CMT TECHNICAL SERVICES

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MATERIALS TESTING •SPECIAL INSPECTIONS •
ORGANIC CHEMISTRY • PAVEMENT
DESIGN •GEOLOGY

GEOTECHNICAL ENGINEERING STUDY

Farmington Regional Center

About 500 North Lagoon Drive
Farmington, Utah

CMT PROJECT NO. 22203

FOR:
ajc architects
703 East 1700 South
Salt Lake City, Utah 84105

July 3, 2024

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Ms. Jill Jones
ajc architects
703 East 1700 South
Salt Lake City, Utah 84105

Subject: Geotechnical Engineering Study
Farmington Regional Center
About 500 North Lagoon Drive
Farmington, Utah
CMT Project Number: 22203

Ms. Jones:

CMT Technical Services (CMT) submits herewith this geotechnical engineering study report for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On May 24, 2024, a CMT staff professional was on-site and observed the drilling of 8 bore holes extending to depths of about 6.5 to 51.5 feet below the existing ground surface. Samples of the subsurface soils were obtained from within the bore holes during the field operations and subsequently transported to our laboratory for further observation and testing of select samples. Infiltration testing and Dynamic Cone Penetration (DCP) testing were also performed.

Conventional spread and/or continuous footings may be utilized to support the proposed structure, provided the recommendations in this report are followed. This report presents detailed discussions of design and construction criteria for this site.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho, Arizona, Colorado and Texas, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at 801-590-0394.

Sincerely,
CMT Technical Services

LICENSED PROFESSIONAL ENGINEER
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CMT TECHNICAL SERVICES

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1.0 INTRODUCTION

1.1 General

CMT Technical Services (CMT) was retained to conduct a geotechnical subsurface study for the proposed Farmington Regional Center office building. The site is situated on the north side of Lagoon Drive at about 500 North in Farmington, Utah, as shown in **Exhibit 1 - Vicinity Map** below.

EXHIBIT 1 - VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in discussions between Ms. Jill Jones with ajc architects, and Mr. Andrew Harris of CMT. In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, our scope of work has included performing field exploration, which consisted of the drilling/logging/sampling of 8 bore holes, performing laboratory testing on representative samples of the subsurface soils collected in the bore holes, performing an infiltration test in one of the bore holes, performing

Dynamic Cone Penetration (DCP) testing, and conducting an office program, which consisted of correlating available data, performing engineering analyses, and preparing this summary report. This scope of work was authorized through our master consultant agreement in relation to our proposal dated March 12, 2024.

1.3 Description of Proposed Construction

We understand that the proposed construction consists of an office building with a plan area of approximately 35,000 square feet, which will be 1 to 2 levels above grade. We project that wall loads will not exceed 6,000 pounds per linear foot and column loads will not exceed 100,000 pounds. Floor slab loads are anticipated to be relatively light, with an average uniform loading not exceeding 150 pounds per square foot. If the structural loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We project that proposed light-duty parking areas and internal drive lanes will be surfaced with asphalt concrete pavement. Traffic is projected to consist of mostly automobiles and light trucks, a few daily medium-weight delivery trucks, a weekly garbage truck, and an occasional fire truck.

Site development will require some earthwork in the form of minor cutting and filling. A site grading plan was not available at the time of this report, but we project that maximum cuts and fills may be on the order of 3 to 4 feet. If deeper cuts or fills are planned, CMT should be notified to provide additional recommendations, if needed.

1.4 Executive Summary

The most significant geotechnical aspects regarding site development include the following:

1. Vegetation, including trees, and topsoil on the surface of the site, with roots observed extending up to 5 feet in depth in places. Topsoil and soil containing a significant organic content are to be removed from footing and floor slab areas.
2. Subsurface soils encountered consisted predominately of CLAY (CL) and SILT (ML), but some SAND (SM, SP-SM) layers, and an occasional GRAVEL (GP) layer were also encountered, extending to the maximum depth explored of 51.5 feet below the existing ground surface.
3. Groundwater was encountered in three of the eight bore holes at depths ranging between 9.5 and 21 feet below the existing ground surface.
4. Foundations and floor slabs may be constructed on suitable undisturbed natural soils or on structural/engineered fill which extends to natural soils.

CMT must assess that topsoil, undocumented fills (if encountered), debris, disturbed or unsuitable soils have been removed and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements.

In the following sections, detailed discussions pertaining to the site are provided, including subsurface descriptions, geologic setting, seismicity, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements.

2.0 FIELD EXPLORATION

2.1 Drilling

To define and evaluate the subsurface soil and groundwater conditions, 8 bore holes were drilled at the site to depths of approximately 6.5 to 51.5 feet below the existing ground surface and observed and logged by an experienced member of our geotechnical staff. Locations of the bore holes are shown on ***Figure 1, Site Plan***, included in the Appendix.

Samples of the subsurface soils encountered in the bore holes were collected at varying depths through the hollow stem drill augers. Relatively undisturbed samples obtained by hydraulically pushing a 3-inch diameter (Shelby) tube or by driving a split-spoon sampler with 2.5-inch outside diameter rings/liners, into the undisturbed soils below the drill augers. Disturbed samples were collected utilizing a standard split spoon sampler that was driven 18 inches into the soils below the drill augers using a 140-pound hammer free-falling a distance of 30 inches. The number of hammer blows needed for each 6-inch interval was recorded. The sum of the hammer blows for the final 12 inches of penetration is known as a standard penetration test and this 'blow count' was recorded on the bore hole logs. The blow count provides an approximation of the relative density of granular soils, but only a limited indication of the relative consistency of silt/clay soils because the consistency of these fine grained soils is significantly influenced by the moisture content.

The subsurface soils encountered in the bore holes were classified in the field based upon visual and textural examination, logged and described in general accordance with ASTM[1] D-2488. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Logs of the bore holes, including a description of the soil strata encountered, is presented on each individual Bore Hole Log, ***Figures 2 through 9***, included in the Appendix. Sampling information and other pertinent data and observations are also included on the logs. In addition, a Key to Symbols defining the terms and symbols used on the logs is provided as ***Figure 10*** in the Appendix.

Following completion of drilling operations, 1.25-inch diameter slotted PVC pipe was installed in bore holes B-1, B-3, and B-4 to allow subsequent water level measurements. The bore holes were backfilled with auger cuttings.

2.2 Dynamic Cone Penetration Testing

A Dynamic Cone Penetrometer (DCP) was used at the locations of bore holes B-2 through B-7 to assess the subgrade soil strength for pavement support characteristics. The DCP consists of an approximate half inch diameter steel rod driven into the soils with a weighted doughnut hammer. The number of millimeters of

[1] American Society for Testing and Materials

penetration per hammer blow is recorded. The data is then correlated to a California Bearing Ratio (CBR) value utilized for pavement design. Data obtained from the DCP testing is presented in **Section 11.0, Pavements** and shown on ***Figures 11 through 16***.

2.3 Infiltration Testing

Infiltration testing was also performed as part of our field exploration within bore hole B-8 at a depth of about 5 feet below the existing ground surface. The testing consisted of drilling to the specified depth, sampling, then filling the inside of the auger with water and measuring the rate of water drop over time. This process was repeated multiple times until subsequent readings were the same. The results of this test indicate that the clay soil at this location has an infiltration rate of approximately 25 minutes per inch. This rate could increase (become slower) over time due to siltation, thus we recommend an appropriate factor of safety be applied for design.

3.0 LABORATORY TESTING

Selected samples of the subsurface soils were subjected to various laboratory tests to assess the following pertinent engineering properties:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117, Grain Size Analysis
5. One Dimension Consolidation, ASTM D-2435, Consolidation properties
6. Laboratory Vane Shear Test, ASTM D-3080, Shear strength parameters
7. Moisture-Density Relationship (Proctor) Test, ASTM D-1557, Compaction properties
8. California Bearing Ratio, ASTM D-2937, Subgrade support properties for pavements

To provide data for an analysis of potential settlement from structural loading, a one-dimensional consolidation test was performed on each of 3 samples of the subsurface soils collected in the bore holes. Based upon data obtained from the consolidation testing, the silt/clay soils at this site are moderately over-consolidated and moderately compressible under additional loading. Detailed results of the consolidation tests are maintained within our files and can be transmitted to you, if so desired.

Laboratory test results are presented on the bore hole logs (***Figures 2 through 9***) and in the **Lab Summary Table** on the following page:

LAB SUMMARY TABLE

BORE	DEPTH	SOIL	SAMPLE	MOISTURE	DRY DENSITY	GRADATION			ATTERBERG LIMITS			VANE SHEAR
HOLE	(feet)	CLASS	TYPE	CONTENT(%)	(pcf)	GRAV.	SAND	FINES	LL	PL	PI	(psf)
B-1	2.5	CL	Shelby	21	97				36	21	15	
B-1	10	CL	Rings	32	91			91				
B-1	20	CL	Shelby	31	93	0	19	81	28	20	8	89
B-1	30	SP-SM	SPT	12		31	58	11				
B-1	40	SM	SPT	18		12	56	32		NP		
B-1	45	GP	SPT	21	111							501
B-1	50	SP-SM	SPT	10		38	56	6				
B-2	7.5	CL	Rings	28	94			90				
B-2	15	CL	Rings	30	85							
B-3	2.5	CL	Rings	16	110							
B-3	5	CL	Shelby	16	115							
B-3	7.5	SM	SPT	25	105	0	69	31				
B-4	7.5	CL	Rings	16	107							
B-4	15	CL	Rings	29	95							1591
B-4	20	CL	SPT	29					30	17	13	
B-4	25	SM	SPT	16		29	53	18				
B-7	5	CL	SPT	7		29	55	16				

4.0 GEOLOGIC & SEISMIC CONDITIONS

4.1 Geologic Setting

The subject site is in the east-central portion of Davis County in north-central Utah and sits at an elevation of approximately 4,272 feet above sea level in a valley bound by the Wasatch Mountains on the east and Antelope Island (Great Salt Lake) and the Promontory Mountains to the west. The valley is a deep, sediment-filled basin that is part of the Basin and Range Physiographic Province. The valley was formed by extensional tectonic processes during the Tertiary and Quaternary geologic time periods. The valley is located within the Intermountain Seismic Belt, a zone of ongoing tectonism and seismic activity extending from southwestern Montana to southwestern Utah. The active (evidence of movement in the last 10,000 years) Wasatch Fault Zone is part of the Intermountain Seismic Belt and extends from southeastern Idaho to central Utah along the western base of the Wasatch Mountain Range.

Much of northwestern Utah, including the valley in which the subject site is located, was also previously covered by the Pleistocene age Lake Bonneville. The Great Salt Lake, located along the western margin of the valley and beyond, is a remnant of this ancient freshwater lake. Lake Bonneville reached a high-stand elevation of between approximately 5,160 and 5,200 feet above sea level at between 18,500 and 17,400 years ago. Approximately 17,400 years ago, the lake breached its basin in southeastern Idaho and dropped by almost 300 feet relatively fast as water drained into the Snake River. Following this catastrophic release, the lake level continued to drop slowly over time, primarily driven by drier climatic conditions, until reaching the current level of the Great Salt Lake. Shoreline terraces formed at the high-stand elevation of the lake and several subsequent lower lake levels are visible in places on the mountain slopes surrounding the valley. Much of the sediment within the valley was deposited as lacustrine sediments during both the transgressive (rise) and regressive (fall) phases of Lake Bonneville and in older, pre-Bonneville lakes that previously occupied the basin.

The geology of the USGS Farmington, Utah 7.5 Minute Quadrangle, that includes the location of the subject site, has been mapped by Lowe and others[2]. The surficial geology of the southeastern portion of the site is mapped as "Younger alluvial-fan deposits" (Map Unit Qaf_1) dated upper Holocene. Unit Qaf_1 is described in the referenced map as "Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; forms fans, locally with distinct levees and channels, at mouths of mountain-front canyons; exposed thickness less than 6 meters (20 ft)." The northwestern portion of the site is mapped as "Fill and disturbed land (historical)" (Map Unit Qfd). Unit Qfd is described as "Land disturbed and excavated through aggregate (sand and gravel) operations and construction of Interstate highways, highway interchanges, and Farmington Bay dikes." Refer to **Exhibit 2 - Geologic Map**, shown below:

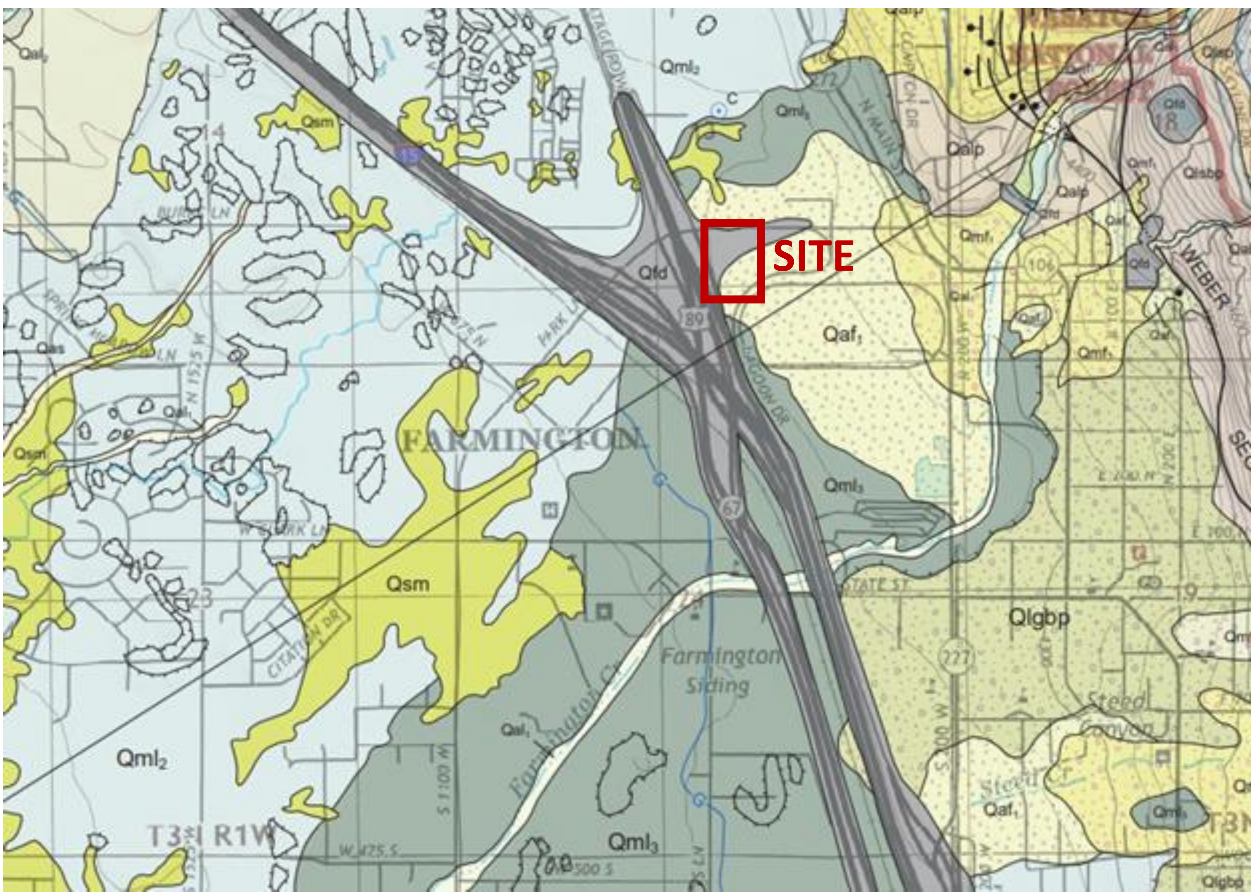

EXHIBIT 2 - GEOLOGIC MAP

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[2]Lowe, M., Kirby, S.M., and Harty, K.M., 2018, Geologic Map of the Farmington Quadrangle, Salt Lake and Davis Counties, Utah; Utah Geological Survey Map 279 DM, Scale 1:24,000.

4.2 Faulting

No surface fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The nearest mapped active (Holocene) fault is the Weber Segment of the Wasatch Fault Zone approximately 0.5 miles to the northeast.

4.3 Seismicity

4.3.1 Site Class

Utah has adopted the International Building Code (IBC) 2021, which determines the seismic hazard for a site based upon 2014 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points). For site class definitions, IBC 2021 Section 1613.2.2 refers to Chapter 20, *Site Classification Procedure for Seismic Design*, of ASCE[3] 7, which stipulates that the weighted average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class.

Based on average shear wave velocity data within the upper 30 meters ($V_{S,30}$) published by McDonald and Ashland[4], the subject site is located within unit description Q02D, which has a log-mean $V_{S,30}$ of 271 meters per second (889 feet per second). Thus, it is our opinion the site best fits Site Class D – Stiff Soil (with data), which we recommend for seismic structural design.

4.3.2 Ground Motions

A site-specific ground motion hazard analysis study will be completed for the site and provided in a separate report.

4.3.3 Liquefaction

Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

The site is located within areas designated by the Utah Geologic Survey[5] having both “Moderate” and “High” liquefaction potential. Moderate potential is defined as having between a 10% and 50% probability that within a 100-year period an earthquake strong enough to cause liquefaction will occur. High potential is defined as having a 50% probability.

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[3] American Society of Civil Engineers

[4] McDonald, G.N. and Ashland, F.X., 2008, “Earthquake Site-Conditions Map for the Wasatch Front Urban Corridor, Utah,” Utah Geological Survey Special Study 125, 41 pp.

[5] Utah Geological Survey, "Liquefaction-Potential Map for a Part of Davis County, Utah," Utah Geological Survey Public Information Series 24, August 1994. https://ugspub.nr.utah.gov/publications/public_information/pi-24.pdf

Subsurface soils encountered consisted predominately of clay, but layers of saturated sand were encountered in each of the bore holes where groundwater was encountered (B-1, B-3, B-4). We evaluated the liquefaction potential of these saturated sand layers using the procedures described in Youd et al[6] and Idriss & Boulanger[7]. Our evaluation indicates the layers at about 40 feet and 45 feet in B-1, the layer in B-3 at about 10 feet, and the layer in B-4 at about 25 feet, could liquefy in a large enough seismic event. Maximum anticipated settlement resulting from the liquefaction is in the range of 1.0 to 1.5 inches at the top of the liquefiable soil layers. However, using the boundary curves provided by Ishihara[8] for identifying when liquefaction-induced damage would occur at the surface, it is our opinion that less than 1 inch of liquefaction-induced settlement will occur within 3 feet of the ground surface. This amount of settlement is considered tolerable for structures, although relatively minor structural damage would be possible. Lateral spreading due to liquefaction is not anticipated to occur. If such liquefaction-induced settlements are not acceptable, we can provide mitigation strategies, such as aggregate columns or other soil densification methods, to treat susceptible soils.

4.4 Other Geologic Hazards

The site is not located within a known or mapped landslide, debris flow, stream flooding[9], or rock fall hazard area.

5.0 SITE CONDITIONS

5.1 Surface Conditions

At the time the bore holes were drilled, the site was vacant and vegetated with grasses, weeds, and a line of trees through the central portion of the site. Overall, the site is relatively flat, with a very slight slope downward to the west. Based upon aerial photos dating back to 1993 that are readily available on the internet, the site appears to have remained relatively unchanged. The aerial photos also indicate the portion for the site south of the line of trees has generally remained more verdant than the area to the north of the line of trees. The site is bordered on the north by 675 North Street, on the south by Lagoon Drive, on the east by a State Liquor Store, and on the west by Highway 89 northbound off-ramp (see **Vicinity Map** in **Section 1.1** above).

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[6] Youd, T.L.; Idriss, I.M.; Andrus, R.D.; Arango, I.; Castro, G.; Christian, J.T.; Dobry, R.; Finn, W.D.L.; Harder, L.F. Jr.; Hynes, M.E.; Ishihara, K.; Koester, J.P.; Liao, S.C.; Marcuson, W.F. III; Martin, G.R.; Mitchell, J.K.; Moriwaki, Y.; Power, M.S.; Robertson, P.K.; Seed, R.B.; and Stokoe, K.H. II; October 2001, "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," ASCE Journal of Geotechnical and Geoenvironmental Engineering, p 817-833.

[7] Idriss, I.M. and Boulanger, R.W., December 2010, "SPT-Based Liquefaction Triggering Procedures," Department of Civil & Environmental Engineering, University of California at Davis, Report No. UCD/CGM 10/02, 259 p.

[8] Ishihara, K., 1985, Stability of Natural Deposits During Earthquakes, International Society for Soil Mechanics and Geotechnical Engineering, pp 321-376.

[9] https://msc.fema.gov/portal/search?AddressQuery=500N%20Lagoon%20Dr%2C%20Farmington%2C%20UT%2C%2084025%2C%20 USA

5.2 Subsurface Soils

Our field personnel noted topsoil on the surface of varying depth. Based upon the near surface samples of the subsurface soils collected, roots and possibly thin organic layers are present up to about 5 feet in depth, possibly deeper in some areas.

Natural soils encountered beneath the topsoil consisted of CLAY (CL) and SILT (ML) layers which extended to the bottom of bore holes B-5, B-6, and B-8 at about 6.5 feet below the ground surface, to about 5.5 feet below the surface in B-7, to the bottom of B-2 at about 16.5 feet below the surface, to about 24 feet in B-4, and to about 25 feet below the surface in B-1. The silt/clay soils were moist to wet, brown to black in color, and very soft to medium stiff in consistency. They also exhibited moderate over-consolidation and strength characteristics with moderate compressibility characteristics.

Below the clay and silt layers, we encountered layers of Silty SAND (SM) and Poorly Graded SAND with silt (SP-SM), and an occasional layer of Poorly Graded GRAVEL (GP) with sand, extending to the bottom of bore holes B-3, B-4, and B-7 at approximately 11.5 feet, 31.5 feet, and 6.5 feet below existing site grades, respectively. Some thinner layers of clay were encountered interbedded with the sands near the bottom of B-1 before terminating in SAND at about 51.5 feet below existing site grades. The natural sand and gravel soils were moist to wet, tan to blue gray in color, and loose to dense based on the blow counts in the bore holes.

For a more descriptive interpretation of subsurface conditions, please refer to the bore hole logs, ***Figures 2 through 9***, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the logs generally represent approximate boundaries; in situ, the transition between soil types may be gradual.

5.3 Groundwater

Groundwater was encountered in bore hole B-1 at about 17 feet below the ground surface, in B-3 at about 9.5 feet below the ground surface, and in B-4 at about 24 feet below the ground surface. On June 11, 2024, CMT personnel returned to the site and measured groundwater level at a depth of about 5.6 feet within slotted PVC pipes installed in bore hole B-3. This depth to groundwater will affect excavations.

Groundwater levels can fluctuate seasonally. Numerous other factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors, may also influence ground water elevations at the site. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, and the magnitude of potential fluctuations, is beyond the scope of this study.

5.4 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

6.0 SITE PREPARATION AND GRADING

6.1 General

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes vegetation, topsoil, loose and disturbed soils, etc. Based upon the conditions observed in the bore holes there is topsoil on the surface of the site with roots potentially extending up to 5 feet in depth in some places. Thin organic layers may also be encountered within the upper 5 feet. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color.

Following clearing and grubbing the subgrade should be observed by a CMT geotechnical engineer to assess that suitable natural soils have been exposed and any deleterious materials, loose and/or disturbed soils have been removed, prior to placing site grading fills, footings, slabs, and pavements.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 3 feet of site grading fill is anticipated over the natural ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Excavations deeper than 8 feet are not anticipated at the site. The shallowest groundwater was encountered in bore hole B-3 at about 9.5 feet below the ground surface. Deeper excavations could potentially encounter groundwater. The past aerial photos of the site indicate the portion of the site south of the tree line seems to stay greener throughout the year, possibly indicating more moist conditions in this area.

The natural soils encountered at this site predominantly consisted of silt/clay. In clayey (cohesive) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 8 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one-half horizontal to one vertical (0.5H:1V).

For sandy/gravelly (cohesionless) soils, temporary construction excavations not exceeding 4 feet in depth should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 8 feet and above groundwater, side slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult to maintain and will require very flat side slopes and/or shoring, bracing and dewatering.

To reduce disturbance of the natural soils during excavation, we recommend that smooth edge buckets/blades be utilized.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

Structural fill is defined as fill that will ultimately be subjected to structural loads imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and potentially as replacement fill below footings. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials. Following are our recommendations for the various fill types we anticipate will be used at this site:

FILL MATERIAL TYPE	DESCRIPTION | RECOMMENDED SPECIFICATION
Structural Fill	Placed below structures, flatwork and pavement. Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, approximately 30% to 70% passing the No. 4 sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
Site Grading Fill	Placed over large areas to raise the site grade. Sandy to gravelly soil, with a maximum particle size of 6 inches, a minimum 70% passing 3/4-inch sieve, a maximum 50% passing No. 200 sieve, and a maximum Plasticity Index of 15.
Non-Structural Fill	Placed below non-structural areas, such as landscaping. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material (see discussion below).
Stabilization Fill	Placed to stabilize soft areas prior to placing structural fill and/or site grading fill. Coarse angular gravels and cobbles 1 inch to 8 inches in size. May also use 1.5- to 2.0-inch gravel placed on stabilization fabric, such as Mirafi RS280i, or equivalent (see **Section 6.6**).

On-site silt/clay soils are not suitable for use as structural fill or as site grading fill, but can be used as non-structural fill.

All fill material should be approved by a CMT geotechnical engineer prior to placement.

6.4 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most “trench compactors” have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions, can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry density as determined by ASTM D-1557 (or AASHTO[10] T-180) in accordance with the following recommendations:

[10] American Association of State Highway and Transportation Officials

LOCATION	TOTAL FILL THICKNESS (FEET)	MINIMUM PERCENTAGE OF MAXIMUM DRY DENSITY
Beneath an area extending at least 4 feet beyond the perimeter of structures, and below flatwork and pavement (applies to structural fill and site grading fill) extending at least 2 feet beyond the perimeter	0 to 5 5 to 8	95 98
Site grading fill outside area defined above	0 to 5 5 to 8	92 95
Utility trenches within structural areas	--	96
Roadbase and subbase	-	96
Non-structural fill	0 to 5 5 to 8	90 92

Structural fills greater than 5 feet thick are not anticipated at the site. For best compaction results, we recommend that the moisture content for structural fill/backfill be within 2% of optimum. Field density tests should be performed on each lift as necessary to verify that proper compaction is being achieved.

6.5 Utility Trenches

For the bedding zone around the utility, we recommend utilizing sand bedding fill material that meets current APWA[11] requirements. All utility trench backfill material below structurally loaded facilities (foundations, floor slabs, flatwork, parking lots/drive areas, etc.) should be placed at the same density requirements established for structural fill in the previous section.

Most utility companies and local governments are requiring Type A-1a or A-1b (AASHTO Designation) soils (sand/gravel soils with limited fines) be used as backfill over utilities within public rights of way, and the backfill be compacted over the full depth above the bedding zone to at least 96% of the maximum dry density as determined by AASHTO T-180 (ASTM D-1557).

Where the utility does not underlie structurally loaded facilities and public rights of way, natural soils (if free of organics) may be utilized as trench backfill above the bedding layer, provided they are properly moisture conditioned and compacted to the minimum requirements stated above in **Section 6.4**.

6.6 Stabilization

The natural silt/clay soils at this site will likely be susceptible to rutting and pumping. The likelihood of disturbance or rutting and/or pumping of the existing natural soils is a function of the moisture content, the load applied to the surface, as well as the frequency of the load. Consequently, rutting and pumping can be reduced by avoiding concentrated traffic, reducing the load applied to the surface by using lighter equipment and/or partial loads, by working in drier times of the year, or by providing a working surface for the equipment. Rubber-tired equipment particularly, because of high pressures, promotes instability in moist/wet, soft soils.

[11] American Public Works Association

If rutting or pumping occurs, traffic should be stopped, and the disturbed soils should be removed and replaced with stabilization material. Typically, a minimum of 18 inches of the disturbed soils must be removed to be effective. However, deeper removal is sometimes required.

To stabilize soft subgrade conditions (if encountered), a mixture of coarse, clean, angular gravels and cobbles and/or 1.5- to 2.0-inch clean gravel should be utilized. This coarse material may be placed and worked into the soft soils until firm and non-yielding or the soft soils removed an additional, minimum of 18 inches, and backfilled with the clean stabilizing fill. A test area should be implemented to achieve a proper stabilization strategy. Often the amount of gravelly material can be reduced with the use of a geotextile fabric such as Mirafi RS280i, or equivalent. Its use will also help avoid mixing of the subgrade soils with the gravelly material. After excavating the soft/disturbed soils, the fabric should be spread across the bottom of the excavation and up the sides a minimum of 18 inches. Otherwise, it should be placed in accordance with the manufacturer's recommendation, including proper overlaps. The gravel material can then be placed over the fabric in compacted lifts as described above.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed based on the previously described project characteristics, the subsurface conditions observed in the field and the laboratory test data, as well as common geotechnical engineering practice.

7.1 Continuous/Spread Footings

Based on our geotechnical engineering analyses, the proposed structure may be supported upon conventional spread and/or continuous wall foundations placed on suitable, undisturbed natural soils and/or on structural fill extending to suitable natural soils. Footings may be designed using a net bearing pressure of 2,000 psf if placed on suitable, undisturbed, natural soils or 2,500 psf if placed on a minimum 18 inches of structural fill.

The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade, thus the weight of the footing and backfill to lowest adjacent final grade need not be considered. The allowable bearing pressure may be increased by ½ for temporary loads such as wind and seismic forces.

We also recommend the following:

1. Exterior footings subject to frost should be placed at least 30 inches below final grade.
2. Interior footings not subject to frost should be placed at least 16 inches below grade.
3. Continuous footing widths should be maintained at a minimum of 18 inches.
4. Isolated footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall foundations be placed on undocumented fill, topsoil with organics, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. Deep, large roots may be encountered where trees and larger bushes are located or were previously located at the site; such large roots should be removed. If these or other unsuitable soils are encountered, they must be completely removed and replaced with properly compacted structural fill.

The base of footing excavations should be observed by a CMT geotechnical engineer to assess if suitable bearing soils have been exposed.

All structural fill placed immediately below footings should meet the requirements for such and should be placed and compacted in accordance with **Section 6** above. The width of structural replacement fill below footings should be equal to the width of the footing plus 1 foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 2 feet, the fill replacement width should be 4 feet, centered beneath the footing.

The minimum thickness of structural fill below footings should be equivalent to one-third the thickness of structural fill below any other portion of the foundations. For example, if the maximum depth of structural fill is 6 feet, all footings for the new structure should be underlain by a minimum 2 feet of structural fill.

7.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience settlement, but we anticipate that total settlements of footings founded as recommended above will not exceed 1 inch, with differential settlements on the order of 0.5 inches over a distance of 25 feet. We expect approximately 50% of the total settlement to initially take place during construction.

7.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.30 for natural silt/clay soils or 0.40 for structural fill, may be utilized for design. Passive resistance provided by properly placed and compacted natural, unsaturated clay/silt soils may be considered equivalent to a fluid with a density of 350 pcf. A combination of passive earth resistance and friction may be utilized if the passive resistance component of the total is divided by 1.5. Note that frictional resistance is mobilized as soon as any movement occurs, while full passive pressure is typically achieved after a small amount of movement occurs (approximately 0.5% of the footing height).

8.0 LATERAL EARTH PRESSURES

We anticipate that below-grade walls up to 4 feet high might be constructed at this site. The lateral earth pressure values given below are for a backfill material that will consist of drained natural clay/silt soils placed and compacted in accordance with the recommendations presented herein. If other soil types will be used as backfill, we should be notified so that appropriate modifications to these values can be provided, as needed.

The lateral pressures imposed upon subgrade facilities will depend upon the relative rigidity and movement of the backfilled structure. Following are the recommended lateral pressure values, which also assume that the soil surface behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment. Subgrade walls less than 12 feet high do not require incorporating a seismic at-rest lateral earth pressure for design.

CONDITION	STATIC (psf/ft)*	SEISMIC (psf/ft)**
Active Pressure (wall is allowed to yield, i.e. move away from the soil, with a minimum 0.001H movement/rotation at the top of the wall, where "H" is the total height of the wall)	40	38
At-Rest Pressure (wall is not allowed to yield)	60	N/A
Passive Pressure (wall moves into the soil)	350	180

*Equivalent Fluid Pressure (applied at 1/3 Height of Wall)
**Equivalent Fluid Pressure (added to static and applied at 1/3 Height of Wall)

9.0 FLOOR SLABS

Properly engineered floor slabs should be established upon uniform, compacted bearing soils comprised of suitable, undisturbed, uniform natural soils and/or on structural fill extending to suitable natural soils (same as for foundations). Under no circumstances shall floor slabs be established directly on any topsoil, undocumented fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. Floor slabs should be properly designed by a structural engineer to accommodate anticipated loads.

To facilitate curing of the concrete, we recommend that floor slabs be directly underlain by at least 4 inches of moist aggregate base or bedding material, or "free-draining" fill such as "pea" gravel or 1-inch minus, clean, gap-graded gravel. To help control normal shrinkage and stress cracking, the floor slab thickness and joint layout should be designed by a qualified structural engineer. Design provisions should address the following features:

1. Adequate reinforcement for the anticipated floor loads;
2. Using smooth bar reinforcement for load transfer through interior floor joints;
3. Portland cement concrete mix design selection to minimize shrinkage concerns;
4. Joint layout and spacing in accordance with ACI[12] or other local standards recommendations; and
5. Properly isolate floor slabs from foundations and other structural elements per recommendations provided by ACI 302 (Guide to Concrete Floor and Slab Construction).

10.0 DRAINAGE RECOMMENDATIONS

It is important to the long-term performance of foundations and floor slabs that water is not allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around the structure should be sloped to provide drainage away from the foundations. We recommend a minimum slope of 4 inches in the first 10 feet away from the structure. This slope should be maintained throughout the lifetime of the structure.

2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.

3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.

4. Landscape sprinklers should be aimed away from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Overwatering should be avoided.

5. Other precautions that may become evident during construction.

11.0 PAVEMENTS

All pavement areas must be prepared as discussed above in **Section 6.1**. Under no circumstances shall pavements be established over topsoil, undocumented fills (if encountered), loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In pavement areas, subsequent to stripping and prior to the placement of pavement materials, the exposed subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If soft, pumping, or otherwise unsuitable soils are encountered, we recommend they be removed to a minimum of 18 inches below the subgrade level and replaced with structural fill.

We anticipate the natural silt/clay soils will exhibit poor pavement support characteristics when saturated or nearly saturated. To provide data to aid in pavement design a California Bearing Ratio (CBR) test was performed

[12] American Concrete Institute

on a bulk sample of the near surface soils conglomerated from the cuttings from several of the bore holes. Results are presented in the following table:

SAMPLE TYPE	SOIL CLASS	OPTIMUM MOISTURE(%)	MAX DRY DENSITY (pcf)	CBR (%)
Bulk	CL	11.3	119.1	4

DCP testing was also utilized to assess the subgrade soils for pavement support. Results showed considerable variation with correlated CBR values ranging from a low of about 2 to a high of about 90 between depths of about 10 inches and 30 inches below the surface.

We have used the laboratory determined CBR value of 4 as the basis for pavement design. Given the projected traffic as discussed above in **Section 1.3**, the following pavement sections are recommended for the given ESAL's (18-kip equivalent single-axle loads) per day:

MATERIAL	PAVEMENT SECTION THICKNESS (inches)			
	PARKING AREAS (1 ESAL per day)		DRIVE AREAS (3 ESAL'S per day)	
Asphalt	**3**	**3**	**3.5**	**3.5**
Road-Base (UTBC)	**8**	**4**	**10**	**6**
Subbase	**0**	**6**	**0**	**6**
Total Thickness	**11**	**13**	**13.5**	**15.5**

Untreated base course (UTBC), typically known as road-base, should conform to city specifications, or to 1-inch-minus UDOT specifications for A–1-a/NP, and have a minimum CBR value of 70%. Material meeting our specification for structural fill can be used for subbase, as long as the fines content (percent passing No. 200 sieve) does not exceed 15%. Roadbase and subbase material should be compacted as recommended above in **Section 6.4**. Asphalt material generally should conform to APWA requirements, having a ½-inch maximum aggregate size, a 75-gyration Superpave mix containing no more than 15% of recycled asphalt (RAP) and a PG58-28 binder.

For dumpster pads, we recommend a pavement section consisting of 6.5 inches of Portland cement concrete and 6 inches of aggregate base over properly prepared suitable natural subgrade or site grading structural fills extending to suitable natural soils. Dumpster pads constructed overlying undocumented fills (if encountered) must be avoided or heavily reinforced.

12.0 QUALITY CONTROL

We recommend that CMT be retained as part of a comprehensive quality control testing and observation program. With CMT onsite we can help facilitate implementation of our recommendations and address, in a timely manner, any subsurface conditions encountered which vary from those described in this report. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

12.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

12.2 Fill Compaction

Compaction testing by CMT is required for all structural supporting fill materials. Maximum Dry Density (Modified Proctor, ASTM D-1557) tests should be requested by the contractor immediately after delivery of any fill materials. The maximum density information should then be used for field density tests on each lift as necessary to verify that the required compaction is being achieved.

12.3 Excavations

All excavation procedures and processes should be observed by a geotechnical engineer from CMT or his representative. In addition, for the recommendations in this report to be valid, all backfill and structural fill placed in trenches and all pavements should be density tested by CMT. We recommend that freshly mixed concrete be tested by CMT in accordance with ASTM designations.

13.0 LIMITATIONS

The recommendations provided herein were developed by evaluating the information obtained from the subsurface explorations and soils encountered therein. The exploration logs reflect the subsurface conditions only at the specific location at the particular time designated on the logs. Soil and ground water conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at 801-590-0394. To schedule materials testing, please call 801-381-5141.

APPENDIX

SUPPORTING
DOCUMENTATION

CMT TECHNICAL SERVICES

Farmington Regional Center
About 500 North Lagoon Drive, Farmington, Utah

SITE MAP

Date:	17-May-1918
CMT No.:	22203

Figure: 1

Client:	ajc architects
Project:	Farmington Regional Center
Location:	About 500 North Lagoon Drive, Farmi
Job No.:	22203
Scale:	4 (←must be at least 2)

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-1

Total Depth: 51.5'
Water Depth: 17'

Date: 5/24/24
Job #: 22203

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	Dark Brown to Brown CLAY (CL) with sand, roots, organics, and mica fragments, moist — medium stiff		1	4 4 2	6								
	grades some gravel		2			21	97				36	21	15
4													
	grades with oxidation		3	4 4 2	6								
	grades gray brown with oxidation and roots												
8			4										
	soft		5	4 3 2	5	32	91			91			
12													
16			6										
	wet												
20			7			31	93	0	19	81	28	20	8
24													
	Blue Gray Poorly Graded SAND with silt (SP-SM) and gravel, wet — medium dense		8	7 9 15	24								
28													

Remarks: Groundwater encountered during drilling at depth of 17 feet.

Coordinates: 40.9904574°, -111.9002282°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 2

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-1

Total Depth: 51.5'
Water Depth: 17'

Date: 5/24/24
Job #: 22203

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
28	Blue Gray Poorly Graded SAND with silt (SP-SM) and gravel, wet												
	medium dense		9	10 12 15	27	12		31	58	11			
32													
	grades brown to black; medium dense to dense		10	9 12 18	30								
36													
	Brown Silty SAND (SM) with gravel, wet												
40	grades gray to black; medium dense		11	15 12 5	17	18		12	56	32		NP	NP
	Brown Sandy SILT (ML) with gravel, wet; medium stiff												
44													
	Gray Brown Sandy GRAVEL (GP), wet; loose		12	3 7 9	16	21	111						
	Gray Brown Sandy CLAY (CL) with oxidation												
48													
	Tan to Gray Brown Poorly Graded SAND with silt (SP-SM) and gravel, oxidation, wet; dense		13	6 12 27	39	10		38	56	6			
	END AT 51.5'												
52													
56													

Remarks: Groundwater encountered during drilling at depth of 17 feet.

Coordinates: 40.9904574°, -111.9002282°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 2

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-2

Total Depth: 16.5'
Water Depth: 5.6'
Date: 5/24/24
Job #: 22203

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	Dark Brown to Black Clayey SILT (ML), some sand, roots and organics, moist												
	soft; grades light brown, sandy with oxidation		14	2 1 1	2								
4			15	2 2 1	3								
	Light Brown CLAY (CL) with mica, trace sand and oxidation												
8	soft		16	3 2 4	6	28	94			90			
	grades with interbedded layers of sand; very soft		17	0 0 0	0								
12													
16	soft to medium stiff		18	3 3 5	8	30	85						
	END AT 16.5'												
20													
24													
28													

Remarks: Groundwater encountered during drilling at depth of feet and measured on 6/11/24 at depth of 5.6 feet.
Slotted PVC pipe installed to depth of 16.5 feet to facilitate water level measurements.

Coordinates: 40.9902395°, -111.8997712°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 3

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-3

Total Depth: 11.5'
Water Depth: 9.5'
Date: 5/24/24
Job #: 22203

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	Dark Brown to Black Sandy CLAY (CL) with gravel, mica, roots and organics, moist												
	soft		19	3 3 2	5	16	110						
4			20			16	115						
8	Brown Silty SAND (SM), moist; loose		21	3 4 4	8	25	105	0	69	31			
	wet		22										
11.5	END AT 11.5'												

Depth scale: 0, 4, 8, 12, 16, 20, 24, 28

Remarks: Groundwater encountered during drilling at depth of 9.5 feet.

Coordinates: 40.9900021°, -111.9003489°
Surface Elev. (approx): Not Given

CMT TECHNICAL SERVICES

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

Figure: 4

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-4

Total Depth: 31.5'
Water Depth: 21'
Date: 5/24/24
Job #: 22203

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0	Brown to Black Clayey SILT (ML) with sand, gravel, roots and organics, moist												
	soft		23	2 2 1	3								
4	medium stiff		24	4 3 2	5								
	Gray Brown Sandy CLAY (CL), trace gravel, oxidation and organics, moist												
8	soft		25	3 5 2	7	16	107						
	grades brown with interbedded sand and oxidation												
	soft to medium stiff		26	0 0 4	4								
12													
16	soft		27	2 2 4	6	29	95						
20	grades less sand; medium stiff to stiff; wet		28	3 3 5	8	29					30	17	13
24	Gray Brown Silty SAND (SM) with gravel, wet												
	medium dense		29	12 8 6	14	16		29	53	18			
28													

Remarks: Groundwater encountered during drilling at depth of 21 feet.

Coordinates: 40.9907995°, -111.9003818°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-4

Total Depth: 31.5'
Water Depth: 21'
Date: 5/24/24
Job #: 22203

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Blows Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
28		Gray Brown Silty SAND (SM) with gravel, wet												
		grades less silt — very dense		30	4 20 33	53								
		END AT 31.5'												
32														
36														
40														
44														
48														
52														
56														

Remarks: Groundwater encountered during drilling at depth of 21 feet.

Coordinates: 40.9907995°, -111.9003818°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 5

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-5

Total Depth: 6.5'
Water Depth: (see Remarks)
Date: 5/24/24
Job #: 22203

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
0		Brown CLAY (CL) with sand and gravel, moist												
		soft		31	3 2 1	3								
4														
		soft to medium stiff		32	1 1 3	4								
		END AT 6.5'												
8														
12														
16														
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: 40.9909273°, -111.8996365°
Surface Elev. (approx): Not Given

CMT TECHNICAL SERVICES

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-6

Total Depth: 6.5'
Water Depth: (see Remarks)

Date: 5/24/24
Job #: 22203

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		Dark Brown CLAY (CL) with sand, roots and organics, moist												
4		medium stiff		33	0 0 5	5								
		grades with gravel and mica; soft grades with peat		34	1 1 2	3								
		END AT 6.5'												
8														
12														
16														
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: 40.9901215°, -111.9008451°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 7

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-7

Total Depth: 6.5'
Water Depth: (see Remarks)

Date: 5/24/24
Job #: 22203

Depth (ft)	Soil Description	Sample Type	Sample #	Blows (N)	Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0	Dark Brown Sandy SILT (ML), trace gravel, mica, roots and organics												
	soft	◣	35	3 2 1	3								
4													
	Gray Brown Silty SAND (SM) with gravel and organics, moist medium dense	◣	36	6 5 7	12	7		29	55	16			
	END AT 6.5'												
8													
12													
16													
20													
24													
28													

Remarks: Groundwater not encountered during drilling.

Coordinates: 40.9896923°, -111.900537°
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 8

Farmington Regional Center

About 500 North Lagoon Drive, Farmington, Utah

Bore Hole Log B-8

Total Depth: 6.5'
Water Depth: (see Remarks)
Date: 5/24/24
Job #: 22203

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)	Blows (N) Total	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		Dark Brown CLAY (CL) with sand, trace gravel, roots, moist												
		soft		37	3 2 1	3								
4														
		grades trace sand, with mica, oxidation		38	2 1 1	2								
		END AT 6.5'												
8														
12														
16														
20														
24														
28														

Remarks: Groundwater not encountered during drilling.

Coordinates: °, °
Surface Elev. (approx): Not Given

Equipment: Hollow-Stem Auger
Automatic Hammer, Wt=140 lbs, Drop=30"
Excavated By: Direct Push Services
Logged By: Jake E.

CMT TECHNICAL SERVICES

Figure: 9

Farmington Regional Center

Key to Symbols

About 500 North Lagoon Drive, Farmington, Utah

Date: 5/24/24

Job #: 22203

① Depth (ft)	② GRAPHIC LOG	③ Soil Description	④ Sample Type	⑤ Sample #	Blows(N) ⑥	⑦ Total	⑧ Moisture (%)	⑨ Dry Density(pcf)	Gradation ⑩ Gravel %	Sand %	Fines %	Atterberg ⑪ LL	PL	PI

COLUMN DESCRIPTIONS

① **Depth (ft.):** Depth (feet) below the ground surface (including groundwater depth - see below right).

② **Graphic Log:** Graphic depicting type of soil encountered (see ② below).

③ **Soil Description:** Description of soils, including Unified Soil Classification Symbol (see below).

④ **Sample Type:** Type of soil sample collected; sampler symbols are explained below-right.

⑤ **Sample #:** Consecutive numbering of soil samples collected during field exploration.

⑥ **Blows:** Number of blows to advance sampler in 6" increments, using a 140-lb hammer with 30" drop.

⑦ **Total Blows:** Number of blows to advance sampler the 2nd and 3rd 6" increments.

⑧ **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight).

⑨ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).

⑩ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), from lab test results of soil passing No. 4 and No. 200 sieves.

⑪ **Atterberg:** Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

MODIFIERS
Trace
<5%
Some
5-12%
With
> 12%

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	②	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% fines)	SM		Silty Sands, Sand-Silt Mixtures
			SC		Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size.	SILTS AND CLAYS Liquid Limit less than 50%		ML		Inorganic Silts and Very Fine Sands, Silty or Clayey Fine Sands or Clayey Silts with Slight
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL		Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils with Plasticity (Elastic Silts)
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler 3.5" OD, 2.42" ID
- D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level

(see Remarks on Logs)

1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

CMT TECHNICAL SERVICES

DCP TEST DATA

Project: *Farmington Regional Center* **Date:** 24-May-24
Location: B-2 **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	24	1
3	47	1
3	70	1
3	91	1
1	169	1
1	195	1
1	222	1
1	251	1
1	284	1
1	320	1
1	354	1
1	390	1
1	425	1
1	468	1
1	500	1
1	534	1
1	613	1
1	664	1
1	713	1
1	772	1
1	830	1
0	0	1
		1
		1
		1
		1
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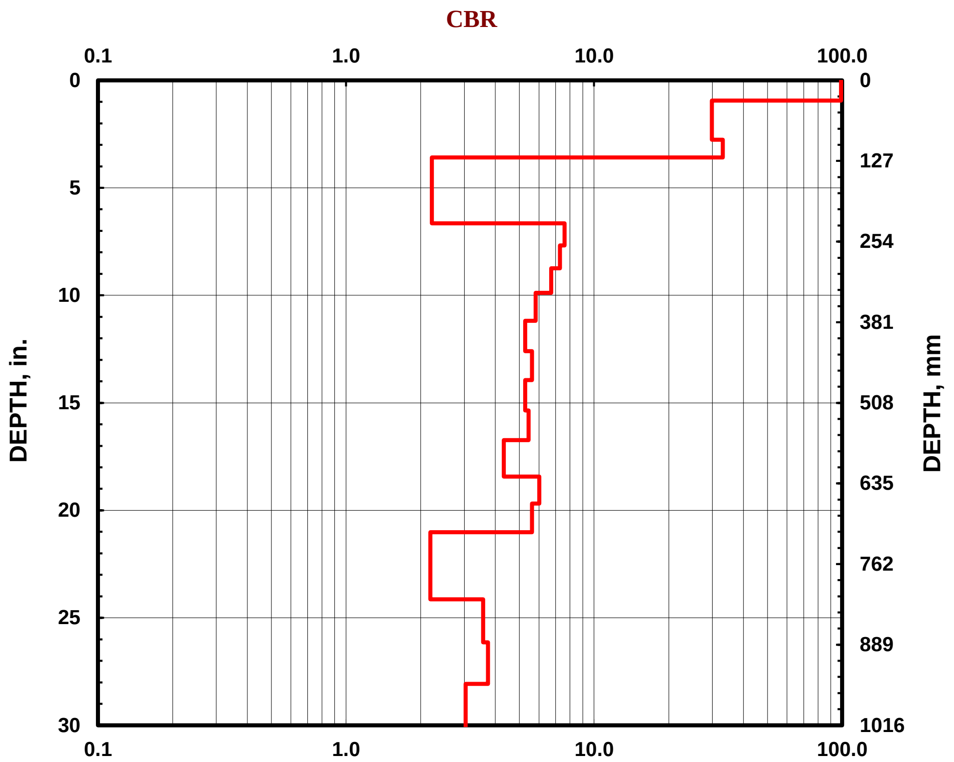

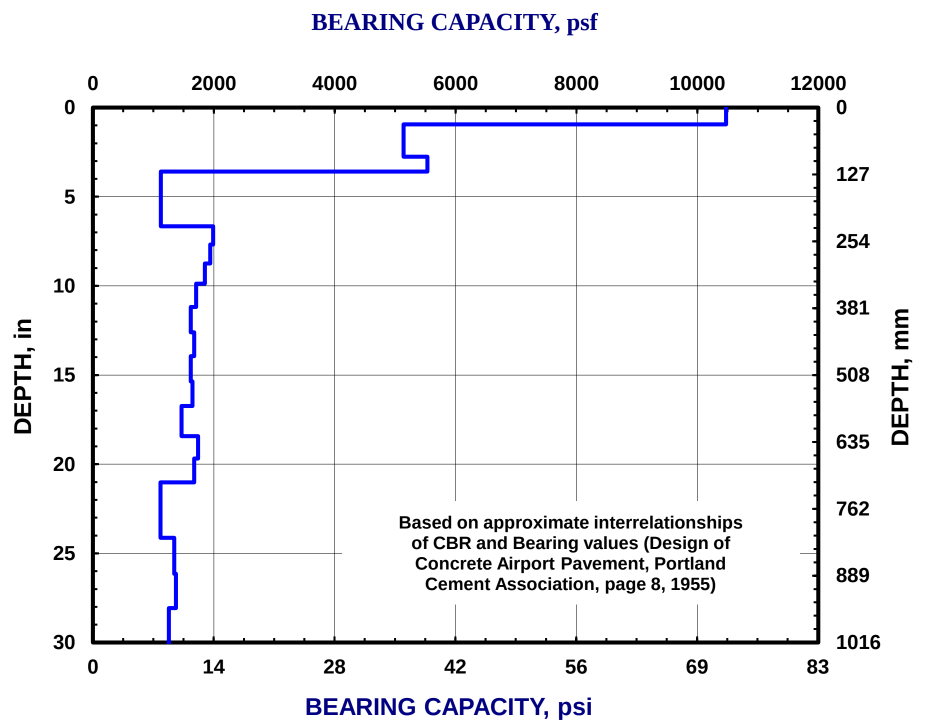

CMT TECHNICAL SERVICES

Date:	5/24/2024	Figure: 11
Job #	22203	

DCP TEST DATA

Project: *Farmington Regional Center* **Date:** 24-May-24
Location: B-3 **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	36	1
1	68	1
1	99	1
1	127	1
1	156	1
1	187	1
1	215	1
1	244	1
1	277	1
1	316	1
1	349	1
1	365	1
1	378	1
1	414	1
1	428	1
1	450	1
1	474	1
1	496	1
1	517	1
1	538	1
1	563	1
1	589	1
1	610	1
1	633	1
1	662	1
1	692	1
1	725	1
1	754	1
1	780	1
1	794	1
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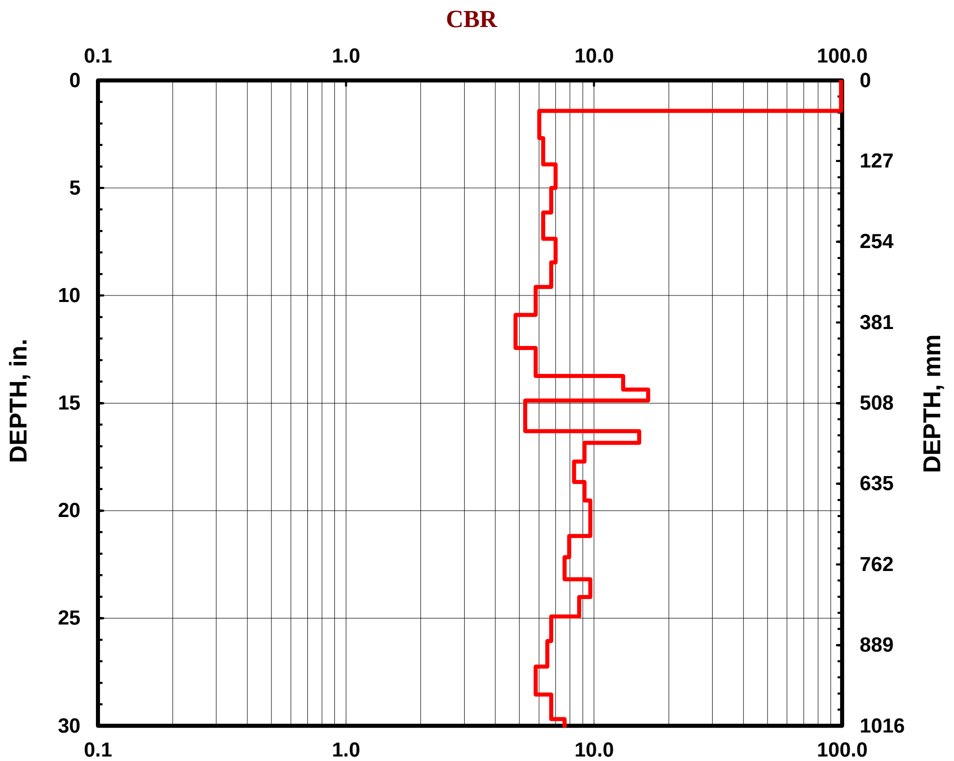

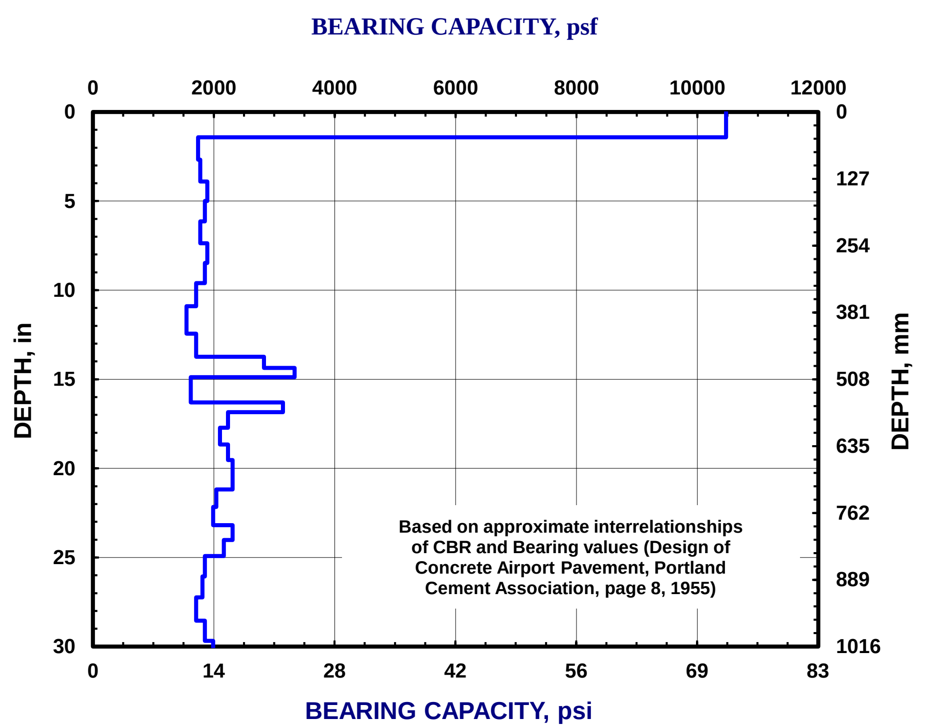

DCP TEST DATA

Project: *Farmington Regional Center* Date: 24-May-24
Location: B-4 Soil Type(s):

Hammer
◯ 10.1 lbs.
◉ 17.6 lbs.
◯ Both hammers used

Soil Type
◯ CH
◯ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	85	1
1	92	1
1	107	1
1	122	1
1	136	1
3	172	1
3	193	1
3	210	1
3	224	1
5	248	1
5	268	1
5	284	1
10	331	1
10	378	1
10	412	1
10	439	1
10	487	1
10	538	1
10	594	1
10	708	1
3	752	1
3	791	1
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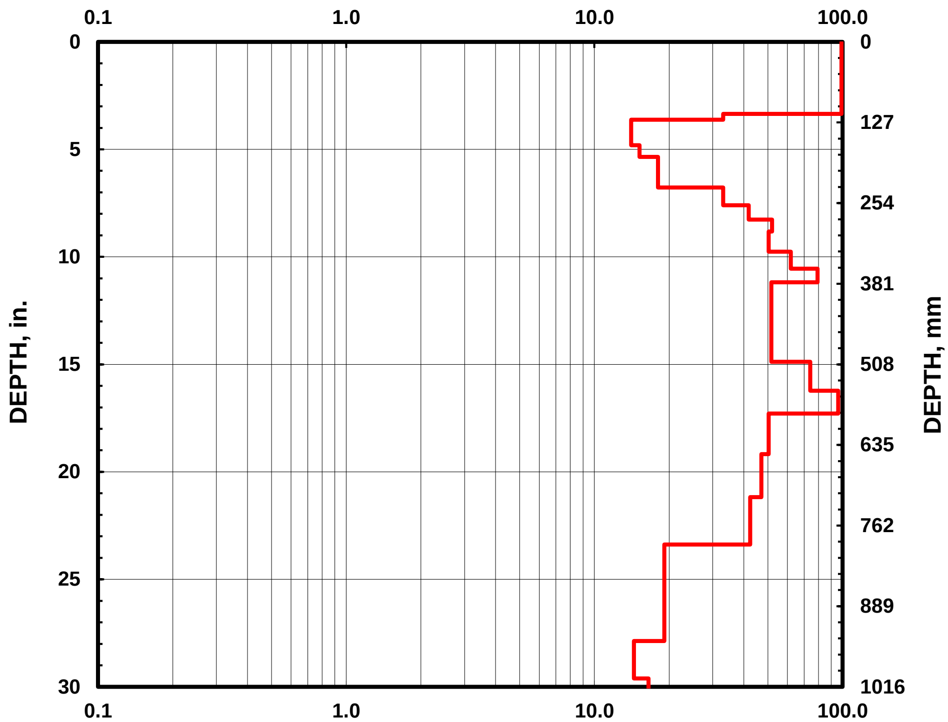

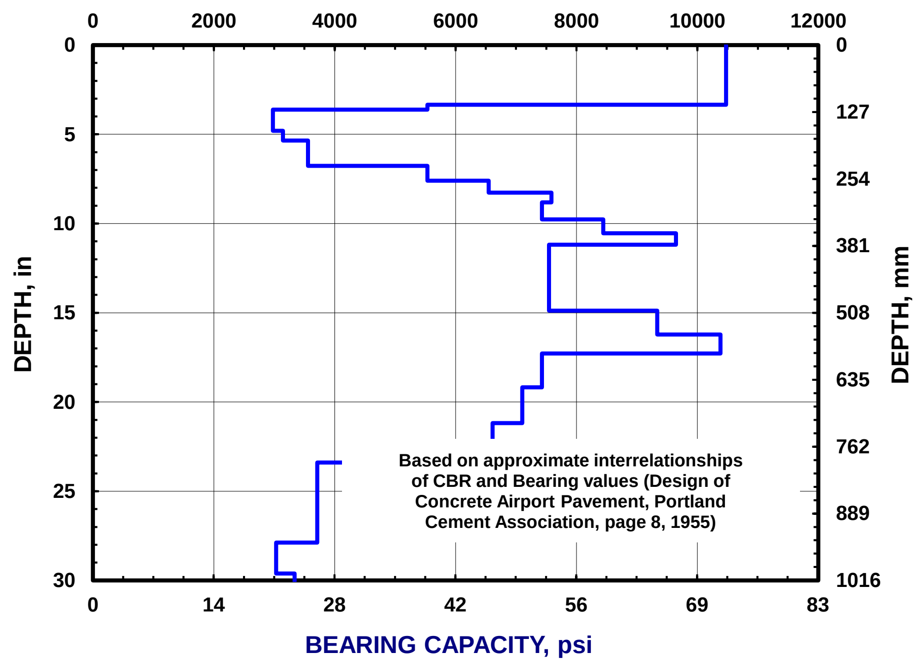

DCP TEST DATA

Project: *Farmington Regional Center*
Location: B-5
Date: 24-May-24
Soil Type(s):

Hammer
◯ 10.1 lbs.
◉ 17.6 lbs.
◯ Both hammers used

Soil Type
◯ CH
◯ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	15	1
1	25	1
3	45	1
3	70	1
3	80	1
5	95	1
10	175	1
5	225	1
5	260	1
5	285	1
5	300	1
5	320	1
6	340	1
55	360	1
10	375	1
10	410	1
10	445	1
10	465	1
10	480	1
10	505	1
10	540	1
10	555	1
10	610	1
10	680	1
0	0	1
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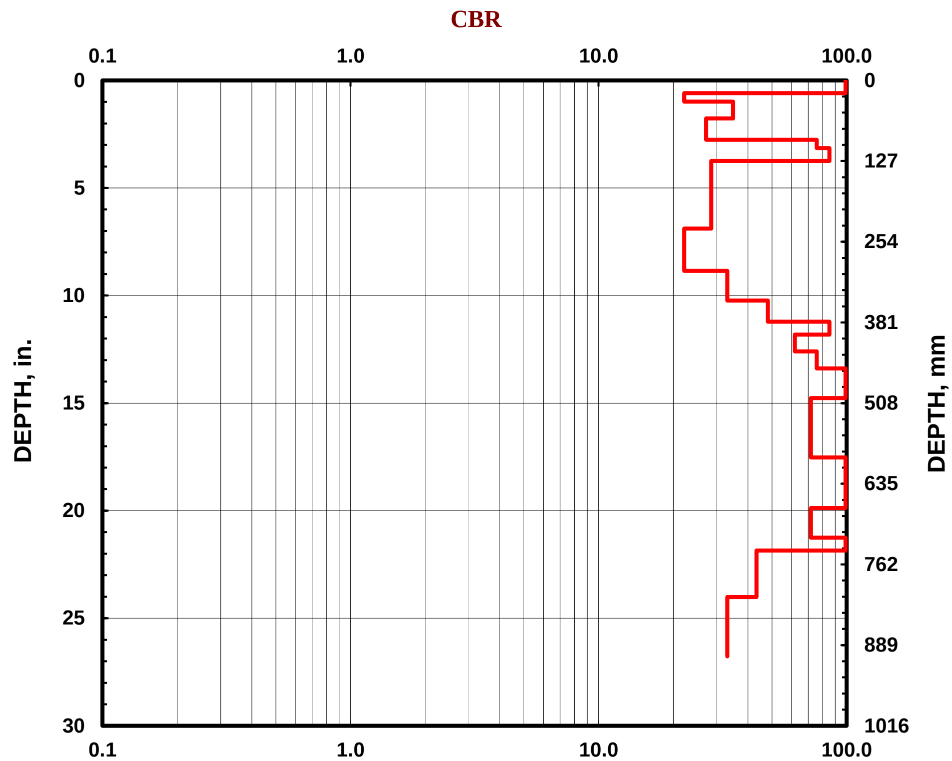

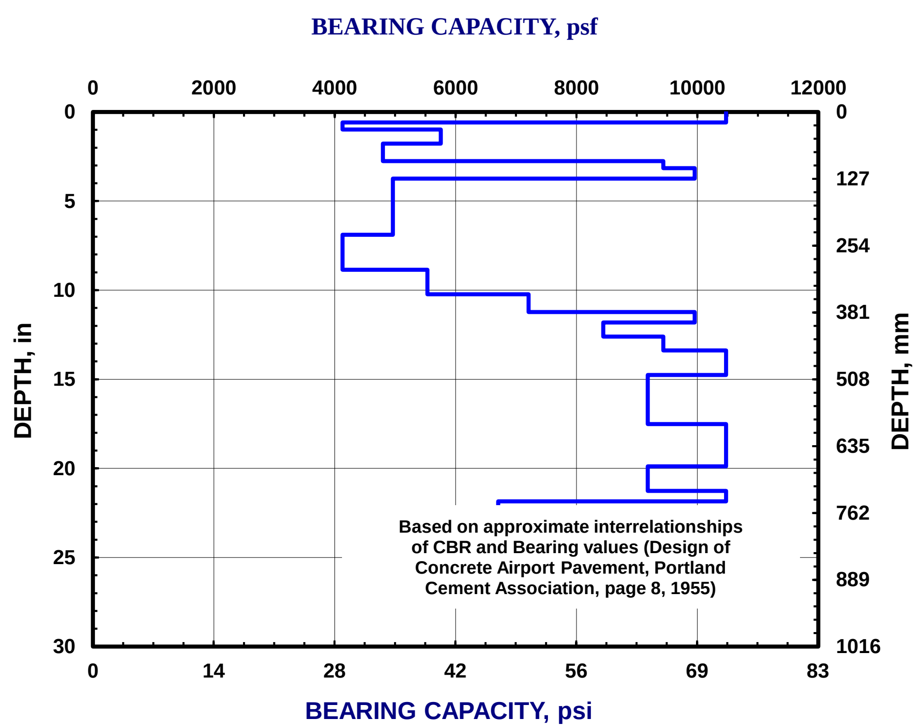

CMT TECHNICAL SERVICES

Date:	5/24/2024	Figure: 14
Job #	22203	

DCP TEST DATA

Project: *Farmington Regional Center*
Location: B-6
Date: 24-May-24
Soil Type(s): CLAY (CL)

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ● CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	28	1
3	46	1
3	63	1
3	84	1
3	109	1
3	131	1
3	152	1
3	172	1
3	192	1
3	271	1
1	302	1
1	336	1
1	384	1
1	449	1
1	529	1
1	619	1
1	687	1
1	735	1
1	804	1
0	0	1
		1
		1
		1
		1
		1
		1
		1
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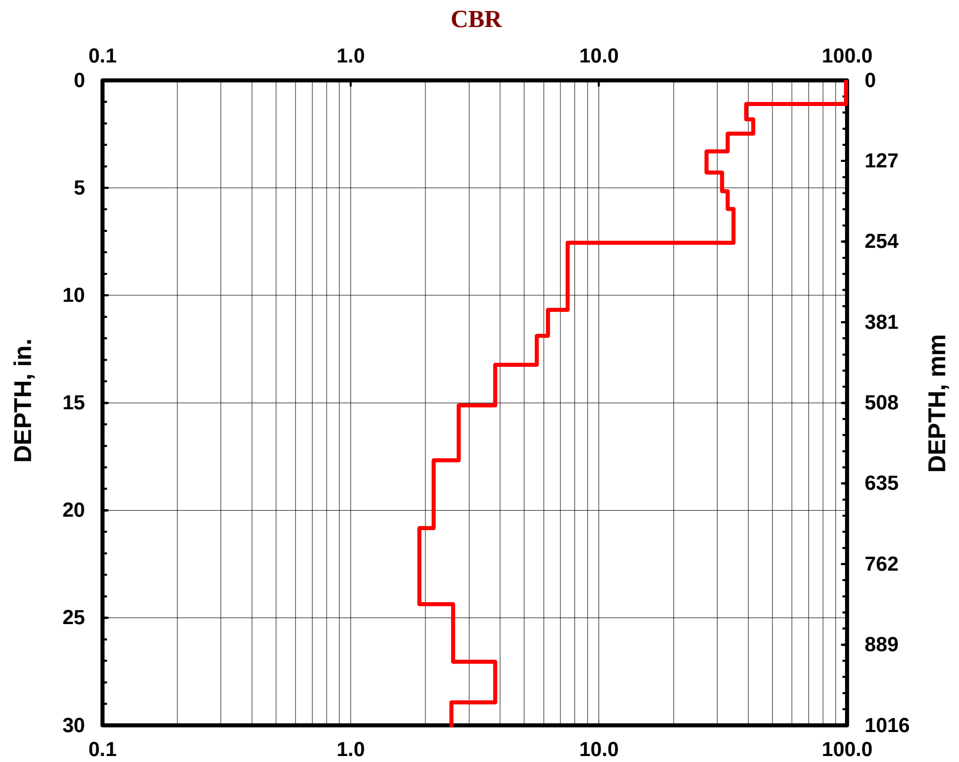

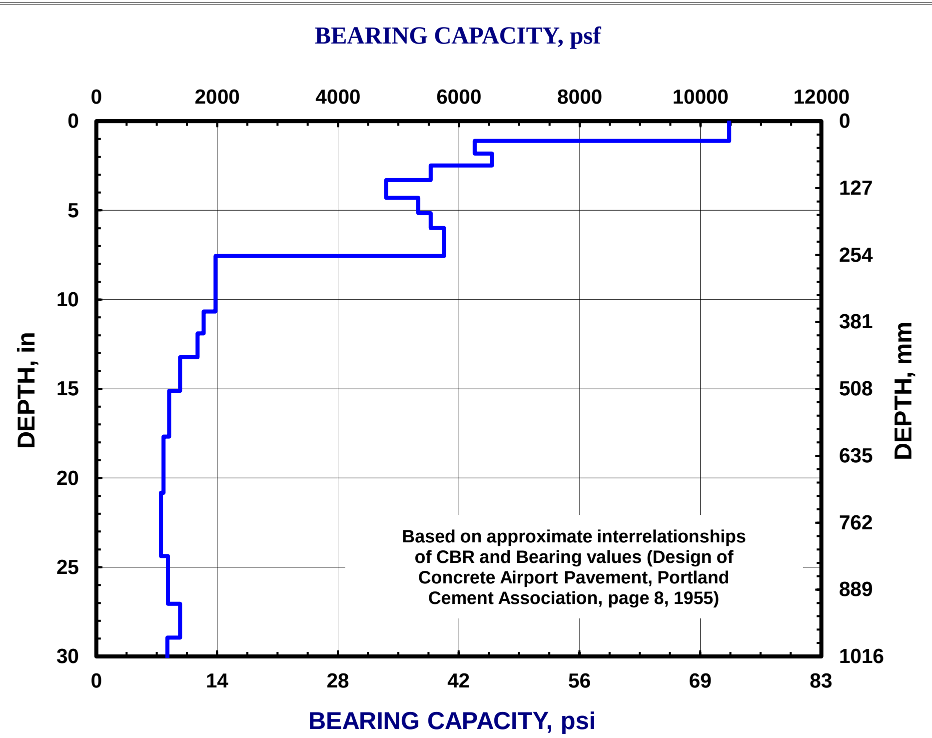

CMT TECHNICAL SERVICES

Date:	5/24/2024
Job #	22203

Figure: 15

DCP TEST DATA

Project: *Farmington Regional Center* **Date:** 24-May-24
Location: B-7 **Soil Type(s):**

Hammer
- ◯ 10.1 lbs.
- ◉ 17.6 lbs.
- ◯ Both hammers used

Soil Type
- ◯ CH
- ◉ CL
- ◯ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	31	1
3	52	1
3	72	1
3	96	1
3	116	1
3	135	1
3	152	1
3	172	1
3	195	1
3	191	1
3	246	1
3	270	1
3	296	1
3	320	1
3	341	1
3	383	1
3	405	1
3	429	1
3	504	1
1	536	1
1	570	1
1	611	1
1	661	1
1	713	1
1	771	1
0	0	1
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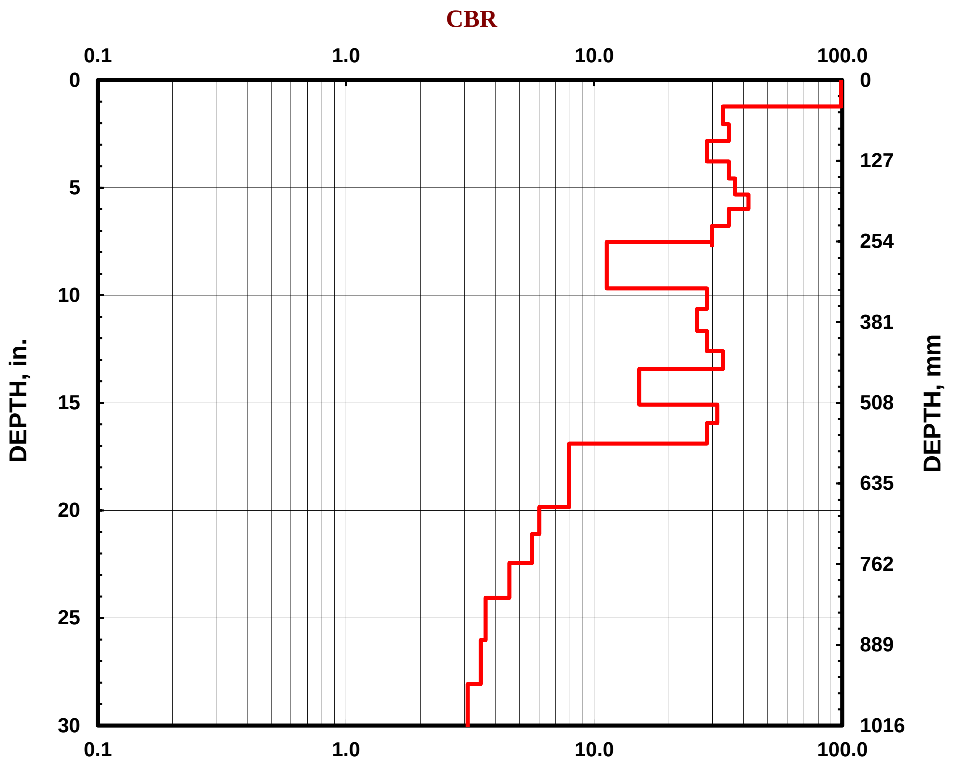

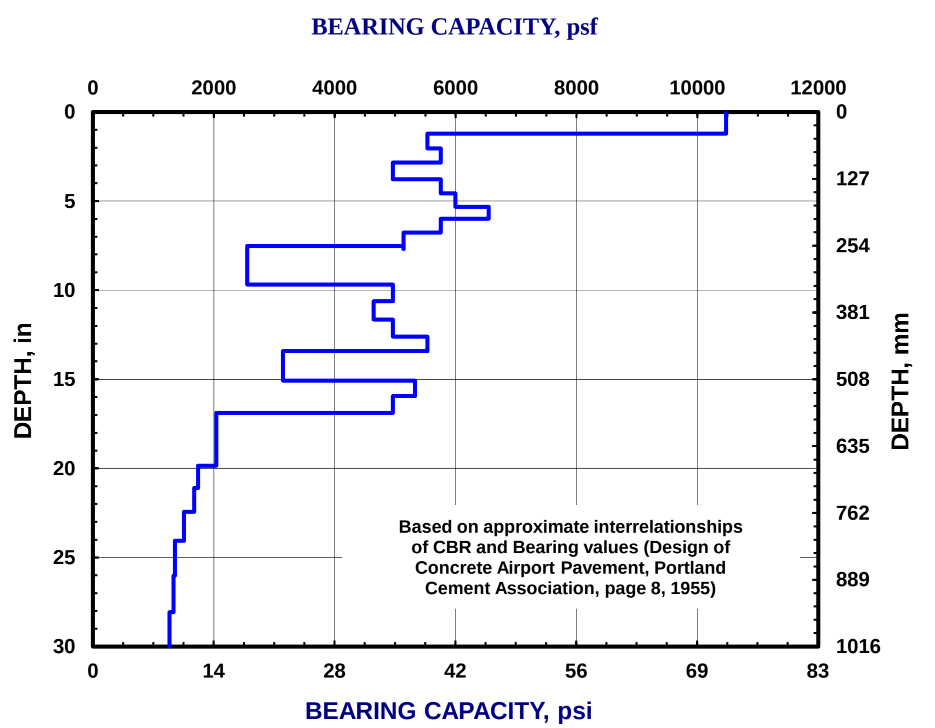

CMT TECHNICAL SERVICES

Date:	5/24/2024
Job #	22203

Figure: 16