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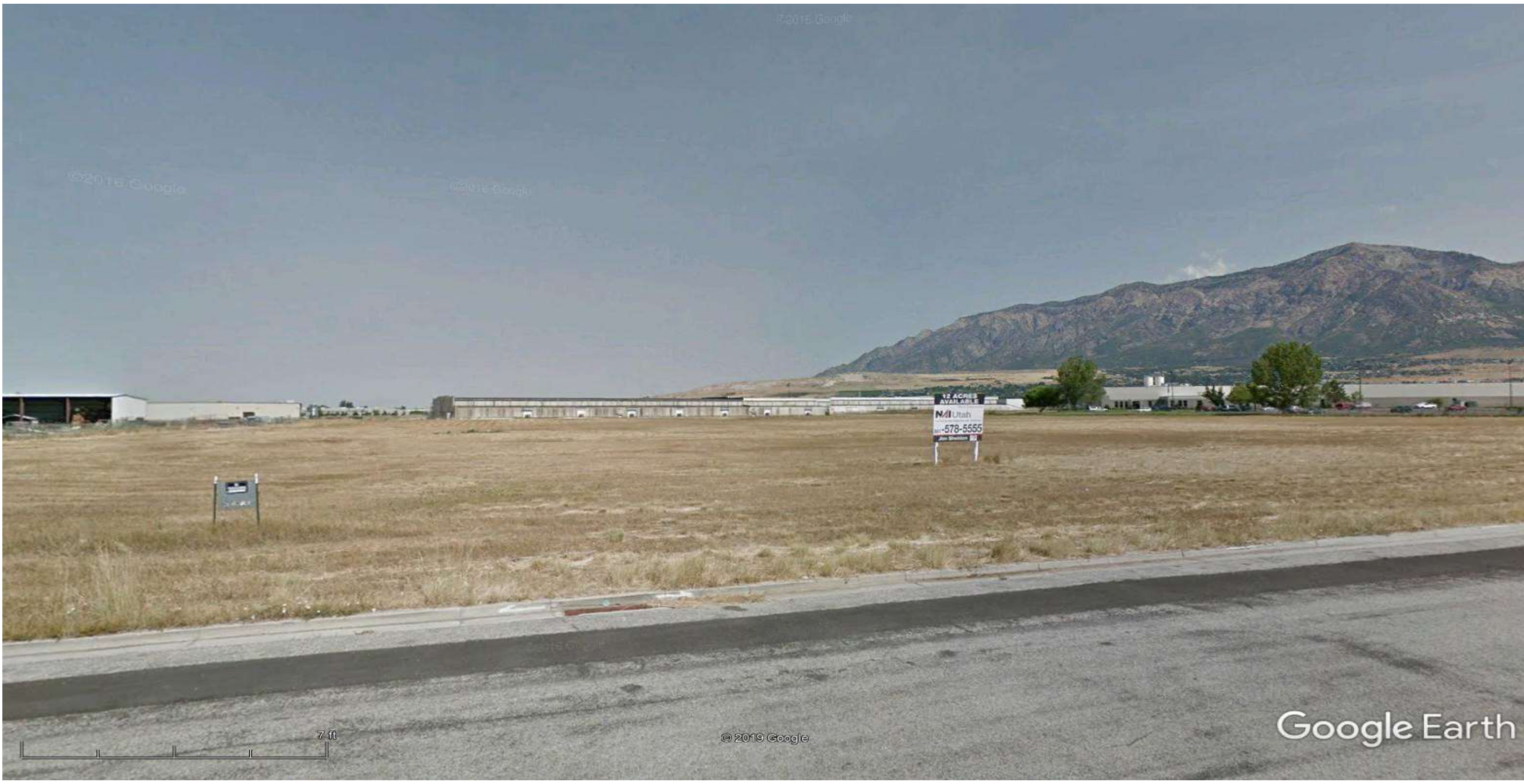

Engineering
Geology
Environmental (ESA I & II)
Organic Chemistry
Materials Testing
Special Inspections

GEOTECHNICAL ENGINEERING STUDY

Proposed Challenger Pallets Building

About 1250 West 2100 North
Farr West, Utah
CMT Project No. 12606

FOR:
Mr. Tad Hegsted
Pinshon Properties, LLC
3521 East 100 North
Rigby, Idaho 83442

April 15, 2019

CMT ENGINEERING LABORATORIES

April 15, 2019

Mr. Tad Hagsted
Pinshon Properties, LLC
3521 East 100 North
Rigby, Idaho 83442

Subject: Geotechnical Engineering Study
Proposed Challenger Pallets Building
About 1250 West 2150 North
Farr West, Utah
CMT Project Number: 12606

Mr. Hagsted:

Submitted herewith is the report of our geotechnical engineering study 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 April 4, 2019, a CMT Engineering Laboratories (CMT) engineer was on-site and supervised the excavation and logging of 11 test pits and the drilling and logging of one bore hole extending to depths of about 10.0 to 31.5 feet below the existing ground surface. Soil samples were obtained during the field operations and subsequently transported to our laboratory for further testing and observation. Groundwater was encountered during the field investigation between depths of about 9.5 to 13 feet below the surface.

Conventional spread and/or continuous footings may be utilized to support the proposed structure, provided the recommendations in this report are followed. A detailed discussion of design and construction criteria is presented in this report.

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 8 offices throughout Utah and Arizona, 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) 870-6730.

Sincerely,
CMT Engineering Laboratories

Bryan N Roberts

LICENSED PROFESSIONAL ENGINEER
276476
BRYAN N. ROBERTS
4/15/19
STATE OF UTAH

Bryan N. Roberts, P.E.
Senior Geotechnical Engineer

Reviewed by:

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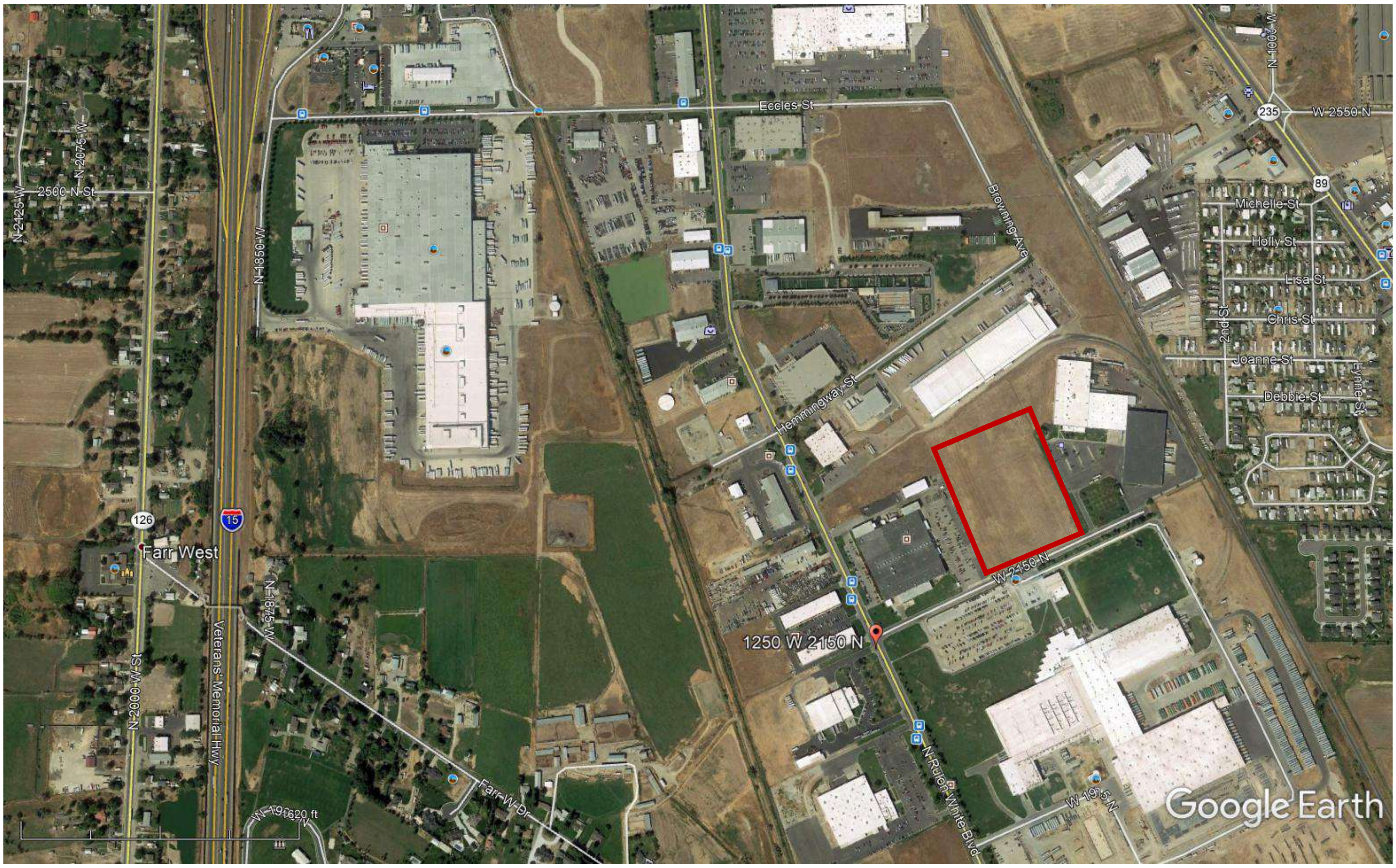
TABLE OF CONTENTS

APPENDIX

1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for the proposed Challenger Pallets Building to be constructed on a vacant parcel at about 1250 West 2150 North in Farr West, Utah, as shown in the **Vicinity Map** below.



Vicinity Map

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in discussions between Mr. Tad Hegsted of Pinshon Properties, LLC and Mr. Andrew Harris of CMT Engineering Laboratories (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 recommendations and seismic information 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 excavating/logging/sampling of 11 test pits and the drilling/logging/sampling of 1 bore hole, performing laboratory testing on representative samples, 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 by returning a signed copy of our proposal dated March 28, 2019 and executed March 29, 2019.

1.3 Description of Proposed Construction

We understand that a one extended level office/ commercial building with a plan area of about 52,000 square feet is planned for site. The structure will be constructed of steel post/beam construction and/or tilt up concrete walls founded on spread footings with slab on grade floors established near existing grade.

Maximum continuous wall and column loads are anticipated to be 2 to 7 kips per lineal foot and 75 to 150 Kips respectively. Floor slab loads are anticipated to be relatively light, with an average uniform loading not exceeding 150 pounds per square foot. If the 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. Pavements at the site are expected to include asphalt paved parking areas and internal drive lanes and concrete aprons for unloading/loading zones.

Projected traffic in the parking areas is anticipated to consist of a light to moderate volume of automobiles and light trucks with occasional medium-weight. In potential delivery areas, traffic is projected to consist of a moderate volume of automobiles and light trucks, a light to moderate volume of medium-weight trucks, and an occasional to light volume of heavy-weight trucks.

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 1 to 3 feet. If site grading fills are more than about 4 feet CMT must be notified to review settlements.

1.4 Executive Summary

The results of our study show that the proposed structure may be supported upon conventional spread and continuous wall foundations placed on suitable natural soils or structural fill extending to suitable natural soils utilizing a bearing pressure of 2,000 pounds per square foot. Footings supported directly on a minimum of 18 inches of granular structural fill extending to suitable natural soil may be designed utilizing an increased bearing pressure of 2,500 pounds per square foot.

The most significant geotechnical aspect of the site is the loose/disturbed surface soils and surface vegetation from past agricultural activities which are on the order of about 6 to 8 inches thick at the surface.

Groundwater was observed during the field work ranging from about 9.5 to 13.0 feet below the ground surface.

Where some of the natural clay soils are high in moisture content they may be easily disturbed and may require some stabilization.

All non-engineered fills/disturbed soils and deleterious material must be removed below structural areas. CMT must verify that all topsoil, vegetation, disturbed, non-engineered fill, 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 and subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements are provided.

2.0 FIELD EXPLORATION

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 11 test pits were excavated with a rubber tire mounted backhoe and one bore hole was drilled with a CMT 55 to depths of approximately 10 to 31.5 feet below the existing ground surface. Locations of the test pits and bore hole are presented on **Figure 1, Site Plan**, included in the Appendix. The field exploration was performed under the supervision of an experienced member of our geotechnical staff.

Representative soil samples were collected within the test pits by obtaining disturbed "grab" samples and cut block samples. Samples of the subsurface soils encountered in the bore hole were collected at varying depths through hollow stem drill augers. Relatively undisturbed samples of the subsurface soils were obtained by pushing a 3 inch diameter Shelby tube. Disturbed samples were collected utilizing a standard split spoon sampler. This standard split spoon sampler 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 samples were placed in sealed plastic bags and containers prior to transport to the laboratory.

The subsurface soils encountered in the test pits and bore hole were logged and described in general accordance with ASTM[1] D-2488. Soil samples were collected as described above, and were classified in the field based upon visual and textural examination. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphical representations of the subsurface conditions encountered are presented on each individual Test Pit Log, **Figures 2 through 12**, included in the Appendix. A Key to Symbols defining the terms and symbols used on the logs, is provided as **Figure 13** in the Appendix.

Following completion of excavation operations, 1.25-inch diameter slotted PVC pipe was installed in test pits TP-2 and TP-8 to allow subsequent water level measurements.

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[1] American Society for Testing and Materials

When backfilling the test pits, only minimal effort was made to compact the backfill and no compaction testing was performed. Thus, the backfill must be considered as non-engineered fill and settlement of the backfill in the test pits over time should be anticipated.

3.0 LABORATORY TESTING

3.1 General

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

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, ASTM D-4648

3.2 Lab Summary

Laboratory test results are presented on the test pit logs (**Figures 2 through 13**) and in the following Lab Summary Table:

Lab Summary Table

Test Pit No.	Depth (feet)	Soil Class	Sample Type	Moisture Content (%)	Dry Denstiy (pcf)	Gradation			Atterberg Limits		
						Grav	Sand	Fines	LL	PL	PI
TP-1	3	CL	Block	22.6	97				50	22.0	28
	9	SM Lense	Block	26.5				26.3			
TP-2	6	CL	Block	20.0	98						
TP-3	2.5	CH	Block	24.0				96.0	56	19	37
TP-5	9	CL	Block	21.0	109						
TP-6	3	CL	Block	30.0	84						
TP-7	6	CL	Block	16.0	110						
TP-11	3	CH	Block	30.8	84			96.0	54	26	28
B-1	2.5	CL	Shelby	25.7	86						
	7.5	CL	Shelby	14.0	116				40	18	22
	15	CL	Shelby	26.3	100			99.0	41	20	21
	25	CL	SPT	28.9				88.0	40	20	20

3.3 One-Dimensional Consolidation Tests

To provide data necessary for our settlement analyses, consolidation tests were performed on four representative samples of the fine-grained clay soils encountered at the site. The data obtained from the tests was used to calculate foundation movements which could occur from the anticipated foundation loadings. Based upon data obtained from the consolidation tests, the clay soils tested are moderately over-consolidated and will exhibit moderate strength and moderate to moderately high compressibility characteristics under the anticipated loadings. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

3.4 Laboratory Vane Shear Tests

To determine the undrained shear strength of the soils encountered at the site, laboratory vane shear tests were performed. The results of the tests are tabulated below:

Bore Hole No.	Depth (feet)	Soil Type	In-Situ Moisture Content (percent)	Dry Density (pcf)	Ultimate Shear Strength (psf)
B-1	2.5	CL	25.7	99	4970
B-1	7.5	CL	14.8	114	6520

4.0 GEOLOGIC & SEISMIC CONDITIONS

4.1 Geologic Setting

The subject site is located in the north-central portion of Weber County in north-central Utah. The site sits at an elevation of approximately 4,290 feet above sea level. The site is located in the northeast portion of 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 fresh water 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 relatively fast, by almost 300 feet, 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 subject site is located near the eastern margin of a geologic map of the Plain City, Utah 7.5 minute quadrangle completed by Harty and others[2]. The surficial geology at the site and adjacent properties is mapped by Harty and others (2012) as "Liquefaction-induced (lateral spread) landslide deposits" (Map Unit Qml) dated to be upper Holocene to upper Pleistocene. No fill has been mapped at the location of the site on the geologic map. Unit Qml is described on the referenced geologic map as "Mixture of silt, fine sand, and minor gravel redeposited in flow slides and lateral spreads (the North Ogden landslide complex) as a result of liquefaction during large earthquakes; first identified as a possible lateral spread by Miller (1980); subsequently mapped in northern and eastern parts by Personius (1990) and Nelson and Personius (1990); on the surface, deposits display landslide-related lineaments and scarps, and hummocky topography; disrupted bedding and sand-filled cracks (injection features) are present in the deposits in the subsurface (Harty and Lowe, 2003); largest landslide is a complex landslide of twenty five square kilometers (10 mi^2), of which six square kilometers (2 mi^2) (degraded and modified toe and lower portion) occupies the eastern part of the quadrangle; variable thickness; …based on the presence of subdued hummocky topography, a small, queried lateral-spread landslide is shown on the map near Willard Bay reservoir (NE1/4NW1/4 section 16, T. 7 N., R. 2 W., Salt Lake Base Line and Meridian)." No break-away scarps associated with the lateral spread landslide deposits are mapped on or in the vicinity of the subject site.

The lateral spread landslides at the site and surrounding area were induced by liquefaction of primarily Lake Bonneville sediments during past earthquake events. A liquefaction analysis for the site is included in Section 4.3.3 of this report. The site is not located within a known or mapped potential debris flow, stream flooding, or rock fall hazard area. Refer to the **Geologic Map**, shown below.

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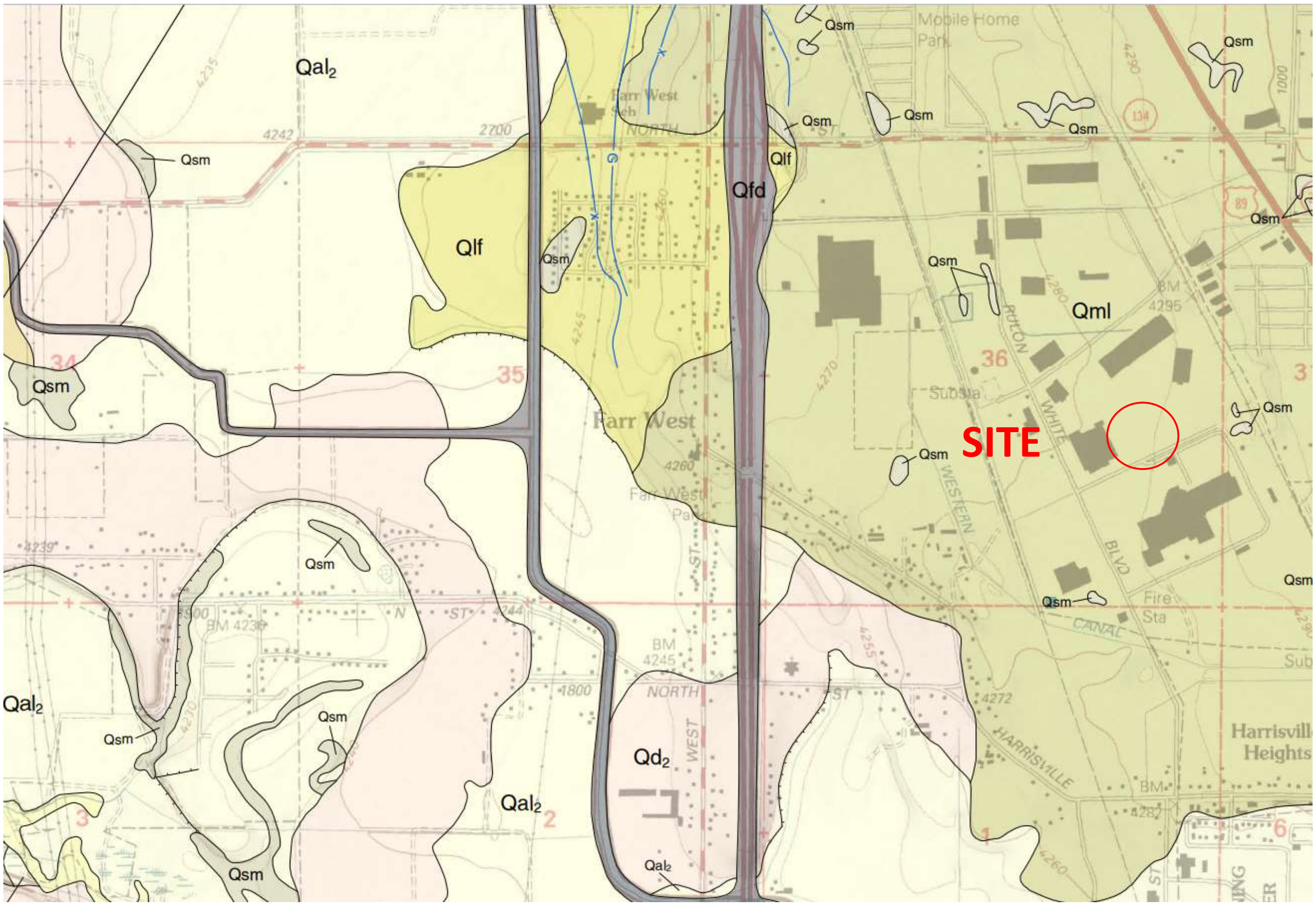
[2] Harty, K.M., Lowe, M., and Kirby, S.M., 2012, Geologic Map of the Plain City Quadrangle, Weber and Box Elder Counties, Utah; Utah Geological Survey Map 253DM, Scale 1:24,000.



Geologic Map

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 fault trace is the Weber section of the Wasatch Fault located about 3.4 miles to the east.

4.3 Seismicity

4.3.1 Site Class

Utah has adopted the International Building Code (IBC) 2015. IBC 2015 determines the seismic hazard for a site based upon 2008 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 2015 (Section 1613.3.2) refers to Chapter 20, Site Classification Procedure for Seismic Design, of ASCE[3] 7. Given the

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[3] American Society of Civil Engineers

subsurface soils encountered at the site, including our projection of soils within the upper 100 feet of the soil profile, it is our opinion the site best fits Site Class D – Stiff Soil Profile, which we recommend for seismic structural design.

4.3.2 Ground Motions

The 2008 USGS mapping utilized by the IBC provides values of peak ground, short period and long period accelerations for the Site Class B boundary and the Maximum Considered Earthquake (MCE). This Site Class B boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground, short period and long period accelerations for the MCE event, and incorporates the appropriate soil correction factor for a Site Class D soil profile at site grid coordinates of 41.29775 degrees north latitude and 112.00901 degrees west longitude:

Spectral Acceleration Value, T	Site Class B Boundary [mapped values] (g)	Site Coefficient	Site Class D [adjusted for site class effects] (g)	Design Values (g)
Peak Ground Acceleration	0.602	F_a = 1.000	0.602	0.401
Short Period Acceleration (0.2 Seconds)	S_S = 1.505	F_a = 1.000	S_{MS} = 1.505	S_{DS} = 1.003
Short Period Acceleration (1.0 Second)	S_1 = 0.521	F_v = 1.500	S_{M1} = 0.782	S_{D1} = 0.521

4.3.3 Liquefaction

The site is located in an area that has been identified by the Utah Earthquake Preparedness Information Center, Utah Division of Comprehensive Emergency Management for Weber County as having "Moderate to High" liquefaction potential. 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.

Subsurface soils encountered to the maximum depth penetrated 31.5 feet, consisted of clay soils with a plastic index greater than 7 percent, typically not liquefiable. These conditions indicate that susceptibility to liquefaction at this site is low.

5.0 SITE CONDITIONS

5.1 Surface Conditions

The target property is located along 2150 North at about 1250 West in Farr West, Utah. The location of the target property is shown on the vicinity map provided above in **Section 1.1** of this report. The target property consists of a vacant, undeveloped, generally rectangular parcel. The property is relatively flat with grass/grain vegetation. Based on aerial photos dated back to 1993 which are readily available on the internet, the site has been vacant and undeveloped since 1993. In the photos from 2016 through 2018 the site appears to be cultivated. The property lies within an industrial/commercial development and is surrounded by commercial/industrial buildings.

5.2 Subsurface Soil and Groundwater Conditions

The subsurface soils conditions were relatively similar across the site. The upper 6 to 8 inches of soil was loose with the top 2 to 4 inches containing major roots/topsoil. Below the topsoil natural soils consisted of lean to fat clays with varying silt and fine sand content as well as occasional silty sand seams and layers up to 6 inches thick extending to the full depth penetrated, 31.5 feet. The natural clay soils were generally medium stiff to stiff and occasionally hard, moist to wet, brown and gray in color and moderately over consolidated. These natural clay soils will exhibit moderate strength and moderate to moderately high compressibility characteristics under static loading. The occasional natural sand soil layers encountered were thin, less than one inch up to about 6 inches thick, moist to wet and brown and gray in color.

For a more descriptive interpretation of subsurface conditions, please refer to the test pit and bore hole logs, **Figures 2 through 13**, 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.

Groundwater was encountered during the field explorations at depth of about 9.5 to 13 feet below the existing ground surface. Groundwater levels can fluctuate as much as 2.0 feet 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, 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

Initial site preparation will consist of the removal of surface vegetation, topsoil, loose/disturbed soils, and any other deleterious materials from beneath an area extending out at least 4 feet from the perimeter of the proposed building and 2 feet beyond pavements and exterior flatwork areas. Vegetation and other deleterious materials should be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

The onsite soils consist of clay with varying moisture contents which may become destabilized under heavy repetitive construction traffic. Under such loading conditions some surface stabilization with large, angular gravel may be necessary to support this traffic.

Subsequent to stripping and prior to the placement of structural site grading fill, pavements, slabs on grade, the prepared subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice.

If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be completely removed. If removal depth required is greater than 2 feet below footings, CMT must be notified to provide further recommendations. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils should be removed to a maximum depth of 2 feet and replaced with compacted granular structural fill.

A representative of CMT must verify that suitable natural soils and proper preparation of existing soils have been encountered/met prior to placing site grading fills, footings, slabs, and pavements.

6.2 Temporary Excavations

Temporary construction excavations in cohesive soil, not exceeding 4 feet in depth and above or below the groundwater table, may be constructed with near-vertical sideslopes. Temporary excavations up to 8 feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical (0.5H:1V). Excavations deeper than 8 feet are not anticipated at the site.

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 8 feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing and dewatering as these soils will tend to flow into the excavation.

To reduce disturbance of the natural soils during excavation, it is recommended 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 all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and 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. Imported structural fill should consist of a Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
Site Grading Fill	Placed over larger 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, and a maximum 40% passing No. 200 sieve.
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.
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 6.5**).

On-site soils encountered consisted primarily of fine-grained clays which were generally moist to very moist. The natural site soils will likely require significant drying prior to re-utilization. Further these soils are inherently more difficult to adequately compact as they are very sensitive to changes in moisture content, and will require very close moisture control during placement and compaction. In addition, smaller lift placement and moderate to high compaction effort will be likely. Re-utilization of the natural soils as structural site grading fill will be very difficult, if not impossible, during wet and cold periods of the year. Therefore, re-utilization of the onsite fine-grained natural soils as structural site grading fill may not be economical or effective for the project schedule.

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[4] T-180) in accordance with the following recommendations:

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[4] 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)	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 8 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[5] requirements.

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

In private utility areas, natural soils may be re-utilized as trench backfill over the bedding layer provided that they are properly moisture prepared and compacted to the minimum requirements stated in Section 6.4 Fill Placement and Compaction.

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[5] American Public Works Association

6.6 Stabilization

The onsite surface clay soils could be susceptible to rutting and pumping particularly during wet periods of the year as well as when within about 18 inches or less above groundwater. To stabilize soft soil conditions, coarse angular gravel and cobble mixtures (stabilizing fill) may be utilized and shall be end-dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment over the surface at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the “fines” are “worked into” the voids in the underlying coarser gravels and cobbles. Utilization of a filter fabric, such as RS280i or equivalent, over soft subgrade may also be advantageous.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, including the maximum loads discussed in **Section 1.3**, the subsurface conditions observed in the field and the laboratory test data, and standard geotechnical engineering practice.

7.1 Foundation Recommendations

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 1/3 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. Spot footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall the footings be established upon non-engineered fills, loose or disturbed soils, topsoil, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with compacted structural fill.

Excavation bottoms should be examined by a CMT geotechnical engineer to confirm that suitable bearing materials soils have been exposed. Where and if the natural clay soils are high in moisture content the exposed footing subgrade may require some stabilization as discussed in section **6.6 Stabilization** of this report.

The width of structural replacement fill below footings should be equal to the width of the footing plus one 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.

7.3 Estimated Settlement

Settlements of foundations designed and installed in accordance with the above criteria and recommendations supporting the loads, as discussed in Section 3, Description of Proposed Construction, can be controlled to within 1 inch or less.

Approximately 40 percent of the quoted settlement should occur 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 should be utilized for natural soils and 0.40 for granular structural fills. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 250 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

8.0 LATERAL EARTH PRESSURES

It is our understanding that the building will be constructed with slab on grade at or near existing grades. However, for shallow retaining/dock height walls or utility boxes up to 4 feet tall the following lateral pressure discussion is provided. Parameters, as presented within this section, are for backfills which will consist of drained granular soil placed and compacted in accordance with the recommendations presented herein.

The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), backfill may be considered equivalent to a fluid with a density of 40 pounds per cubic foot in computing lateral pressures. For more rigid walls (moderately yielding), backfill may be considered equivalent to a fluid with a density of 50 pounds per cubic foot. For very rigid non-yielding walls, granular backfill should be considered equivalent to a fluid with a density of at least 60 pounds per cubic foot. The above values assume that the surface of the soils slope behind the wall is horizontal and that the fill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading of retaining/below-grade walls, the following uniform lateral pressures, in pounds per square foot (psf), should be added based on wall depth and wall case.

Uniform Lateral Pressures			
Wall Height (Feet)	**Active Pressure Case (psf)**	**Moderately Yielding Case (psf)**	**At Rest/Non-Yielding Case (psf)**
4	35	68	10

9.0 FLOOR SLABS

Floor slabs may be established upon suitable, undisturbed, 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, non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In order to facilitate curing of the concrete, we recommend that floor slabs be directly underlain by at least 4 inches of “free-draining” fill, such as “pea” gravel or 3/4-inch quarters to 1-inch minus, clean, gap-graded gravel. Floors established over partial dock height fills comprised of a minimum 6 inches of granular soils with less than 12 percent fines may forgo the 4 inches of free draining fill. To help control normal shrinkage and stress cracking, the floor slabs may include the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation walls and bearing slabs.

10.0 DRAINAGE RECOMMENDATIONS

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

1. All areas around structures should be sloped to provide drainage away from the foundations. Where possible we recommend a minimum slope of 6 inches in the first 10 feet away from 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. Sprinklers should be aimed away and kept at least 4 feet from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.

5. Other precautions may become evident during construction.

11.0 PAVEMENTS

The existing natural clay soils will govern design and are anticipated to exhibit relatively poor pavement support when saturated. Our pavement design is based upon an estimated California Bearing Ratio (CBR) of 3 for the surficial clay soils.

Pavements at the site is anticipated to consist primarily of asphalt paved parking areas adjacent to the building and private access drives. However, for loading/unloading zones and aprons we recommend rigid (Portland cement concrete-PCC) pavements.

Light Duty Parking Areas

(Light to moderate Volume of Automobiles and Light Trucks,
Occasional Medium-Weight Trucks,
No Heavy-Weight Trucks)
[1-4 equivalent 18-kip axle loads per day]

Material	Pavement Section Thickness (in)
Asphalt	**3**
Roadbase	**9**
Total Thickness	**12**

*Subgrade should be proof-rolled and stable

Access Driveway/Aprons
(Moderate Volume of Automobiles and Light Trucks,
Light to moderate Volume of Medium-Weight Trucks,
And Occasional to light volume of Heavy-Weight Trucks)
[up to 15 equivalent 18-kip axle loads per day]

Material	Pavement Section Thickness (in)
Asphalt	**4.5**
Roadbase	**11**
Total Thickness	**15.5**
OR	
Asphalt	**4**
Roadbase	**8**
Subbase	**6**
Total Thickness	**18**
Aprons/Loading Zones	
PCC	**6.5**
Roadbase	**5**
Total Thickness	**11.5**

*Subgrade should be proof-rolled and stable

Untreated base course (UTBC) 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%. Subbase shall have a minimum CBR of 40%. 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, 4.0 inches of aggregate base, over properly prepared suitable natural subgrade or site grading structural fills extending to suitable natural soils. Dumpster pads shall not be constructed overlying non-engineered fills unless heavily reinforced.

These above rigid pavement sections are for non-reinforced Portland cement concrete. Concrete should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

12.0 QUALITY CONTROL

We recommend that CMT be retained to 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 ensure 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.

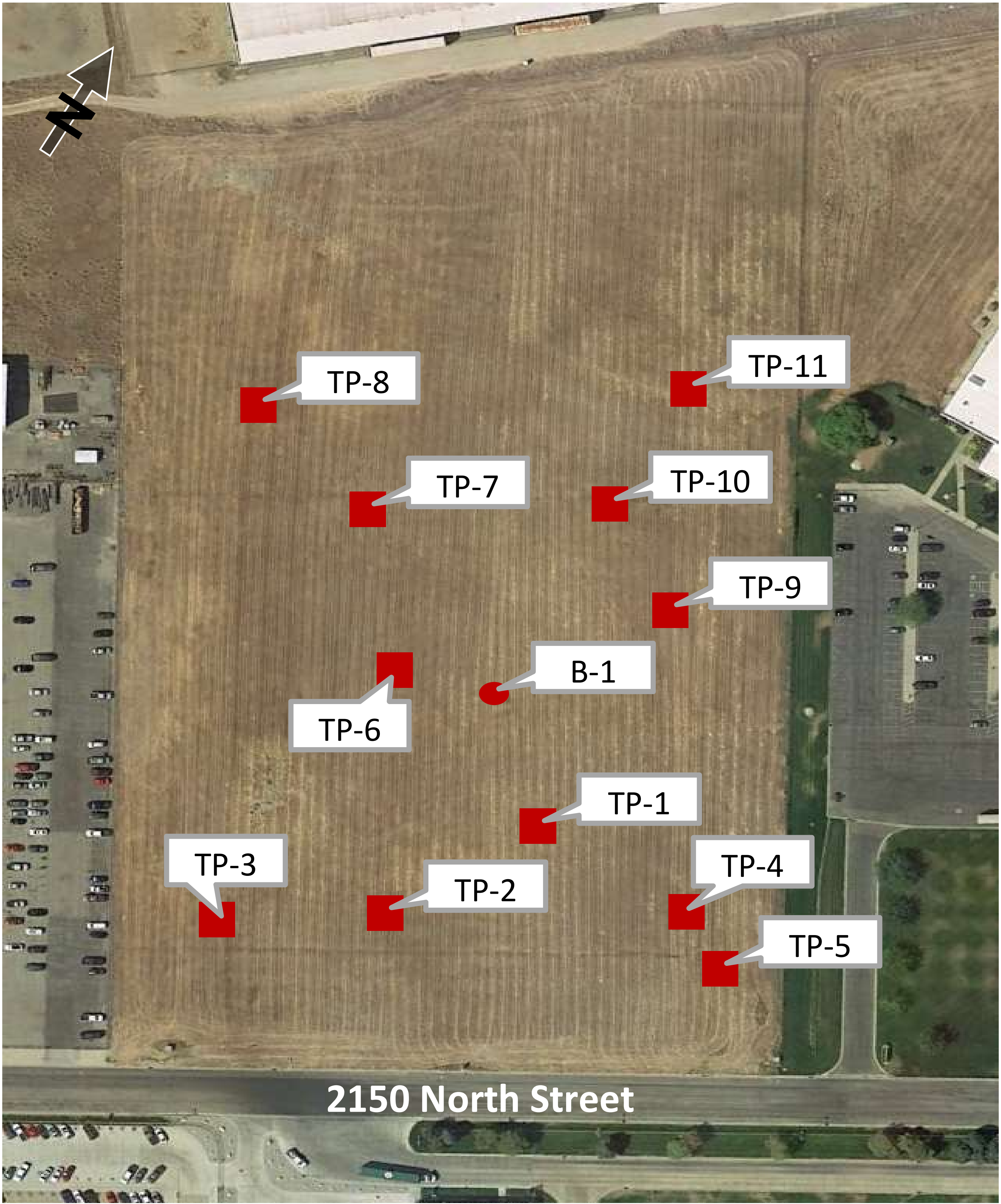
13.0 LIMITATIONS

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) 870-6730. To schedule materials testing, please call (801) 381-5141.

Appendix



Challenger Pallets Building
About 1250 West 2150 North, Farr West, Utah

CMT ENGINEERING LABORATORIES

Site Plan

Date:	15-Apr-19
Job #	12606

Figure:
1

Challenger Pallets Building

Test Pit Log

TP-1

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gravel %	Sand %	Fines %	LL	PL	PI
								Gradation			Atterberg		
0	⁘	TOPSOIL, disturbed native soil											
	▨	Dark Brown Silty CLAY (CL)	moist, very stiff										
2	▨												
	▨			■	9	22.6					50	22	28
4	▨												
6	▨			■	10								
8	▨	grades to brown clay with gray sand lenses	slightly moist, hard										
	▨			■	11	26.5				23.3			
10	▨												
12	▨			■	12								
		END AT 12.5'											
14													
16													
18													
20													
22													
24													
26													
28													

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure:
2

Challenger Pallets Building

Test Pit Log

TP-2

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: 9.5'

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gravation Gravel %	Sand %	Fines %	Atterberg LL	PL	PI
0	⁘	TOPSOIL, disturbed native soil											
	▨	Dark Brown Silty CLAY (CL)	moist, stiff										
2	▨	grades light brown with calcification to 2.5ft	slightly moist										
	▨	grades brown with orange fine sand and light brown silt	moist	◣	13								
4	▨												
6	▨			▮	14	20	98						
8	▨												
▽													
10	⁙	Brown SAND (SM) with silt	wet, medium dense	◣	15								
12	▨	Light Brown CLAY (CL)	wet										
		END AT 12.5'											
14													
16													
18													
20													
22													
24													
26													
28													

Remarks: Groundwater encountered during excavation at depth of 9.5 feet.
Slotted PVC pipe installed to depth of 12.5 feet to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure:
3

Challenger Pallets Building

Test Pit Log

TP-3

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Sand %	Fines %	Atterberg LL	PL	PI
0		TOPSOIL, disturbed native soil											
	▨	Dark Brown Silty CLAY (CL) with trace roots	very moist, stiff										
2	▨	grades to light brown mottled clay	moist										
	▨	Grades Fat CLAY (CH)		■	16	24				98	56	19	37
4	▨												
6	▨			■	17								
8	▨												
	▨			■	18								
10	▨	grades with gray trace sand lenses	slightly moist, very stiff										
12	▨			■	19								
		END AT 12.5'											
14													
16													
18													
20													
22													
24													
26													
28													

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure: 4

Challenger Pallets Building

Test Pit Log

TP-4

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL, disturbed native soil										
	▨	Dark Brown Silty CLAY (CL) moist, stiff										
2	▨	grades to light brown mottled clay										
	▨		■	20								
4	▨											
6	▨		■	21								
8	▨											
	▨	slightly moist, hard	■	22								
10	▨											
12	▨		■	23								
		END AT 12.5'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure:
5

Challenger Pallets Building

Test Pit Log

TP-5

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe	Total Depth: 12.5'	Date: 4/4/19
Surface Elev. (approx):	Water Depth: 12'	Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
								Gravel %	Sand %	Fines %	LL	PL	PI
0	⁖	TOPSOIL, disturbed native soil											
	▨	Brown CLAY (CL) with silt and trace sand	moist, stiff										
2	▨												
	▨	grades with mottling to 7.0ft		◣	24								
4	▨												
6	▨			■	25								
8	▨												
	▨		hard	■	26	21	109						
10	▨												
∇ 12	▨		wet	■	27								
		END AT 12.5'											
14													
16													
18													
20													
22													
24													
26													
28													

Remarks: Groundwater encountered during excavation at depth of 12 feet.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure:
6

Challenger Pallets Building

1250 West 2150 North, Farr West, Utah

Test Pit Log

TP-6

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0	⁘	TOPSOIL, disturbed native soil										
	▨	Dark Brown Silty CLAY (CL) with trace roots moist, stiff										
2	▨											
	▨		■	28	30	84						
4	▨											
	▨	grades brownish gray										
6	▨	grades brown with trace sand seems	■	29								
8	▨											
	▨	very stiff to hard	■	30								
10	▨											
12	▨		■	31								
		END AT 12.5'										
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure:
7

Challenger Pallets Building

Test Pit Log

TP-7

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
								Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL, dark brown											
		Dark Brown/Gray Silty CLAY (CL)	moist, stiff										
2		grades to brown mottled clay with trace sand and silt											
				■	32								
4													
6				■	33	16	110						
		mottling grades out grades with sand seems											
8													
			hard	■	34								
10													
12				■	35								
		END AT 12.5'											
14													
16													
18													
20													
22													
24													
26													
28													

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack

Figure:
8

Challenger Pallets Building

Test Pit Log

TP-8

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 10'
Water Depth: 9.5'

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0	⁘	TOPSOIL											
	▨	Dark Brown Silty CLAY (CL) with trace roots	moist, stiff										
	▨	grades brown to light brown with mottling											
2	▨												
	▨		moist	◢	36								
4	▨												
6	▨			■	37								
	▨	grades to brown clay with sand seems											
8	▨												
	▨		hard	◢	38								
▽	▨		wet										
10		END AT 10'											
12													
14													
16													
18													
20													
22													
24													
26													
28													

Remarks: Groundwater encountered during excavation at depth of 9.5 feet.
Slotted PVC pipe installed to depth of 10 feet to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack

Figure:
9

Challenger Pallets Building

Test Pit Log

TP-9

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):
Total Depth: 10'
Water Depth: (see Remarks)
Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0	⁘	TOPSOIL										
	▨	Dark Brown Silty CLAY (CL) moist, stiff										
2	▨	grades to brown mottled clay to 5.5ft										
	▨		■	39								
4	▨											
6	▨	grades to brown clay with sand seems hard										
	▨		■	40								
8	▨											
	▨		■	41								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure: 10

Challenger Pallets Building

Test Pit Log

TP-10

1250 West 2150 North, Farr West, Utah

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 10'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL										
	▨	Dark Brown Silty CLAY (CL) moist, stiff										
2	▨	grades to brown mottled clay to 7ft										
	▨		■	42								
4	▨											
6	▨	very stiff	■	43								
	▨	grades with gray sand seems hard										
8	▨											
	▨		■	44								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

CMT ENGINEERING LABORATORIES

Excavated By: Todd Nelson
Logged By: Nate Pack
Page: 1 of 1

Figure:
11

Challenger Pallets Building

1250 West 2150 North, Farr West, Utah

Test Pit Log

TP-11

Equipment: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 10'
Water Depth: (see Remarks)

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		TOPSOIL, disturbed native soil										
		Dark Brown Silty CLAY (CL) very moist, soft										
2		Light brown Fat CLAY (CH) very Moist Medium stiff										
			■	45	30.8	84			96	54	26	28
4		grades to light brown mottled clay with trace pinholes to 8ft										
		Brown, mottled Silty CLAY (CL) moist, stiff										
6			■	46	22.5	95						
8		grades to brown mottled clay with no pinholes										
			◣	47								
10		END AT 10'										
12												
14												
16												
18												
20												
22												
24												
26												
28												

Remarks: Groundwater not encountered during excavation.

Excavated By: Todd Nelson
Logged By: Nate Pack

Figure:
12

Challenger Pallets Building

Bore Hole Log

B-1

1250 West 2150 North, Farr West, Utah

Boring Type: Hollow-Stem Auger
Surface Elev. (approx):

Total Depth: 31.5'
Water Depth: 13'

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	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	☒	FILL/Distrubed soils 8 inches													
	▨	Dark Brown Silty CLAY (CL)	moist, soft												
	▨	grades gray													
	▨	grades with mottling		‖	1			25.7	86						
4	▨														
	▨		stiff to very stiff	◣	2	3 5 7	12								
8	▨			‖	3			14	116				40	18	22
	▨	grades brown with sand lenses	hard	◣	4	11 17 27	44								
12	▨														
▽	▨														
	▨		slightly moist	‖	5			26.3	100			99	41	20	21
16	▨														
20	▨	grades with trace sand lenses		◣	6	4 6 7	13								
24	▨														
	▨	grades with some dark gray sand lenses	wet	◣	7	2 3 6	9	28.9				88	40	20	20
28	▨														

Remarks: Groundwater encountered during drilling at depth of 13 feet.

CMT ENGINEERING LABORATORIES

Drilled By: Great Basin Drilling
Logged By: Hogan Wright
Page: 1 of 2

Figure:
13

Challenger Pallets Building

Bore Hole Log

B-1

1250 West 2150 North, Farr West, Utah

Boring Type: Hollow-Stem Auger
Surface Elev. (approx):

Total Depth: 31.5'
Water Depth: 13'

Date: 4/4/19
Job #: 12606

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Blows (N)		Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
						Total			Gravel %	Sand %	Fines %	LL	PL	PI
28	▨													
	▨		◣	8	7 7 7	14								
		END AT 31.5'												
32														
36														
40														
44														
48														
52														
56														

Remarks: Groundwater encountered during drilling at depth of 13 feet.

CMT ENGINEERING LABORATORIES

Drilled By: Great Basin Drilling
Logged By: Hogan Wright

Figure:
13

Challenger Pallets Building

1250 West 2150 North, Farr West, Utah

Key to Symbols

Date: 4/4/19
Job #: 12606

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

COLUMN DESCRIPTIONS

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

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

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

④ **Sample Type:** Type of soil sample collected at depth interval shown; 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 of sample).

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), obtained from lab test results of soil passing the 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, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with
			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
			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 ENGINEERING LABORATORIES

Figure:

14