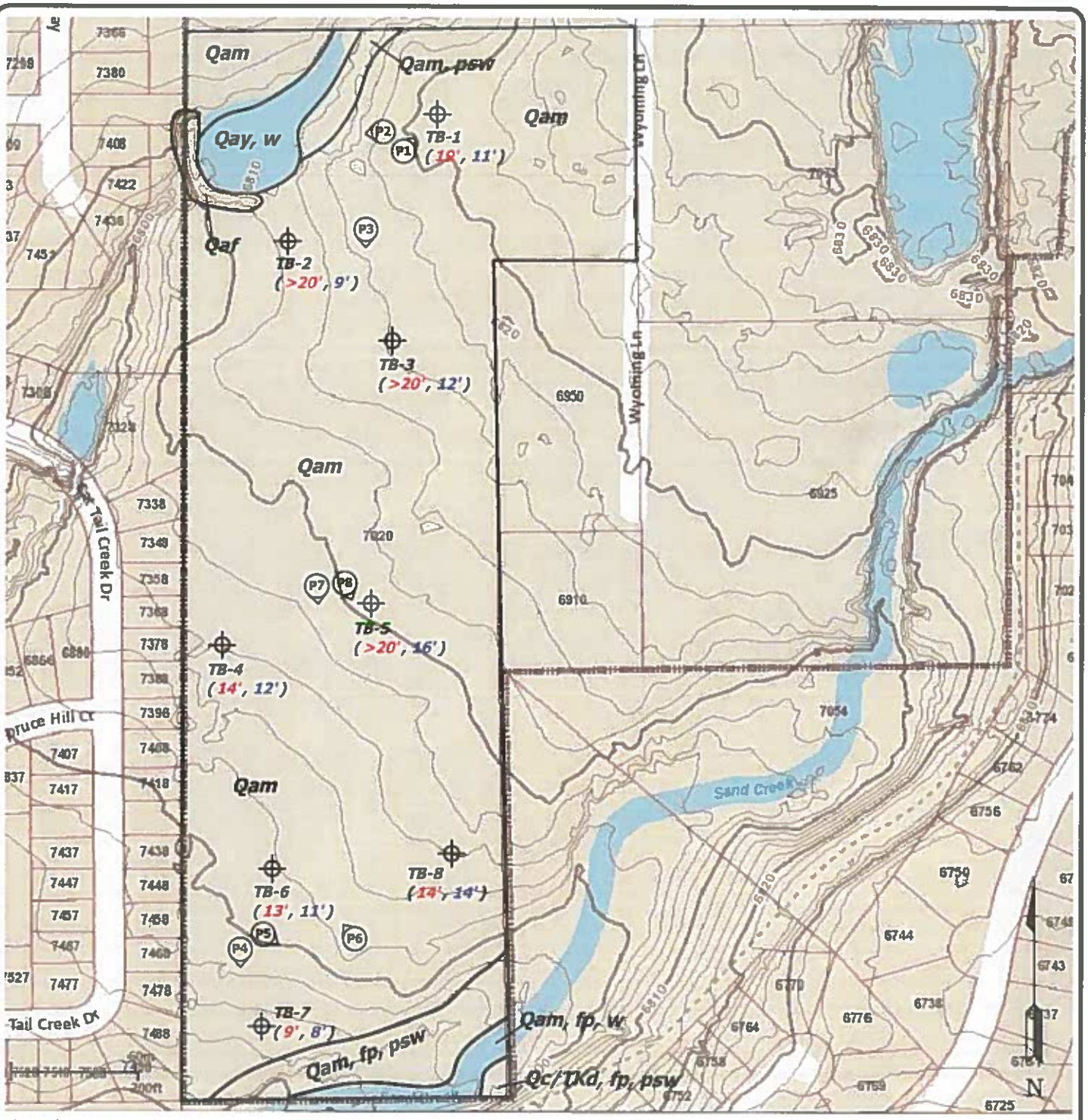
ENTECH ENGINEERING, INC.
305 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

FALCON NW QUADRANGLE GEOLOGY MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	6/2/21		

JOB NO.: 210932

FIG NO.: 5



Legend:

Qaf -	*Artificial Fill of Holocene Age:* *Man-made fill deposits*	*fp -*	*floodplain*
Qay -	*Young Alluvium, undivided of late to mid Holocene Age:* *water deposited sands and gravel*	*psw -*	*potentially seasonal shallow groundwater*
Qam -	*Middle Alluvium of early Holocen and late Pleistocene Age:* *water deposited sand, terrace deposits*	*w -*	*flowing and ponded water*
Tkda -	*Dawson Formation of Tertiary to Cretaceous Age:* *arkosic sandstone, with interbedded claystone and siltstone*		

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GEOLOGY/ENGINEERING GEOLOGY MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	6/2/21		

JOB NO.: 210932

FIG NO.: 6

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585 ELKTON DRIVE
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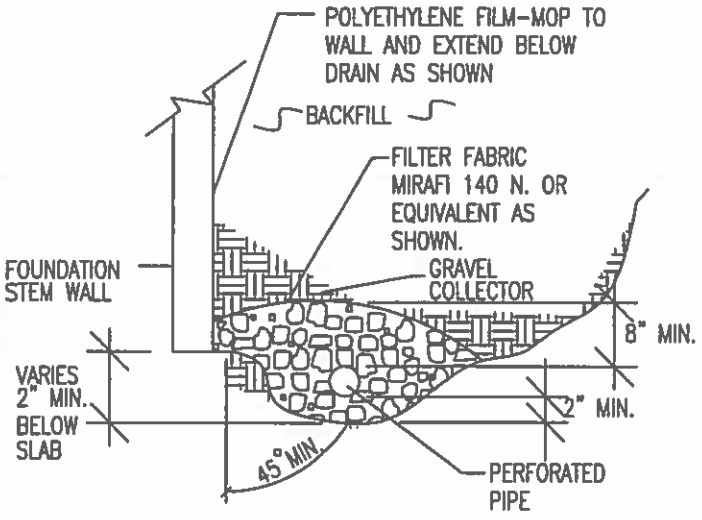
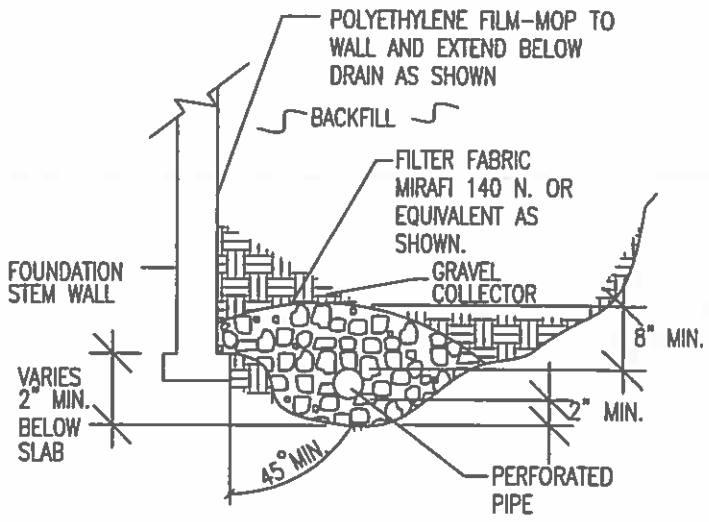
FEMA FLOODPLAIN MAP
7020 WYOMING LANE
PARCEL NO. 53080-00-105
EL PASO COUNTY, CO
FOR: PHOENIX HOLDINGS

DRAWN:	DATE:	CHECKED:	DATE:
LLL	6/2/21		

JOB NO.: 210932

FIG NO.: 7





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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565 ELKTON DRIVE
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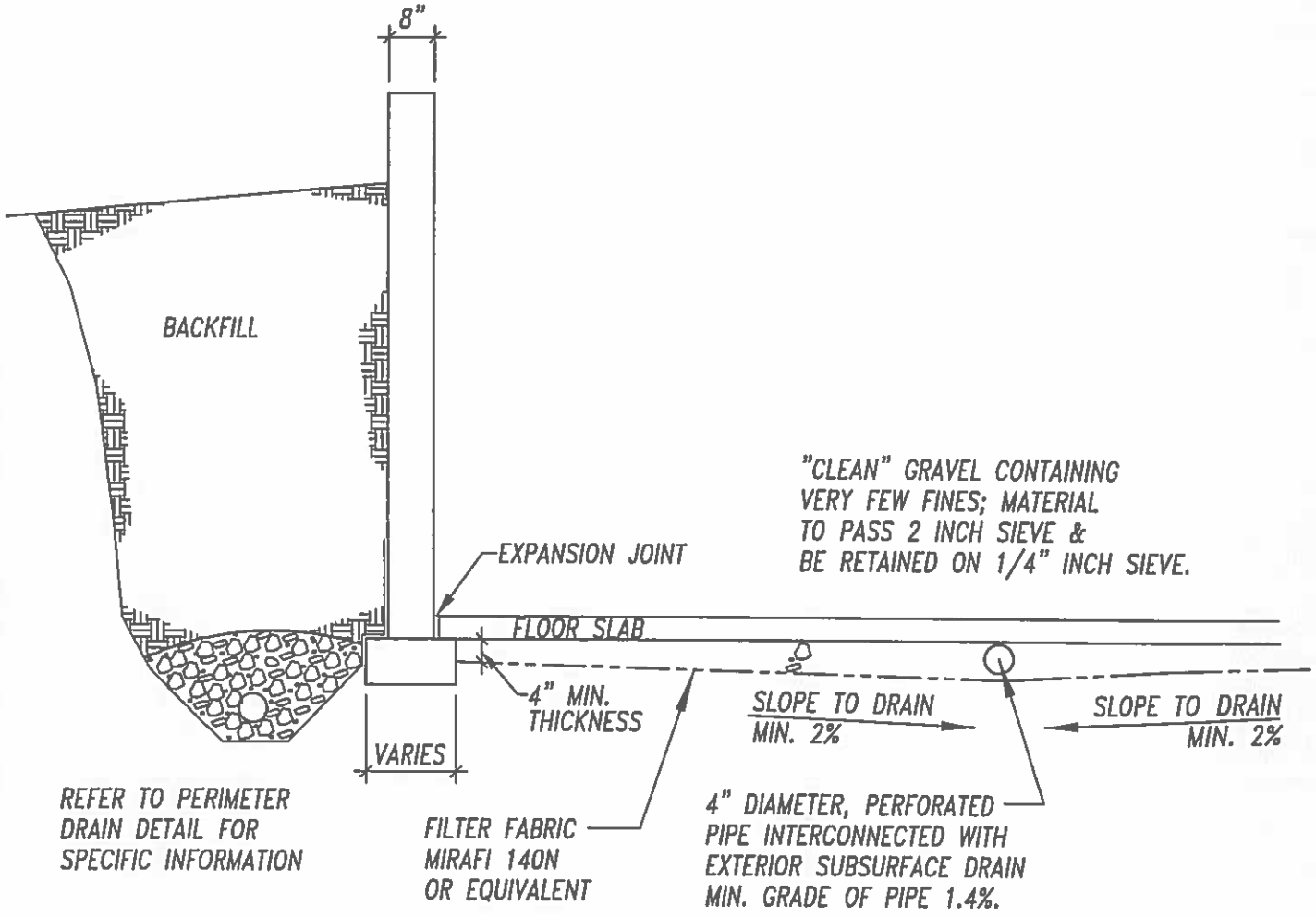
PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:
		DS	LLL

JOB NO.: 210932

FIG NO.: 8



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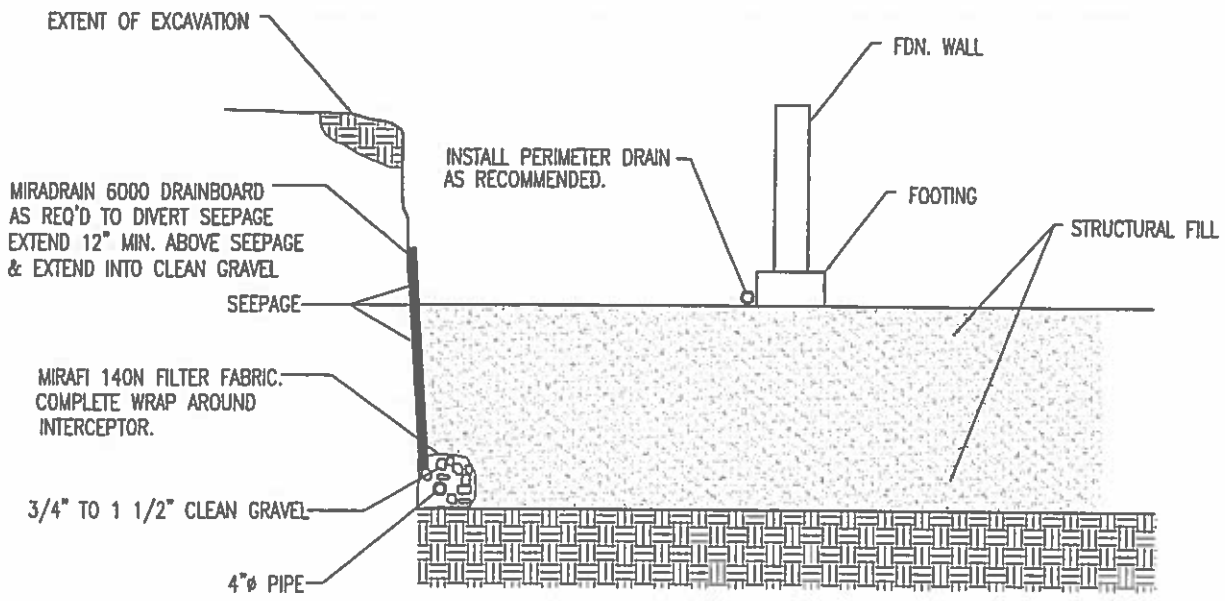
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

TYP. UNDERSLAB DRAINAGE
LAYER (CAPILLARY BREAK)

DRAWN:	DATE:	DESIGNED:	CHECKED:
		DS	LLL

JOB NO.: 210932
FIG NO.: 9



NOTE:
EXTEND INTERCEPTOR DRAIN TO DAYLIGHT

INTERCEPTOR DRAIN DETAIL

N.T.S.

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

INTERCEPTOR DRAIN DETAIL

DRAWN BY:	DATE DRAWN:		CHECKED:
			LLC

JOB NO.: 210932

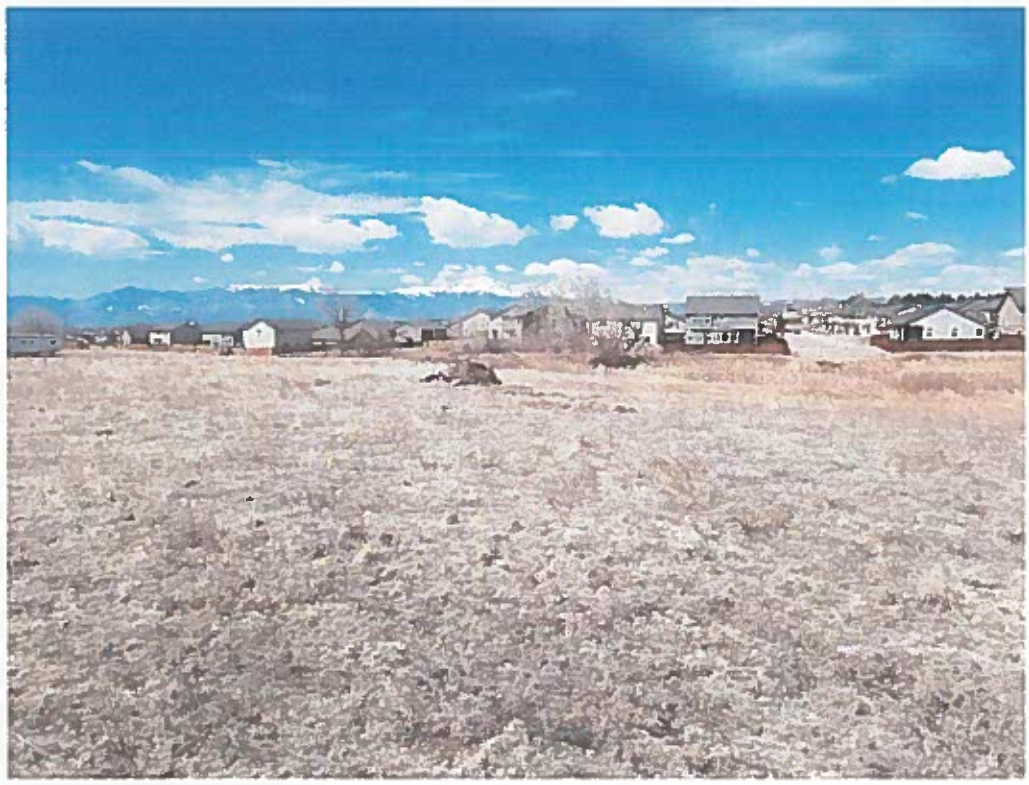
FIG. NO.: 10

APPENDIX A: Site Photographs

1

Looking northeast from northern portion of the site.

April 19, 2021



2

Looking west from the northern portion of the site.

April 19, 2021

Job No. 210932

3

Looking south from northern portion of the site.

April 19, 2021

4

Looking south from the southwestern portion of the site.

April 19, 2021

Job No. 210932

5

Looking southeast from the southwestern portion of the site.

April 19, 2021

6

Looking northwest from the southern portion of the site.

April 19, 2021

Job No. 210932

7

Looking south from the central portion of the site.

April 19, 2021

8

Looking southeast from the central portion of the site.

April 19, 2021

Job No. 210932

APPENDIX B: Test Boring Logs & Laboratory Test Results, Preliminary Subsurface Soil Investigation, Entech Job No. 210932

TEST BORING NO. 1
DATE DRILLED 4/23/2021
Job # 210932

REMARKS

WATER @ 11', 4/29/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			15	0.7	1
5			14	0.7	1
10			17	3.8	1
15			4	11.2	1
20			20	25.3	3

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

HIGHLY WEATHERED SILTSTONE, SANDY, BLUE GRAY, STIFF, WET

TEST BORING NO. 2
DATE DRILLED 4/23/2021
CLIENT PHOENIX HOLDINGS
LOCATION 7020 WYOMING LANE

REMARKS

WATER @ 9', 4/29/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			4	5.6	1
5			2	11.9	1
10			8	38.6	2
15			9		1
20			5	10.2	1

SAND, SILTY, FINE TO COARSE GRAINED, BROWN, LOOSE, MOIST

CLAY, SANDY, GRAY BROWN, FIRM, WET

SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, WET

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932
FIG NO A- 1

TEST BORING NO. 3
DATE DRILLED 4/23/2021
Job # 210932

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 12', 4/29/21						
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST				12	0.6	1
	5			15	5.4	1
	10			12	4.2	1
CLAY, SANDY, GRAY BROWN STIFF, WET	15			25	21.6	2
	20					

TEST BORING NO. 4
DATE DRILLED 4/23/2021
CLIENT PHOENIX HOLDINGS
LOCATION 7020 WYOMING LANE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 12', 4/29/21						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, DRY TO MOIST				9	2.1	1
	5			8	3.3	1
CLAY, SANDY, TAN, SOFT, WET	10			5	31.6	2
SILTSTONE, SANDY, GRAY BROWN, HARD, MOIST	15			50 | 6"	23.0	3
	20			50 | 8"	25.2	3

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO. 210932
FIG NO. A- 2

TEST BORING NO. 5
DATE DRILLED 4/25/2021
Job # 210932

REMARKS

WATER @ 16', 4/29/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			15	4.0	1	SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, DRY TO WET
5			17	2.1	1	
10			24	2.2	1	
15			27	4.8	1	
20			3	12.8	1	

TEST BORING NO. 6
DATE DRILLED 4/25/2021
CLIENT PHOENIX HOLDINGS
LOCATION 7020 WYOMING LANE

REMARKS

WATER @ 11', 4/29/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			20	2.5	1	SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST
5			22	2.4	1	
10			28	5.6	1	
15			50/8"	23.1	3	SILTSTONE, VERY SANDY, BLUE GRAY, HARD, MOIST
20			50/6"	26.1	3	

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO. 210932
FIG NO. A- 3

TEST BORING NO. 7
DATE DRILLED 4/25/2021
Job # 210932

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 8', 4/29/21						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST				18	3.8	1
	5			14	6.0	1
SILTSTONE, SANDY, TAN, HARD, MOIST	10			50	24.9	3
	15			50/7"	20.5	3
	20			50/8"	26.0	3

TEST BORING NO. 8
DATE DRILLED 4/25/2021
CLIENT PHOENIX HOLDINGS
LOCATION 7020 WYOMING LANE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 14', 4/29/21						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, DRY TO MOIST				26	2.3	1
	5			28	3.5	1
CLAY, SANDY, TAN, VERY STIFF, MOIST	10			41	27.5	2
WEATHERED TO FORMATIONAL SILTSTONE, SANDY, TAN, HARD, MOIST	15			45	20.9	3
	20			50/7"	18.0	3

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ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

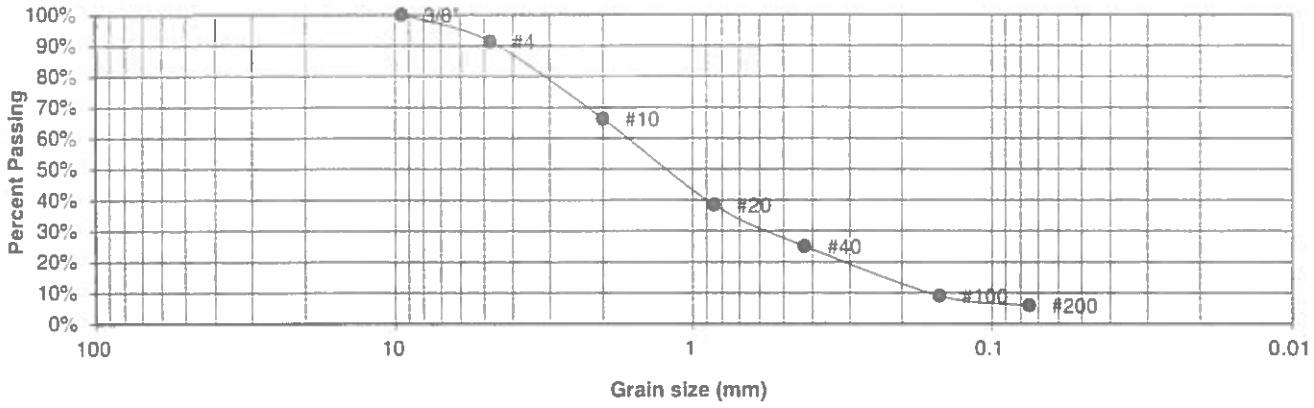
TEST BORING LOG

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932
FIG NO A- 4

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	1	PROJECT	7020 WYOMING LANE
TEST BORING #	1	JOB NO.	210932
DEPTH (FT)	2-3	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.3%
10	66.3%
20	38.4%
40	25.0%
100	9.0%
200	5.9%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

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

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

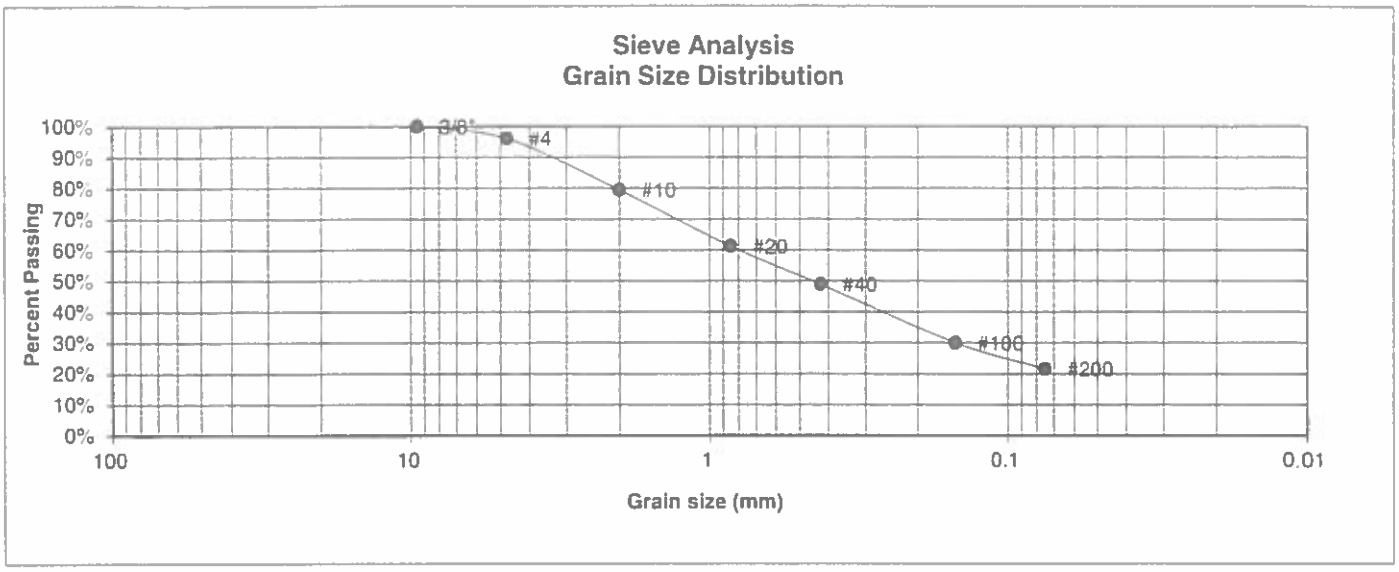
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932

FIG NO B-1

UNIFIED CLASSIFICATION	SM	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	1	PROJECT	7020 WYOMING LANE
TEST BORING #	5	JOB NO.	210932
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.1%
10	79.5%
20	61.2%
40	48.9%
100	30.0%
200	21.6%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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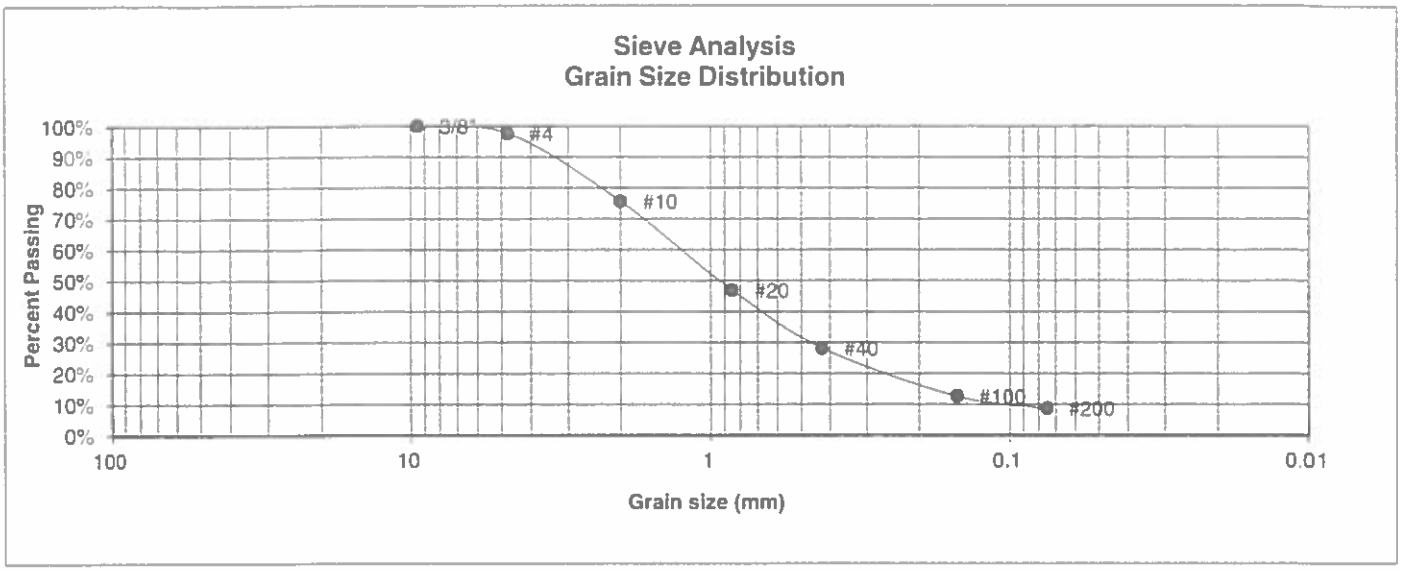
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932

FIG NO B-2

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	1	PROJECT	7020 WYOMING LANE
TEST BORING #	3	JOB NO.	210932
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.7%
10	75.7%
20	46.9%
40	28.1%
100	12.6%
200	8.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

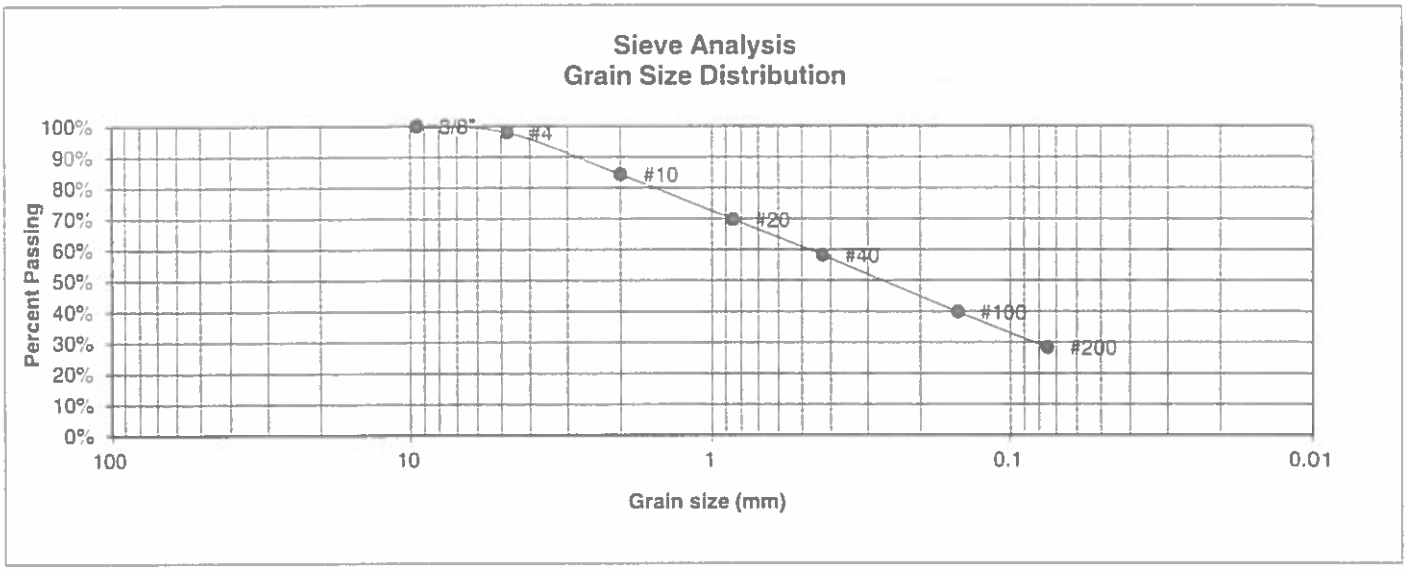
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932

FIG NO B-3

UNIFIED CLASSIFICATION	SM	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	1	PROJECT	7020 WYOMING LANE
TEST BORING #	7	JOB NO.	210932
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.9%
10	84.3%
20	69.7%
40	58.2%
100	39.8%
200	28.3%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

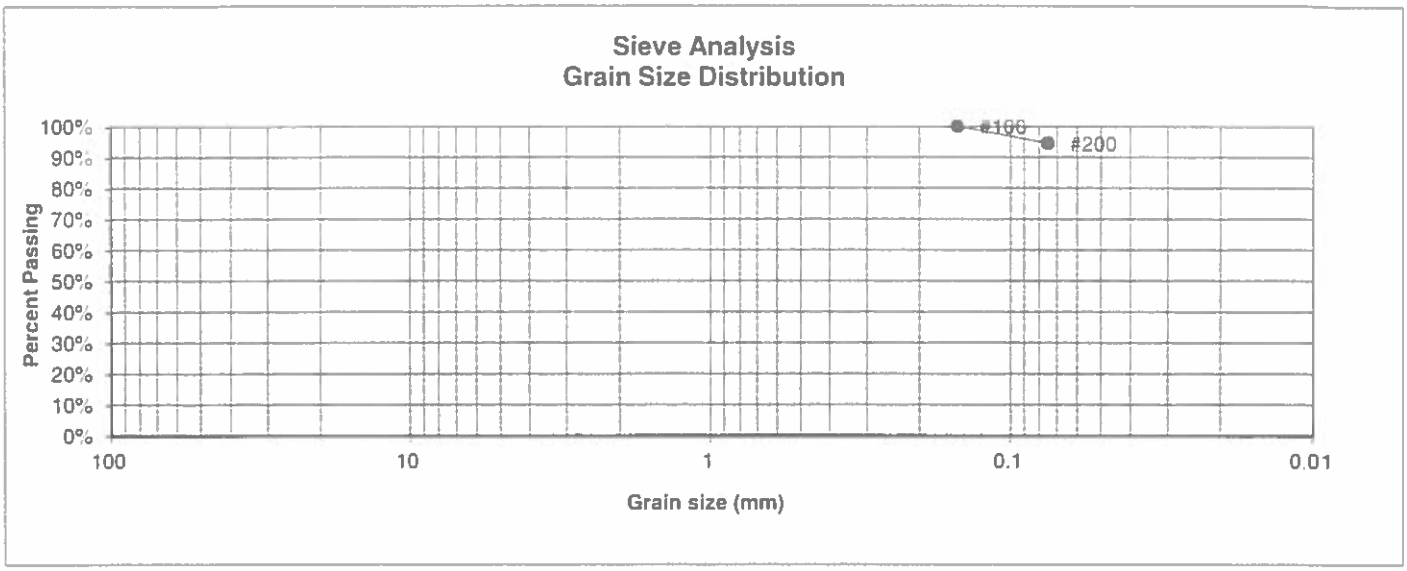
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED:	DATE
		LLL	5/12/21

JOB NO. 210932

FIG NO. B-4

UNIFIED CLASSIFICATION	CH	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	2	PROJECT	7020 WYOMING LANE
TEST BORING #	2	JOB NO.	210932
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	100.0%
200	94.5%

Atterberg Limits	
Plastic Limit	29
Liquid Limit	57
Plastic Index	28

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

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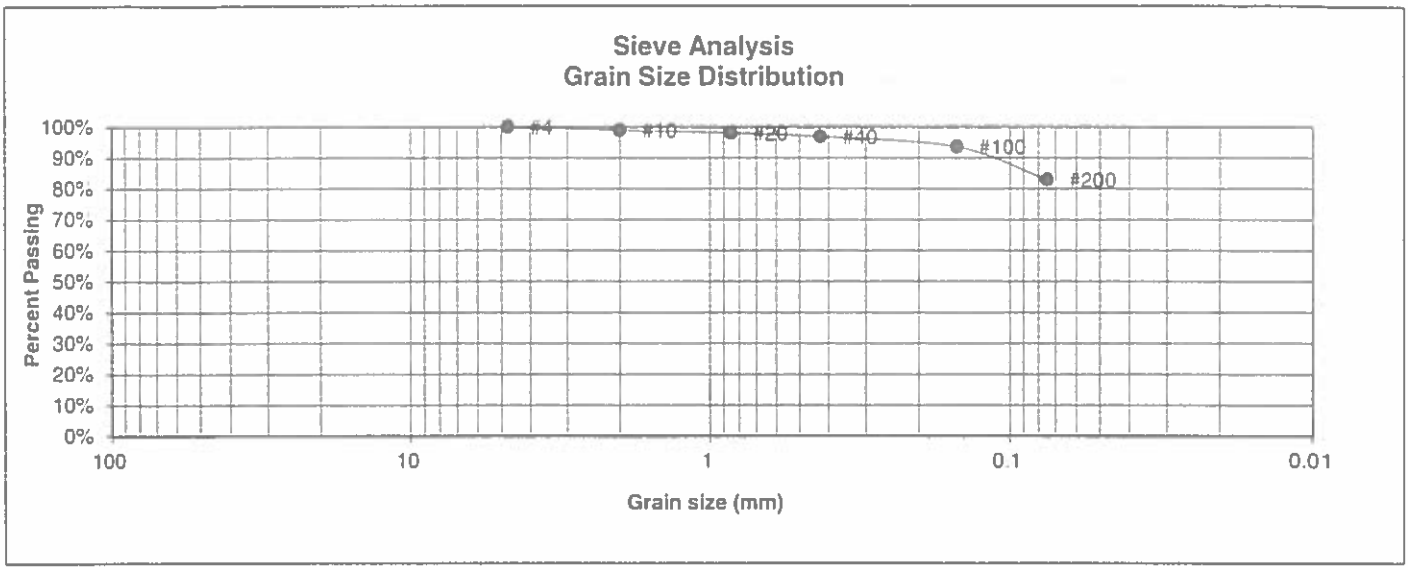
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/2/21

JOB NO 210932

FIG NO B-5

UNIFIED CLASSIFICATION	CL	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	2	PROJECT	7020 WYOMING LANE
TEST BORING #	4	JOB NO.	210932
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.0%
20	98.1%
40	96.9%
100	93.6%
200	82.9%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	16.6%
Moisture at finish	24.9%
Moisture increase	8.3%
Initial dry density (pcf)	95
Swell (psf)	670

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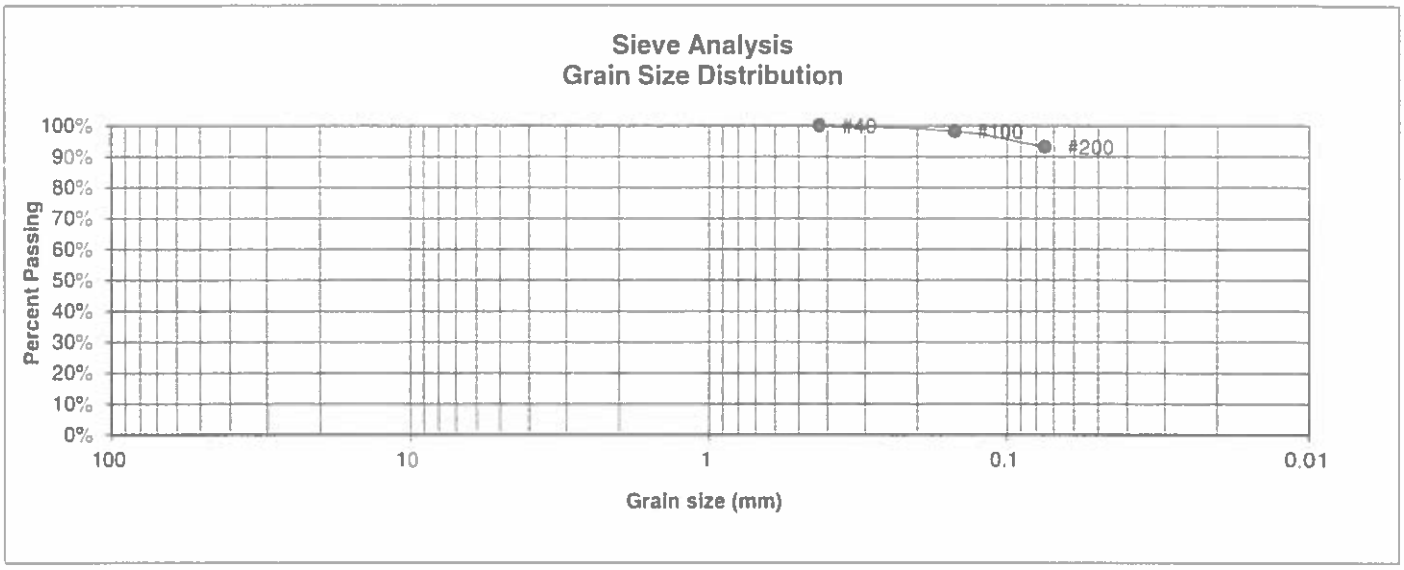
LABORATORY TEST RESULTS

DRAWN:	DATE	CHECKED:	DATE:
		LLL	5/12/21

JOB NO 210932

FIG NO B-6

UNIFIED CLASSIFICATION	CL	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	2	PROJECT	7020 WYOMING LANE
TEST BORING #	8	JOB NO.	210932
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	100.0%
100	98.3%
200	93.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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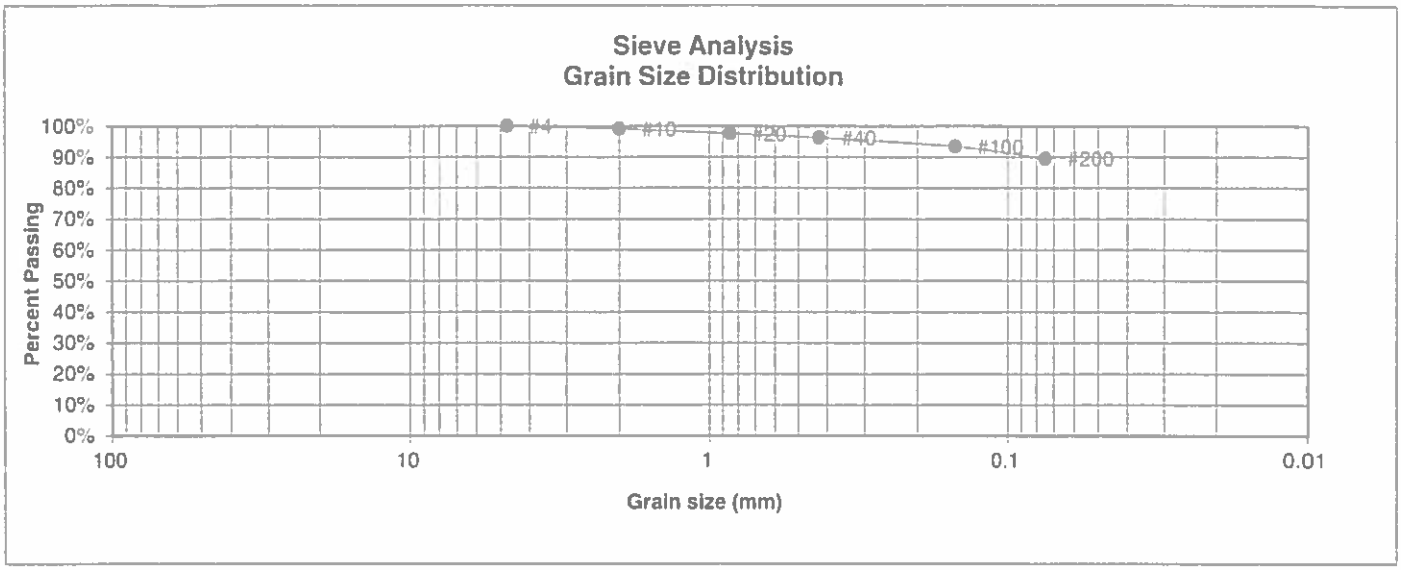
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED:	DATE
		LLL	5/12/21

JOB NO 210932

FIG NO B-7

UNIFIED CLASSIFICATION	ML	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	3	PROJECT	7020 WYOMING LANE
TEST BORING #	1	JOB NO.	210932
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.1%
20	97.5%
40	96.2%
100	93.4%
200	89.5%

Atterberg Limits	
Plastic Limit	29
Liquid Limit	45
Plastic Index	16

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

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LABORATORY TEST RESULTS

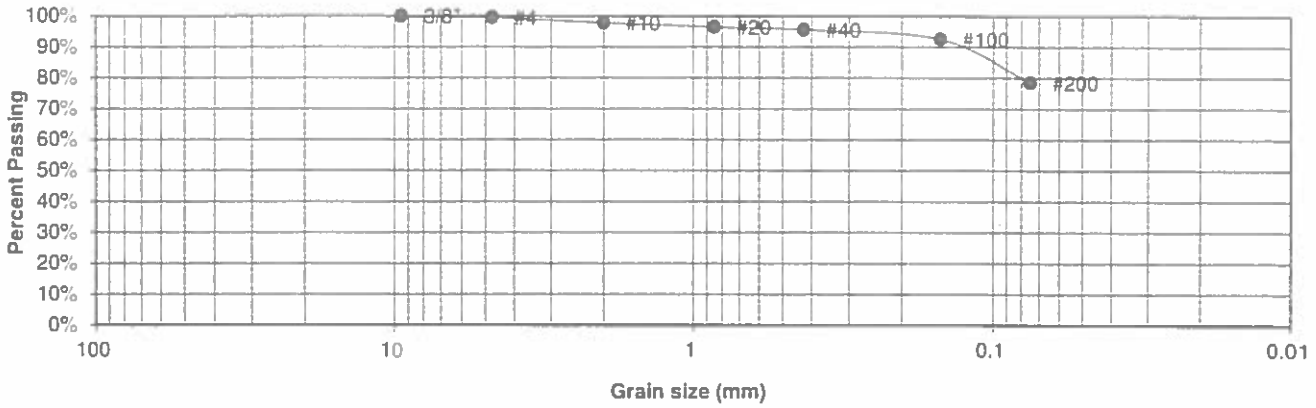
DRAWN	DATE	CHECKED:	DATE:
		LLC	5/12/21

JOB NO 210932

FIG NO B-8

UNIFIED CLASSIFICATION	ML	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	3	PROJECT	7020 WYOMING LANE
TEST BORING #	4	JOB NO.	210932
DEPTH (FT)	15	TEST BY	BL

Sieve Analysis
Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.5%
10	97.8%
20	96.5%
40	95.6%
100	92.5%
200	78.5%

Atterberg Limits	
Plastic Limit	27
Liquid Limit	42
Plastic Index	15

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

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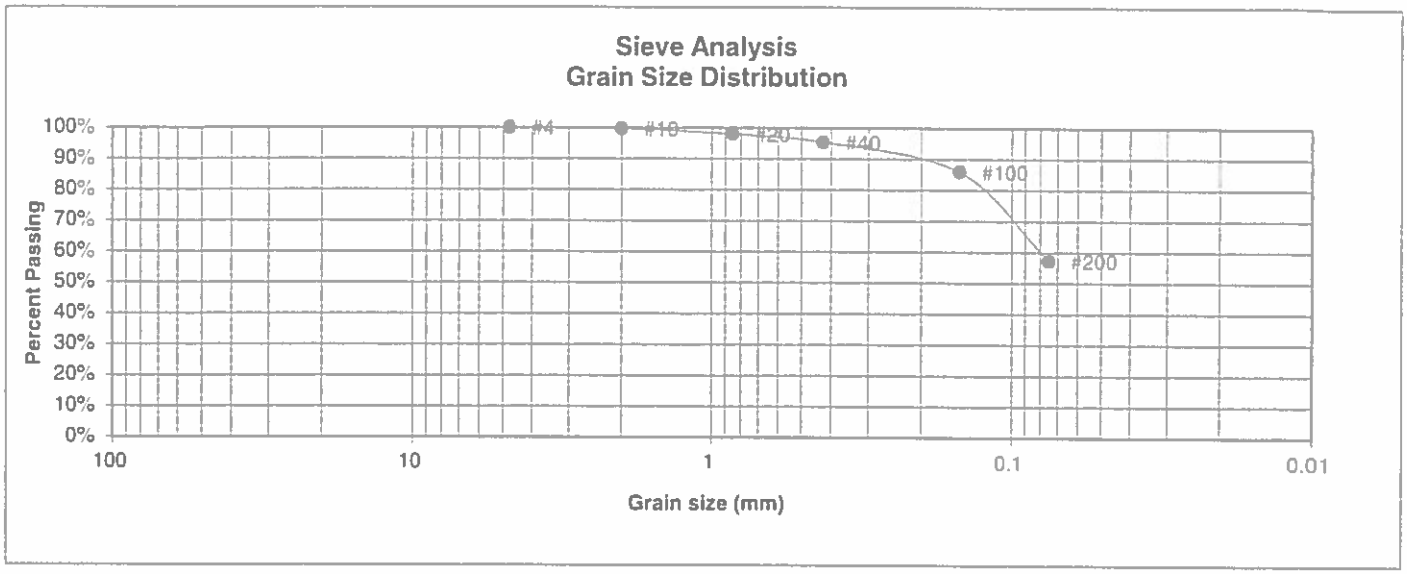
LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932

FIG NO B-9

UNIFIED CLASSIFICATION	ML	CLIENT	PHOENIX HOLDINGS
SOIL TYPE #	3	PROJECT	7020 WYOMING LANE
TEST BORING #	6	JOB NO.	210932
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	98.0%
40	95.4%
100	86.0%
200	57.3%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

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

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LABORATORY TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

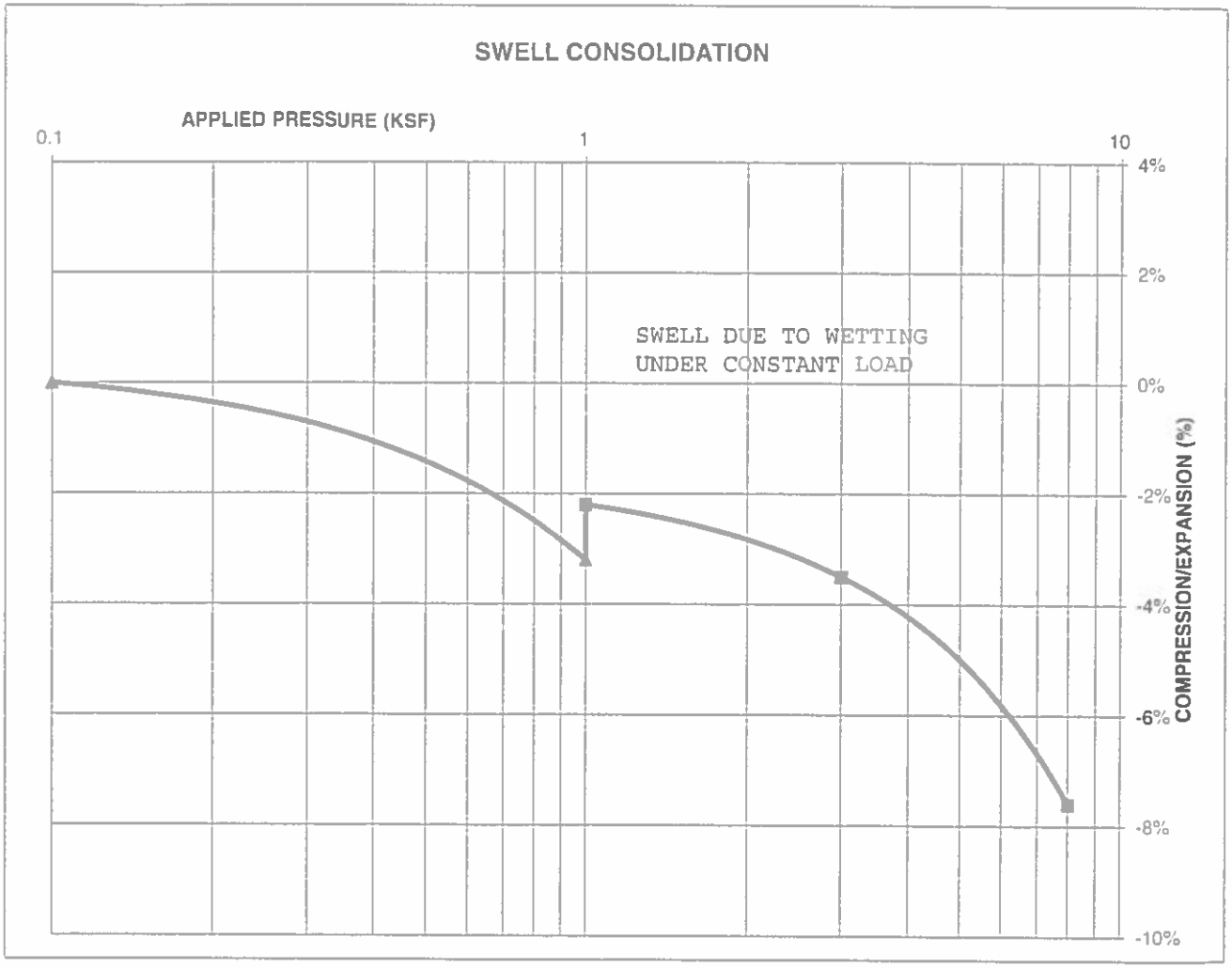
JOB NO 210932

FIG NO B-10

CONSOLIDATION TEST RESULTS

TEST BORING #	2	DEPTH(ft)	10
DESCRIPTION	CH	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			82
NATURAL MOISTURE CONTENT			39.2%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 210932
CLIENT PHOENIX HOLDINGS
PROJECT 7020 WYOMING LANE



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SWELL CONSOLIDATION
TEST RESULTS

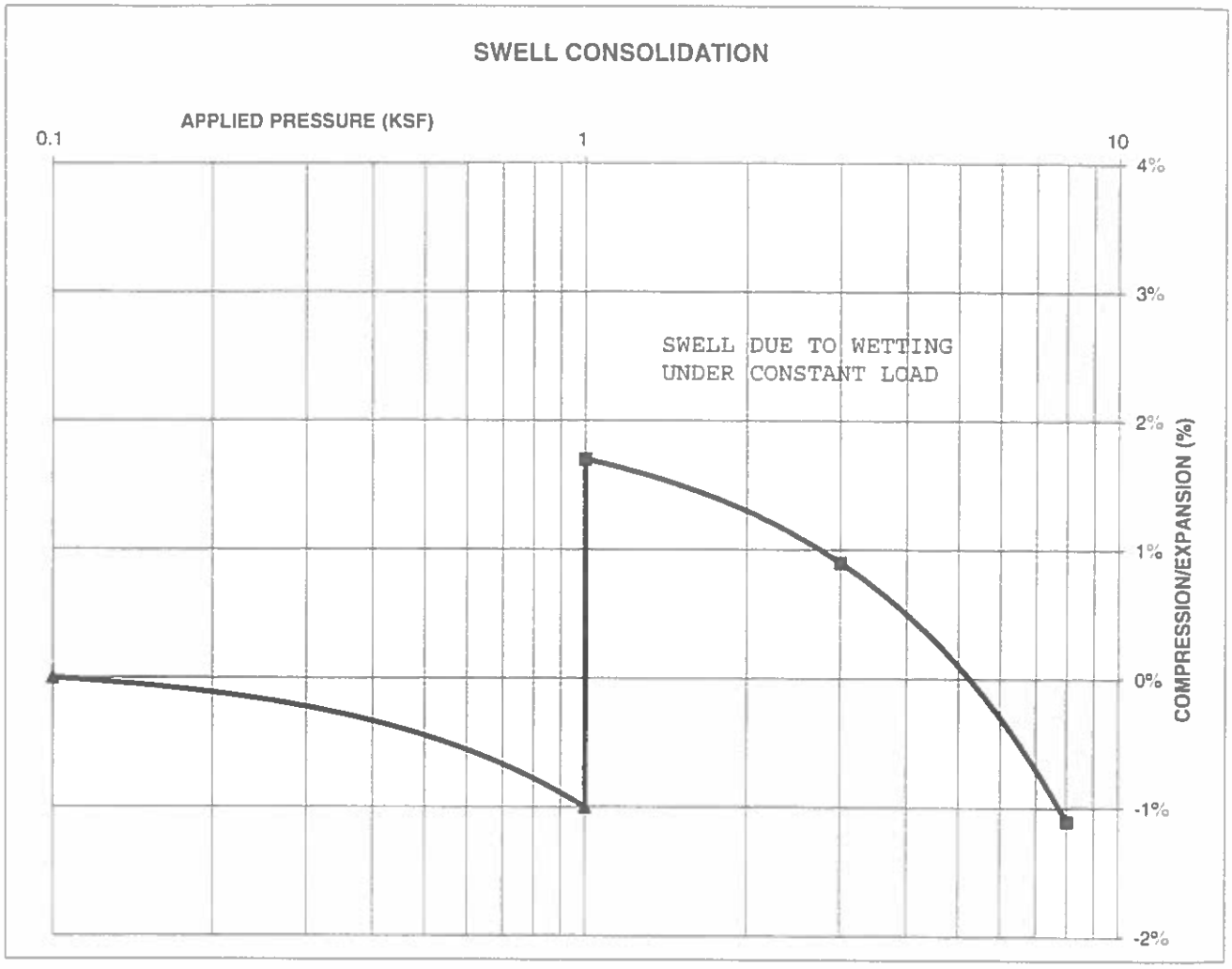
DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO 210932
FIG NO B-11

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			96
NATURAL MOISTURE CONTENT			25.5%
SWELL/CONSOLIDATION (%)			2.7%

JOB NO. 210932
CLIENT PHOENIX HOLDINGS
PROJECT 7020 WYOMING LANE



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SWELL CONSOLIDATION
TEST RESULTS

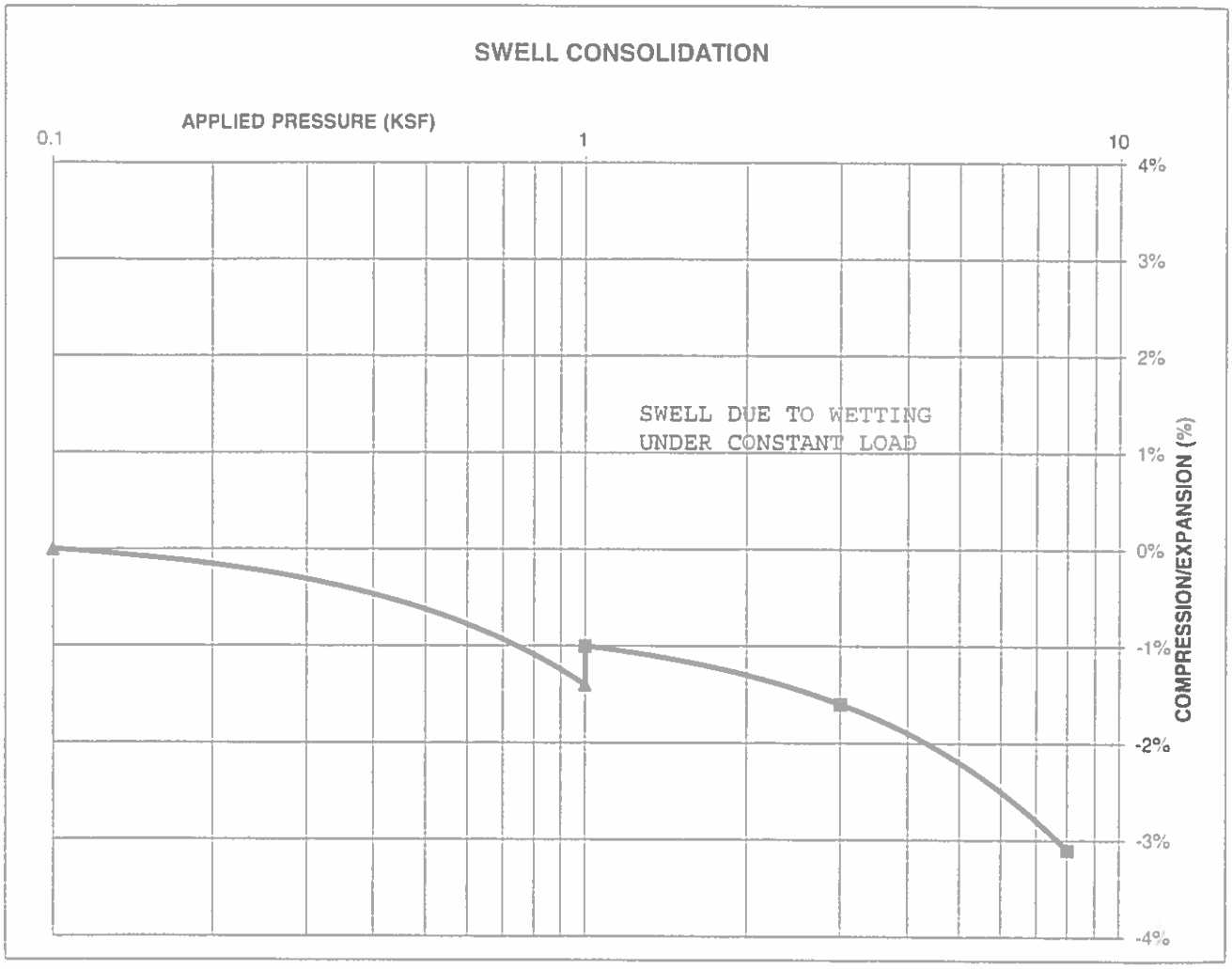
DRAWN	DATE	CHECKED:	DATE
		LLL	5/12/21

JOB NO. 210932
FIG NO. B-12

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	15
DESCRIPTION	ML	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			106
NATURAL MOISTURE CONTENT			22.5%
SWELL/CONSOLIDATION (%)			0.4%

JOB NO. 210932
CLIENT PHOENIX HOLDINGS
PROJECT 7020 WYOMING LANE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN	DATE	CHECKED	DATE
		LLL	5/12/21

JOB NO. 210932
FIG NO. B-13

CLIENT	PHOENIX HOLDINGS	JOB NO.	210932
PROJECT	7020 WYOMING LANE	DATE	5/4/2021
LOCATION	7020 WYOMING LANE	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	2-3	1	SM-SW	<0.01
TB-1	20	3	ML	0.02
TB-2	10	2	CH	0.02
TB-4	15	3	ML	<0.01

QC BLANK PASS

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LABORATORY TEST
SULFATE RESULTS

DRAWN	DATE	CHECKED:	DATE
		LLL	5/12/21

JOB NO.: 210932

FIG NO.: B-14

APPENDIX C: Soil Survey Discerptions

El Paso County Area, Colorado

9—Blakeland-Fluvaquentic Haplaquolls

Map Unit Setting

National map unit symbol: 36b6
Elevation: 3,500 to 5,800 feet
Mean annual precipitation: 13 to 17 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 60 percent
Fluvaquentic haplaquolls and similar soils: 38 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose and/or eolian deposits derived from arkose

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 capacity: 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

Description of Fluvaquentic Haplaquolls

Setting

Landform: Swales
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 12 inches: variable

Properties and qualities

Slope: 1 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: D
Hydric soil rating: Yes

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 18, Jun 5, 2020

El Paso County Area, Colorado

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671
Elevation: 6,000 to 6,800 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

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

Description of Blendon

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

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

Data Source Information

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