Applied GeoTech

GEOTECHNICAL INVESTIGATION

PROPOSED FIELDHOUSE

CORNER CANYON HIGH SCHOOL

12943 SOUTH 700 EAST

DRAPER, UTAH

PREPARED FOR:

CANYONS SCHOOL DISTRICT
9100 SOUTH 500 WEST
SANDY, UT 84070

ATTENTION: LUKE BUTTERFIELD

PROJECT NO. 1240393 JULY 30, 2024

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EXECUTIVE SUMMARY

1. Approximately 1 to 2 feet of fill was encountered in all but Borings B-7 and B-10, which encountered fill to depths of approximately 13 and 6 feet, respectively. Lean clay was encountered below the fill. The clay generally extends to the maximum depth of the borings, approximately 10½ to 20½ feet. The clay between depths of approximately 12 and 15½ feet in Boring B-10 has significant silt layers.

   Cone Penetration Test CPT-1 was conducted near Boring B-4 and encountered predominantly clay to a depth of approximately 33 feet overlying predominantly sand to a depth of approximately 40 feet. Clay, silt and sand layers were encountered from a depth of approximately 40 feet to the maximum depth of the CPT, approximately 50 feet.

2. Subsurface water was measured in the borings at depths of approximately 3.5 to 6.2 feet except in Boring B-7. Boring B-7 is higher in elevation than the other borings and the subsurface water was measured in this boring at a depth of approximately 15.5 feet. The water levels were measured on July 18, 2024.

3. With the proposed construction and the subsurface conditions encountered, the proposed building may be supported on spread footings bearing on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil. Spread footings bearing on the undisturbed natural soil or on compacted structural fill may be designed using an allowable net bearing pressure of 1,500 psf. Footings bearing on at least 2 feet of compacted structural fill may be designed for an allowable net bearing pressure of 2,500 psf.

4. Approximately 1 to 13 feet of fill was encountered in the borings. Unsuitable fill, topsoil, debris and other deleterious materials should be removed from below areas of proposed buildings, turf fields, exterior slabs and other improvements sensitive to differential settlement.

5. The upper soil has a high clay content and will be easily disturbed by construction equipment traffic when it is very moist to wet. Placement of approximately 1 to 2 feet of granular borrow consisting predominantly of gravel with less than 15 percent passing the No. 200 sieve may be needed to provide limited access for rubber-tired equipment and to facilitate placement and compaction of structural fill and site grading fill when the subgrade is very moist to wet.

6. Geotechnical information relating to foundations, subgrade preparation and materials is included in the report

SCOPE

This report presents the results of a geotechnical investigation for the proposed fieldhouse and turf soccer field at Corner Canyon High School at 12943 South 700 East in Draper, Utah. The report presents the subsurface conditions encountered, laboratory test results and recommendations for foundations. The study was conducted in general accordance with our proposal dated May 21, 2024.

Field exploration was conducted to obtain information on the subsurface conditions at the site. Samples obtained from the field investigation were tested in the laboratory to determine physical and engineering characteristics of the on-site soil. Information obtained from the field and laboratory investigations was used to define conditions at the site and to develop recommendations for the proposed foundations.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations relating to construction are included in the report.

SITE CONDITIONS

The site consists of grass fields south of the Corner Canyon High School football field. The site topography, proposed fieldhouse and turf soccer field locations are shown on Figure 1.

The area of the proposed fieldhouse building is in the northeastern portion of the site. This area is relatively flat with a gentle slope down to the west.

The area of the proposed turf soccer field is in the southeastern portion of the site. The northern portion of this area is relatively flat with a gentle slope down to the west. The southern portion of this area has a fill, approximately 9 feet higher than the adjacent areas as indicated on Figure 1.

The western portion of the site is several feet lower in elevation than the eastern portion and slopes down to the south. This area appears to form a runoff basin.

The site is generally covered with sod.

The surrounding areas include a football field to the north, baseball field to the south and school and parking lot to the west. There is a trail and canal to the east. Residences and undeveloped areas are to the east of the canal.

FIELD STUDY

The field study was conducted on July 3, 8 and 9, 2024. Ten borings were drilled at the approximate locations indicated on Figure 1 using direct push for Borings B-7 and B-10 and 8-inch-diameter hollow-stem auger for the other borings. The borings were logged and soil samples obtained by representatives of AGEC. Logs of the subsurface conditions encountered in the borings are graphically shown on Figures 2 and 3 with legend and notes on Figure 4.

Cone penetration test (CPT) soundings were taken at the approximate location indicated on Figure 1 on July 3, 2024. The CPT results are included in the appendix.

DOUBLE RING INFILTROMETER TESTS

Double ring infiltrometer tests were conducted near Borings B-8 and B-9 in the lean clay at a depth of approximately 2 feet below the ground surface. The test depth was approximately 1½ to 2 feet above the measured subsurface water level.

An infiltration rate of 0.01 centimeters per hour was measured for both tests.

Test pits were excavated with a rubber-tired backhoe to facilitate the testing. The test pits were backfilled without significant compaction. The test pit backfill should be removed and replaced with properly compacted backfill where it will support proposed improvements.

SUBSURFACE CONDITIONS

Approximately 1 to 2 feet of fill was encountered in all but Borings B-7 and B-10, which encountered fill to depths of approximately 13 and 6 feet, respectively. Lean clay was encountered below the fill. The clay generally extends to the maximum depth of the borings, approximately 10½ to 20½ feet. The clay between depths of approximately 12 and 15½ feet in Boring B-10 has significant silt layers.

Cone Penetration Test CPT-1 was conducted near Boring B-4 and encountered predominantly clay to a depth of approximately 33 feet overlying predominantly sand to a depth of approximately 40 feet. Clay, silt and sand layers were encountered from a depth of approximately 40 feet to the maximum depth of the CPT, approximately 50 feet.

A description of the various soils encountered in the borings follows:

Clay Fill - The fill consists of lean clay to sandy lean clay. It is slightly moist to moist, brown to gray and contains roots near the ground surface.

Laboratory tests conducted on a sample of the fill indicate it has a moisture content of 18 percent and a dry density of 103 pounds per cubic foot (pcf).

Gravel Fill - The fill below a depth of approximately 1 foot in Boring B-10 consists of poorly graded gravel. It is moist to wet and brown. A geotextile fabric was encountered at the top of this fill.

Lean Clay - The clay contains small to moderate amounts of sand and occasional silt and silty sand layers. It is soft to stiff, moist to wet and brown to gray with iron oxide staining.

Laboratory tests conducted on samples of the clay indicate it has natural moisture contents ranging from 26 to 34 percent and natural dry densities ranging from 84 to 101 pcf.

A sample of the clay tested in the laboratory was found to have an unconfined compressive strength of 2,490 pounds per square foot (psf).

Consolidation tests conducted on samples of the clay indicate that the soil will compress a small to moderate amount with the addition of light to moderate loads. Results of the consolidation tests are presented on Figures 5, 6 and 7.

Silt and Lean Clay - The silt and clay are interlayered. The interlayered soil is stiff, wet and grayish brown.

Results of the laboratory tests are summarized on Table I and are included on the logs of the borings.

SUBSURFACE WATER

Subsurface water was measured in the borings at depths of approximately 3.5 to 6.2 feet except in Boring B-7. Boring B-7 is higher in elevation than the other borings and the subsurface water was measured in this boring at a depth of approximately 15.5 feet. The water levels were measured on July 18, 2024.

Slotted PVC pipe was installed in the borings to facilitate future measurement of the free-water level. Fluctuations in the water level will occur over time. An evaluation of such fluctuations is beyond the scope of this report.

PROPOSED CONSTRUCTION

We understand that the proposed fieldhouse will be a prefabricated metal building with a slab-on-grade floor. Based on an estimate provided by the structural engineer, column loads are anticipated to not exceed 225 kips and wall loads to not exceed 1 kip per foot.

A turf soccer field is planned south of the fieldhouse. Details of the proposed construction were not provided at the time of this study. We anticipate that the field will be supported on compacted granular fill.

If the proposed construction or building loads are significantly different from those described above, we should be notified to reevaluate the recommendations given.

RECOMMENDATIONS

Based on the subsurface conditions encountered, laboratory test results and our understanding of the proposed construction, the following recommendations are given:

A. Site Grading

We anticipate that the main floor elevation of the field house will be within approximately 3 feet of existing grade. Site grading fill for the proposed building should be placed as soon as possible prior to constructing elements of the building that are sensitive to differential settlement. If the grade of the proposed building area is raised more than about 3 feet above existing grade, the fill should be placed well in advance to building construction so that the significant portion of the settlement due to the load of the fill occurs prior to construction.

1. Subgrade Preparation

Approximately 1 to 13 feet of fill was encountered in the borings. Unsuitable fill, topsoil, debris and other deleterious materials should be removed from below areas of proposed buildings, turf fields, exterior slabs and other improvements sensitive to differential settlement.

The upper soil has a high clay content and will be easily disturbed by construction equipment traffic when it is very moist to wet. Placement of approximately 1 to 2 feet of granular borrow consisting predominantly of gravel with less than 15 percent passing the No. 200 sieve may be needed to provide limited access for rubber-tired equipment and to facilitate placement and compaction of structural fill and site grading fill when the subgrade is very moist to wet. Consideration may be given to placing a support fabric between the natural soil and granular borrow.

2. Excavation

We anticipate that excavation at the site can be accomplished with typical excavation equipment. Excavation equipment with a flat cutting edge should be used when excavating for building foundations to minimize disturbance of the bearing soil.

Temporary excavations may be sloped at 1½ horizontal to 1 vertical or flatter. The temporary excavation slopes indicated assume that the excavation is dewatered. Flatter slopes may be needed if there is water seepage into the excavation.

Excavations that extend below the water level should be dewatered. The water level should be maintained below the base of the excavation during initial fill and concrete placement. Free-draining gravel with less than 5 percent passing the No. 200 sieve should be used for fill or backfill below the original water level. A filter fabric should be placed between the natural soil and free-draining gravel.

3. Materials

Listed below are recommendations for imported structural fill.

Fill to Support	Recommendations
Footings	Non-expansive granular soil Passing No. 200 Sieve < 35% Liquid Limit < 30% Maximum size 4 inches
Floor Slab (Upper 4 inches)	Sand and/or Gravel Passing No. 200 Sieve < 5% Maximum size 2 inches
Slab Support	Non-expansive granular soil Passing No. 200 Sieve < 50% Liquid Limit < 30% Maximum size 6 inches

Materials placed as fill to support structures should be non-expansive granular soil. The existing fill and natural soil consist predominantly of clay and are not recommended for us as structural fill within proposed building areas. The on-site soils may be considered for use as site grading fill, utility trench and wall backfill outside of building areas if the topsoil, organics, debris and other deleterious are removed or they may be used in landscape areas.

The on-site soil may require moisture conditioning (wetting or drying) prior to use as fill. Drying of the soil may not be practical during cold or wet periods of the year.

Free-draining gravel with less than 5 percent passing the No. 200 sieve should be used as fill below the original free water level.

4. <u>Compaction</u>

Compaction of materials placed at the site should equal or exceed the minimum densities as indicated below when compared to the maximum dry density as determined by ASTM D 1557.

Fill To Support	Compaction
Foundations	≥ 95%
Concrete Flatwork and Turf Field	≥ 90%
Pavement	
Base Course	≥ 95%
Fill Placed Below Base Course	≥ 90%
Landscaping	≥ 85%
Retaining Wall Backfill	85 - 90%

To facilitate the compaction process, fill should be compacted at a moisture content within 2 percent of the optimum moisture content.

The fill should be placed and compacted in thin enough lifts to allow for proper compaction. Fill placed for the project should be frequently tested for compaction during construction.

5. Drainage

The ground surface surrounding the proposed building and turf soccer field should be sloped away from the building and field in all directions. Roof downspouts and drains should discharge beyond the limits of backfill.

B. Foundations

1. Bearing Material

With the proposed construction and the subsurface conditions encountered, the proposed building may be supported on spread footings bearing on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil.

Structural fill placed below footings should extend down to the undisturbed natural soil and out away from the edge of footings at least a distance equal to the depth of fill beneath footings.

Topsoil, organics, unsuitable fill and other deleterious materials should be removed from below proposed foundation areas.

2. Bearing Pressure

Spread footings bearing on the undisturbed natural soil or on compacted structural fill may be designed using an allowable net bearing pressure of 1,500 psf. Footings bearing on at least 2 feet of compacted structural fill may be designed for an allowable net bearing pressure of 2,500 psf.

3. Settlement

We estimate that total settlement for foundations designed as indicated above will be less than 1 inch. Differential settlement is estimated to be less than ¾ inch.

4. Temporary Loading Conditions

The allowable bearing pressure may be increased by one-half for temporary loading conditions such as wind or seismic loads.

5. Frost Depth

Exterior footings and footings beneath unheated areas should be placed at least 30 inches below grade for frost protection.

6. Foundation Base

The base of foundation excavations should be cleared of loose or deleterious material prior to structural fill or concrete placement.

7. Construction Observation

A representative of the geotechnical engineer should observe footing excavations prior to structural fill or concrete placement.

C. Concrete Slab-on-Grade

1. Slab Support

Concrete slabs may be supported on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil.

Topsoil, organics, debris, unsuitable fill and other deleterious materials should be removed from below proposed floor slab areas.

2. Underslab Sand and/or Gravel

A 4-inch layer of free draining sand and/or gravel (less than 5 percent passing the No. 200 sieve) should be placed below the concrete slabs for ease of construction and to promote even curing of the slab concrete.

3. Vapor Barrier

A vapor barrier should be placed under the concrete floor if the floor will receive an impermeable floor covering. The barrier will reduce the amount of water vapor passing from below the slab to the floor covering.

D. Lateral Earth Pressure

1. Lateral Resistance for Footings

Lateral resistance for spread footings placed the natural soil or on compacted structural fill is controlled by sliding resistance between the footing and the structural fill or natural soil. A friction value of 0.35 may be used in design for ultimate lateral resistance. The passive resistance of the soil adjacent foundations may be used in design

2. Subgrade Walls and Retaining Structures

The following equivalent fluid weights are given for the design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. The values listed below assume a horizontal surface adjacent the wall.

Soil Type	Active	At-Rest	Passive
Clay & Silt	50 pcf	65 pcf	250 pcf
Sand & Gravel	40 pcf	55 pcf	300 pcf

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weight should be increased by 45 and 30 pcf for active and at-rest conditions, respectively, and decreased by 45 pcf for the passive condition. This assumes a peak horizontal ground acceleration of 0.75g which represents a 2 percent probability of exceedance in a 50-year period.

4. Safety Factors

The values recommended above assume mobilization of the soil to achieve the soil strength under active and passive conditions. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

E. Seismicity, Faulting and Liquefaction

1. Seismicity

Listed below is a summary of the site parameters that may be used with the 2021 International Building Code.

Description	Value[1]
Site Class	D[2]
S_s - MCE_R ground motion (period = 0.2s)	1.49g
S_1 - MCE_R ground motion (period = 1.0s)	0.55g
F_a - Site amplification factor at 0.2s	1.0
F_v - Site amplification factor at 1.0s	1.75
PGA - MCE_G peak ground acceleration	0.68g
PGA_M - Site modified peak ground acceleration	0.75g

[1] Values obtained from information provided by the Applied Technology Council at https://hazards.atcouncil.org

[2] Site Class D was selected based on the subsurface conditions to the depth investigated and our understanding of the geology of the area.

2. Faulting

There are no mapped active faults extending through the project site. The closest mapped fault, which is considered active, is the Wasatch Fault, which has mapped traces extending approximately 1.5 miles east of the site (Utah Geological Survey, 2024).

3. Liquefaction

The site is located in an area mapped as having a "moderate" liquefaction potential (Salt Lake County, 2002). The soil type most susceptible to liquefaction during a large magnitude earthquake is loose, clean sand. The liquefaction potential tends to decrease with an increase in fines content and density.

Based on subsurface conditions encountered, liquefaction is not considered to be a significant hazard at this site. There are some thin layers that may be susceptible to liquefaction. Our analysis indicates that liquefaction-induced settlement is expected to be less than ½ inch and no lateral spread is anticipated.

F. Water Soluble Sulfates

One sample of the natural soil was tested in the laboratory for water soluble sulfate content. The test results indicate there is less than 0.1 percent water soluble sulfate in the sample tested. Based on the results of the test and published literature, the soil possesses a negligible sulfate attack potential on concrete. No special cement type is required for concrete placed in contact with the soil.

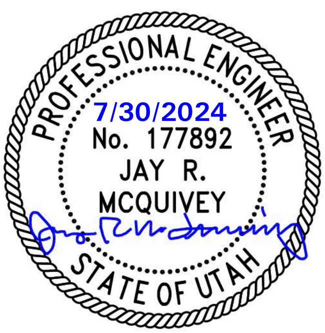
G. Preconstruction Meeting

A preconstruction meeting should be held with representatives of the owner, project architect, geotechnical engineer, general contractor, earthwork contractor and other design team members to review construction plans, specifications, methods and schedule.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the borings drilled and CPT soundings at the approximate locations indicated on Figure 1, the results of laboratory tests and our experience in the area. Variations in the subsurface conditions may not become evident until additional exploration or excavation is conducted. If the subsurface conditions, proposed construction or groundwater level is found to be significantly different from what is described above, we should be notified to reevaluate the recommendations given.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Jay R. McQuivey, P.E.

Reviewed by Douglas R. Hawkes, P.E., P.G.

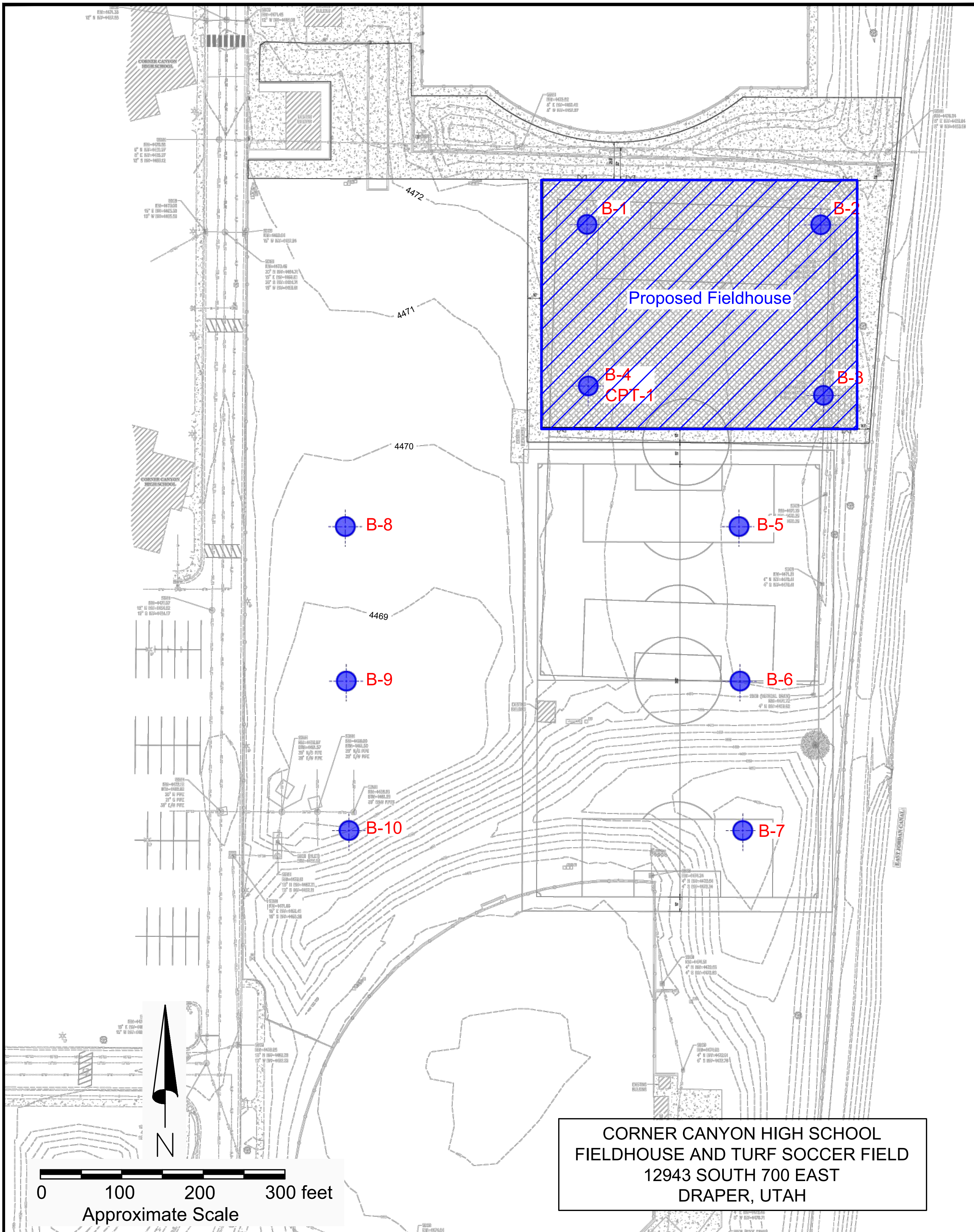
JRM/bw

REFERENCES

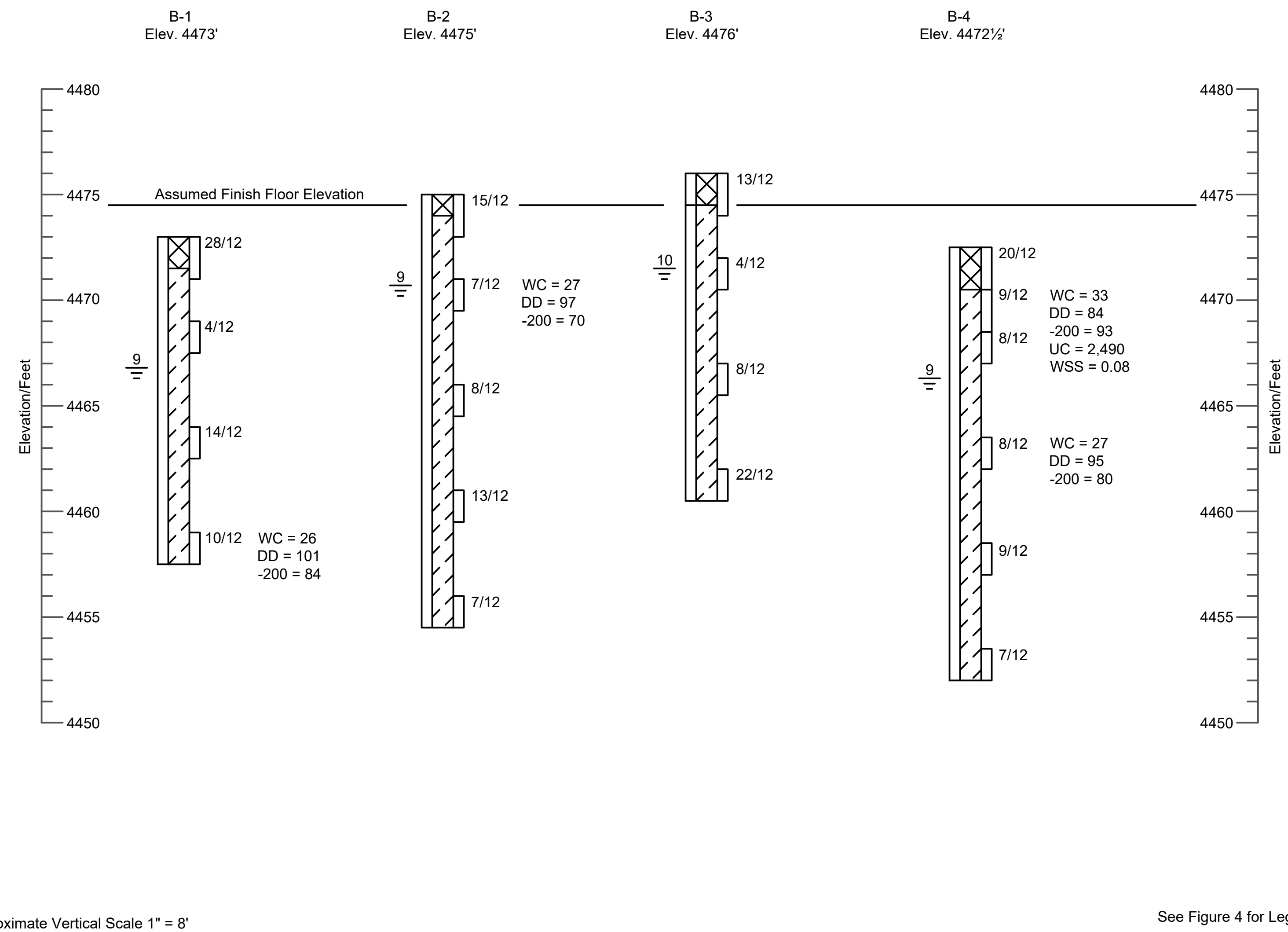
International Code Council, 2020; 2021 International Building Code, Falls Church, Virginia. City, Utah.

Salt Lake County, 2002; Surface Rupture and Liquefaction Potential Special Study Areas Map, Salt Lake County, Utah, adopted March 31, 1989, updated March 2002, Salt Lake County Public Works - Planning Division, 2001 South State Street, Salt Lake City, Utah.

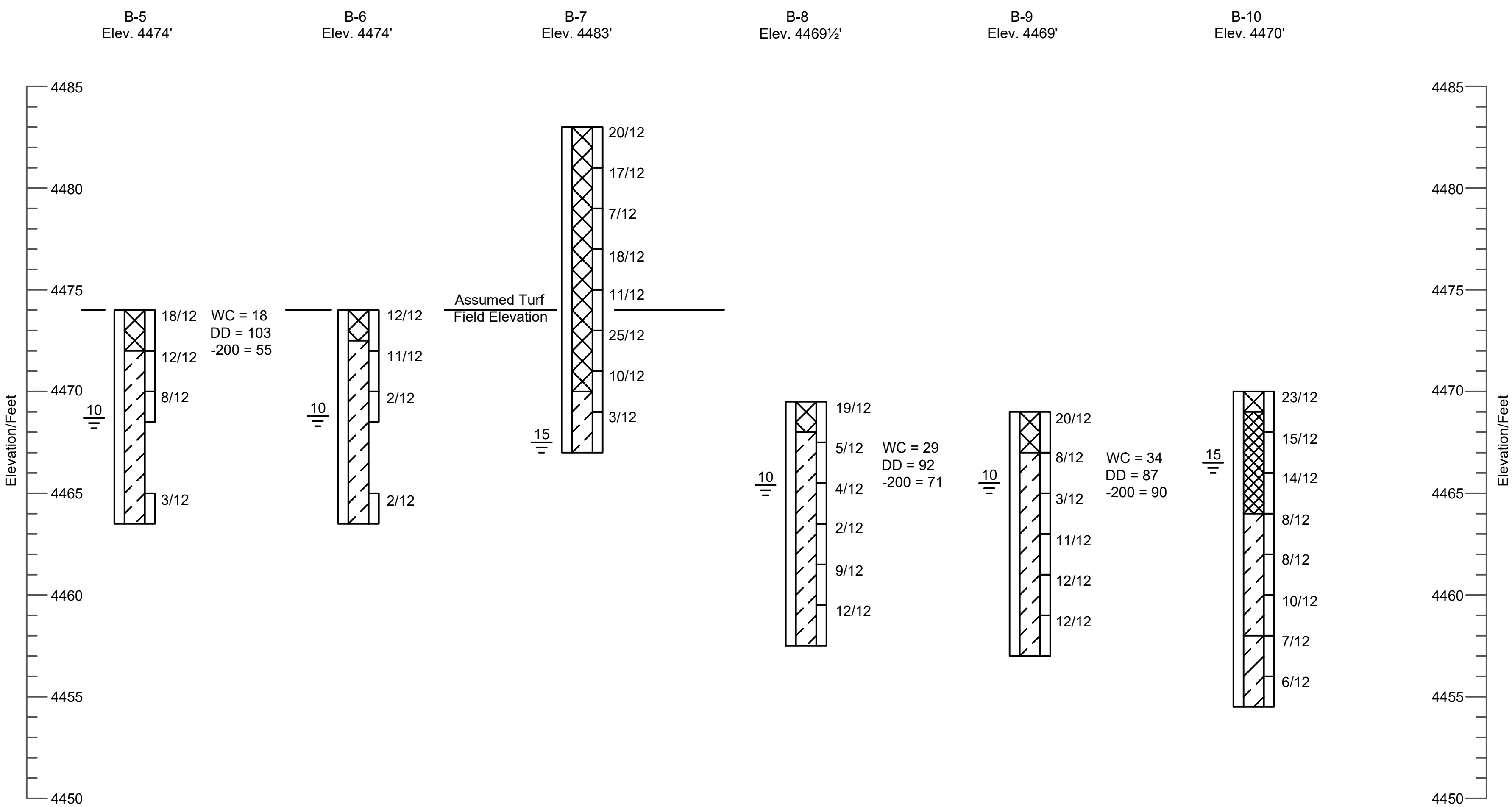
Utah Geological Survey, 2024; Utah Geological Hazard Portal accessed July 11, 2024 at https://geology.utah.gov/apps/hazards/.



1240393	AGEC	Exploratory Boring and CPT Locations	Figure 1



1240393	AGEC	Exploratory Boring Logs	Figure 2



Approximate Vertical Scale 1" = 8'

See Figure 4 for Legend and Notes

1240393	AGEC	Exploratory Boring Logs	Figure 3

LEGEND:

Fill; lean clay to sandy lean clay, slightly moist to moist, brown to gray, roots near surface.

Fill; poorly graded gravel, moist to wet, brown, geotextile fabric at top.

Lean Clay (CL); small to moderate amount of sand, occasional silt and silty sand layers, soft to stiff, moist to wet, brown to gray, iron oxide staining.

Silt and Lean Clay (CL/ML); interlayered, stiff, wet, grayish brown.

10/12 California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140-pound automatic hammer falling 30 inches were required to drive the sampler 12 inches.

Indicates slotted 1½-inch PVC pipe installed in the boring to the depth shown.

9 Indicates the depth to free water and number of days after drilling the measurement was taken.

NOTES:

1. Borings B-7 and B-10 were drilled on July 3, 2024 using direct push. The other borings were drilled on July 8 and 9, 2024 with 8-inch-diameter hollow-stem auger.
2. The location of the borings were measured approximately by pacing from features shown on the site plan provided.
3. The elevations of the borings were determined by interpolating between contours shown on Figure 1.
4. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
6. The water level readings shown on the logs was made at the time and under the conditions indicated. Fluctuations in the water level will occur with time.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   -200 = Percent Passing the No. 200 Sieve;
   UC = Unconfined Compressive Strength (psf);
   WSS = Water Soluble Sulfates (%).

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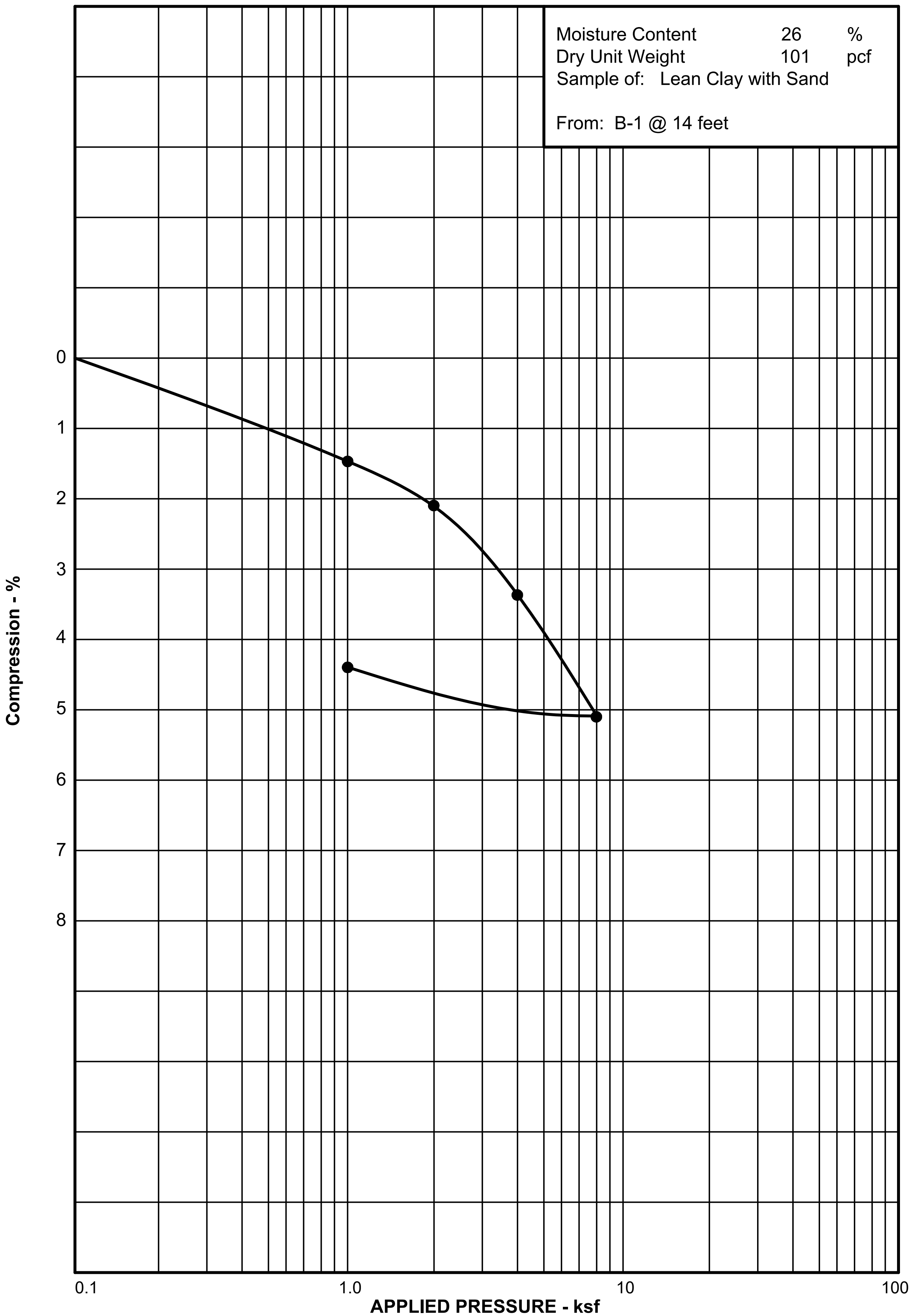
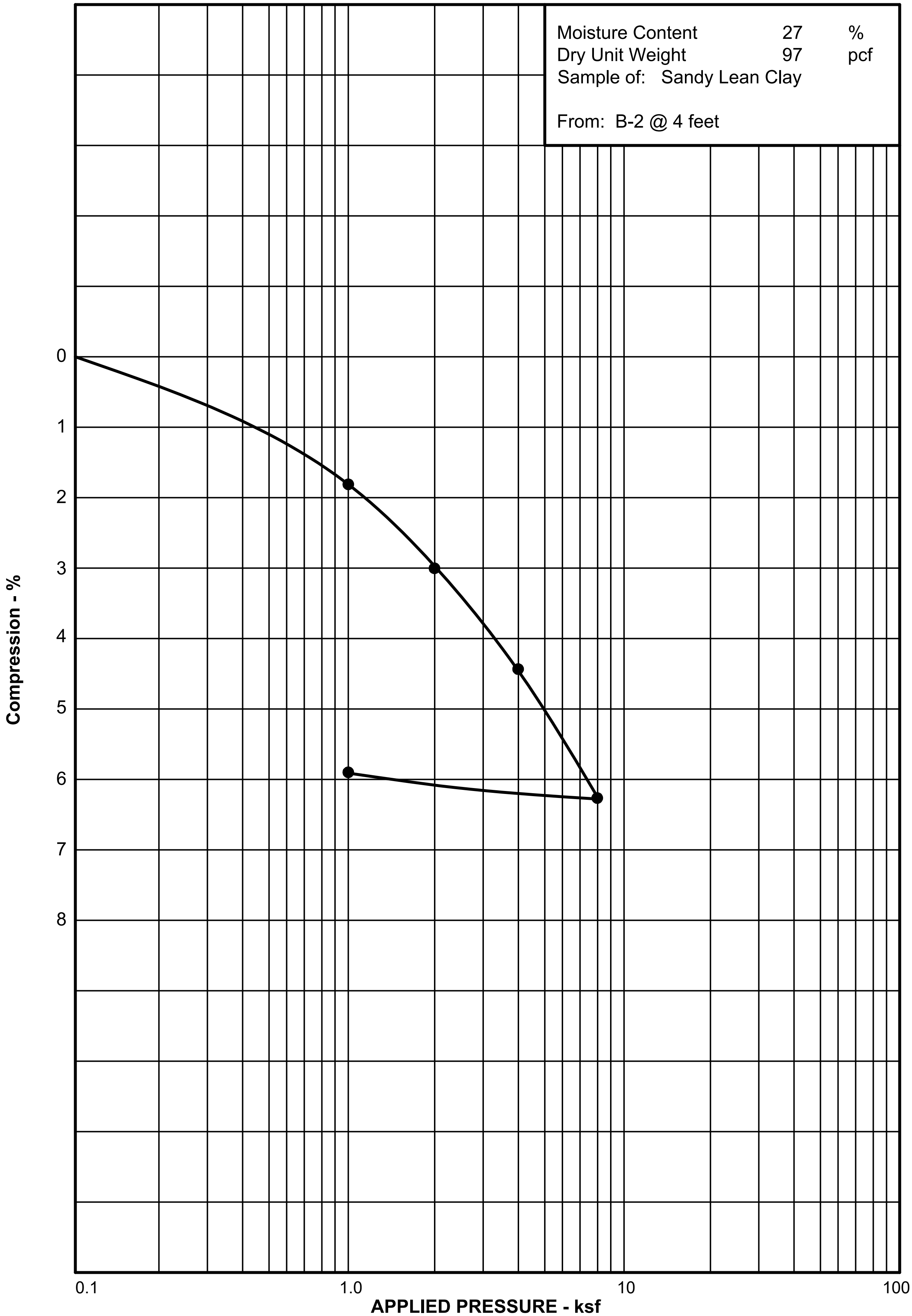


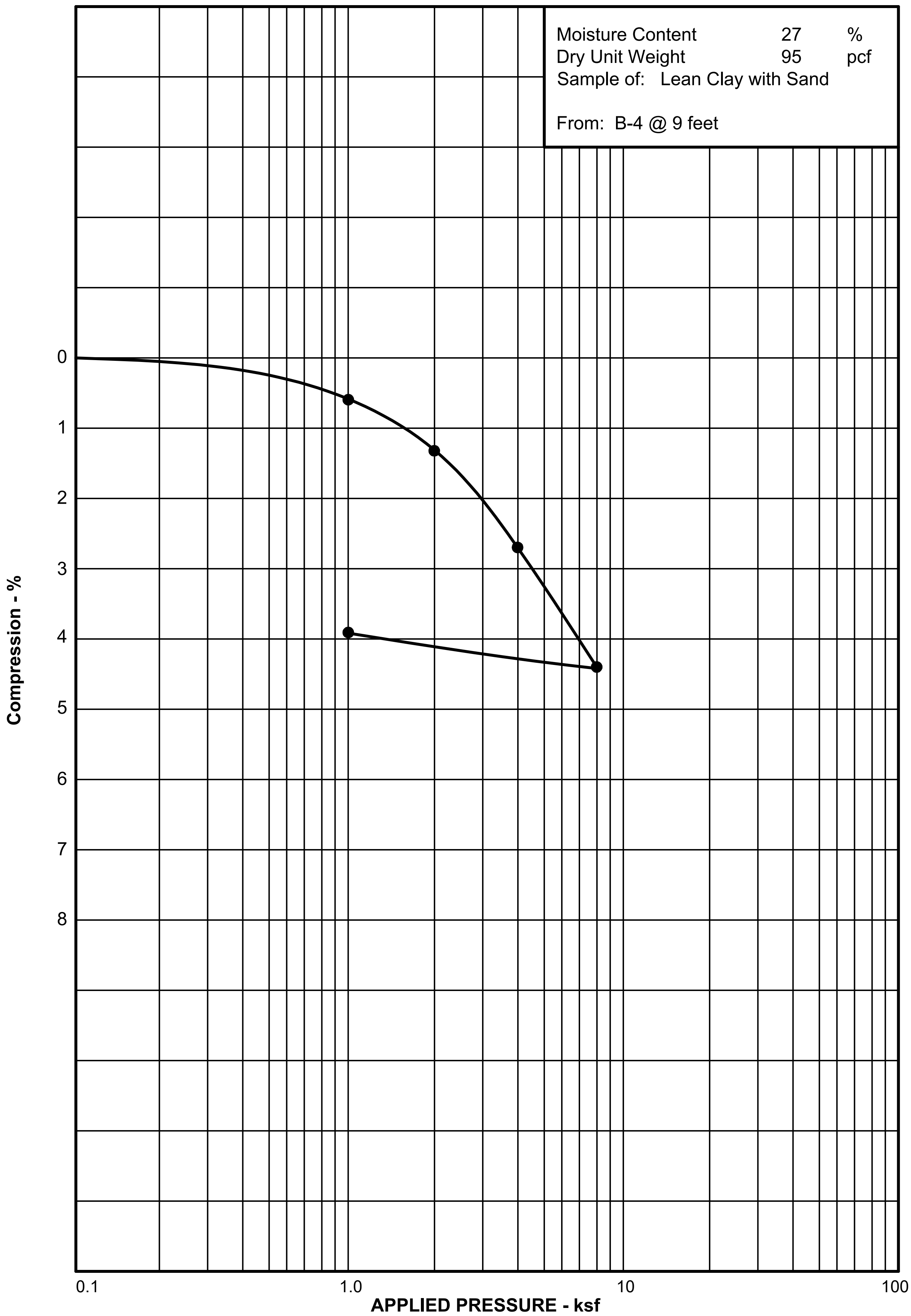
Project No. 1240393 **CONSOLIDATION TEST RESULTS** **Figure 5**

Applied Geotechnical Engineering Consultants, Inc.



Project No. 1240393 **CONSOLIDATION TEST RESULTS** **Figure 6**

Applied Geotechnical Engineering Consultants, Inc.



Project No. 1240393 **CONSOLIDATION TEST RESULTS** Figure 7

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I
SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER: 1240393

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)	WATER SOLUBLE SULFATE (%)	SAMPLE CLASSIFICATION
BORING	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX			
B-1	14	26	101			84					Lean Clay with Sand
B-2	4	27	97			70					Sandy Lean Clay
B-4	2	33	84			93			2,490	0.08	Lean Clay
	9	27	95			80					Lean Clay with Sand
B-5	0	18	103			55					Fill; Sandy Lean Clay
B-8	2	29	92			71					Lean Clay with Sand
B-9	2	34	87			90					Lean Clay

APPENDIX

CPT RESULTS

600 W. Sandy Parkway
Sandy, UT 84070

CPT: CPT-1
Total depth: 50.07 ft, Date: 7/3/2024
Surface Elevation: 4472.50 ft
Coords: X:0.00, Y:0.00
Cone Type: Nova
Cone Operator: Nathan Salazar and Jason Staker

Project: 1240393
Location: Corner Canyon High School Fieldhouse