

July 16, 2021

Mr. Jeremy Krause  
2166 East Wild Pine Drive  
Ogden, Utah 84403

Subject: Geotechnical Consultation  
Proposed Charly's Acres  
About 8450 East 500 South  
Huntsville, Utah  
CMT Project Number: 900090

Mr. Krause:

## **INTRODUCTION**

We understand that plans are to develop the referenced 38.23-acre property for a residential subdivision. Associated roadways are to be paved with asphaltic concrete. It is our understanding that Weber County has requested the minimum pavement section for residential development meeting the following thicknesses:

<b>Material</b>	<b>County Minimum Residential Pavement Section Thickness (inches)</b>
Asphalt	<b>3.0</b>
Road-Base	<b>6.0</b>
4 inch Minus Subbase	<b>8.0</b>
Total Thickness	<b>17.0</b>

CMT has been asked to further evaluate the onsite near surface soils by completing shallow test pits, soil sampling, and subsequent laboratory testing, followed by an engineering design review with respect to anticipated traffic and laboratory soil California Bearing Ratios (CBR) of the recovered near surface soil.

## **ESTIMATED TRAFFIC**

The estimated traffic over the lifetime for the residential roadways is likely to consist of a light to moderate volume of automobiles/light pick-up trucks, up to about 6 daily medium weight delivery trucks (I.E. UPS/FedEx/Amazon etc.), and occasional to one heavy weight trucks per day (I.E., garbage trucks and larger delivery trucks).

Based on this estimated traffic described above, a total daily ESAL of 6 per day was calculated.

## **FIELD EXPLORATION**

On June 18, 2021, CMT personnel arrived on site and visually logged and sampled soils from two shallow test pits extending to depths of about 3.5 feet (test pit TP-1) and 4.0 feet below existing site grades (test pit TP-2). The general location of the test pits is shown on the attached **Figure 1 Site Map**. Further, a graphical representation of the visually logged soils are presented as **Figures 2 and 3 Test Pits**, attached.

At the surface, a layer of topsoil ranging from a few inches to about 12 inches thick was observed. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus, we estimate that topsoil stripping will need to include the upper 4 to 12 inches. However, given the past agricultural uses of the site, the upper 12 to 15 inches may have been disturbed during farming.

Below the topsoil at test pit TP-1, natural soils visually consisted of silty CLAY to about 2 feet below the surface underlain by clayey SILT extending to the full depth penetrated, about 3.5 feet.

Below the topsoil at test pit TP-3, natural soils visually consisted of silty CLAY with sand and minor gravel to about 2.5 feet underlain by clayey SAND and GRAVEL soils extending to the full depth penetrated, about 4.0 feet.

## **LABORATORY TESTING**

### **General**

Bulk soil samples were obtained from the test pits which were subjected to the following laboratory testing:

1. Laboratory Compaction Test, AASHTO T-180, Modified Proctor density
2. California Bearing Ratio, ASTM D-2937, Subgrade support properties

### **Compaction Testing (Laboratory Proctor)**

A bulk sample of the natural Silty CLAY was taken from below the topsoil at test pits TP-1. Similarly, a bulk sample of the natural Clayey SAND and GRAVEL soils was taken from the test pit TP-2. A compaction test and subsequent California Bearing Ratio (CBR) test was performed on each of these two samples. The compaction tests were completed in accordance with the (AASHTO<sup>1</sup> T-180) specifications.

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1 American Association of State Highway and Transportation Officials

Location	Sample Depth (feet)	Unified Soil Classification	Optimum Moisture Content (percent)	Maximum Dry Density (pcf)
TP-1	About 1 to 2 feet	CL	11.7	115.3
TP-2	About 2.5 to 3.5 feet	GC-SC	9.7	126.6

California Bearing Ration (CBR) Test

To determine subgrade characteristics and to provide data for design of pavements, a California Bearing Ratio (CBR) test was performed on each of the two bulk soil sample described above in the section Compaction Testing (laboratory Proctor). The results of the CBR tests are presented in the following table:

Location	Moisture Content at Compaction (%)	Compacted Dry Density (PCF)	Percent Compaction	Percent Swell	Measured CBR (0.1/0.2)
TP-1	11.8	112.1	97.2	1.89	16/18
TP-2	8.8	118.9	94	0.9	35/39

**SUMMARY/RECOMENDATIONS**

Utilizing the lowest CBR test value and assuming some reduction due to potential saturated subgrade soil conditions, the minimum pavement section required by the County, as described above, is more than adequate for the estimated traffic conditions.

Our calculations, indicate that the following recommended minimum pavement section required for the estimated traffic conditions and a reduced CBR value from 16 to 8 percent for in-situ variability in subgrade compaction and moisture:

MATERIAL	PAVEMENT SECTION THICKNESS (inches)
Asphalt	3
Road-Base	8
Subbase	0
Total Thickness	11

Minimal site preparation should consist of removing the topsoil/organics followed by the scarification, moisture conditioning and recompacting the exposed 6 to 8 inches of natural soil to a minimum of 92 percent of the Modified Proctor density (AASHTO T-180/ASTM<sup>2</sup> D1557).

### **CLOSURE**

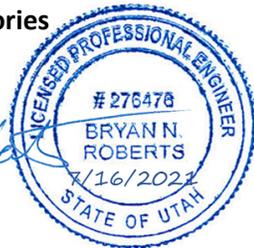
We appreciate the opportunity to provide geotechnical services on your project. Please call with any questions at 801-590-0394.

Sincerely,

**CMT Engineering Laboratories**



Bryan N. Roberts  
Senior Geotechnical Engineer



**Reviewed by:**



Andrew M Harris, P.E.  
Geotechnical Division Manager

**Attachments:**

- Figure 1 Site Map;
- Figures 2 and 3 Test Pit Logs
- Laboratory CBR Test Sheets (2)
- Pavement Calculations

Addressee (email)



500 South Street

### Charly's Acres

About 8450 East 500 South, Huntsville, Utah



### Site Map

Date:	12-Jul-21
Job #	90090

Figure:

# 1

# Huntsville Pavement

Near 8450 East 500 South, Huntsville, Utah

# Test Pit Log

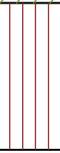
# TP-1

Total Depth: 3.5'

Date: 2/20/17

Water Depth: (see Remarks)

Job #: (enter job #)

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		1' Topsoil										
1		Dark Brown Silty CLAY (CL)	moist, stiff									
2		Reddish-Tan Clayey SILT (ML)	moist, stiff	1								
3				2								
4		END AT 3.5'										
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												

Remarks: Groundwater not encountered during excavation.

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

Equipment: Rubber Tire Backhoe  
Excavated By: Farrer Excavation  
Logged By: Nate Pack

Figure:

# 2

# Huntsville Pavement

Near 8450 East 500 South, Huntsville, Utah

## Test Pit Log

# TP-2

Total Depth: 4'

Date: 2/20/17

Water Depth: (see Remarks)

Job #: (enter job #)

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density (pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		Topsoil, about 12 inches; dark brown silty clay with minor gravel moist, medium dense										
1		Dark Brown Silty CLAY (CL) with sand and minor gravel										
2												
3		Red Brown Clayey fine GRAVEL(GC) with Sand moist, dense										
4		END AT 4'		3								
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												

Remarks: Groundwater not encountered during excavation.

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

Equipment: Rubber Tire Backhoe  
Excavated By: Farrer Excavation  
Logged By: Nate Pack

Figure:

# 3

# Huntsville Pavement

# Key to Symbols

Near 8450 East 500 South, Huntsville, Utah

Date: 2/20/17

Job #: (enter job #)

① Depth (ft)	② GRAPHIC LOG	③ <b>Soil Description</b>	④ Sample Type	⑤ Sample #	⑥ Moisture (%)	⑦ Dry Density(pcf)	Gradation	Atterberg
							⑧ Gravel % Sand % Fines %	⑨ LL PL PI

## 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 **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight of sample).
- ⑦ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).
- ⑧ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.
- ⑨ **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		MODIFIERS	MOISTURE CONTENT
Description	Thickness	Trace	
Seam	Up to ½ inch	<5%	<b>Dry:</b> Absence of moisture, dusty, dry to the touch.
Lense	Up to 12 inches	<b>Some</b>	<b>Moist:</b> Damp / moist to the touch, but no visible water.
Layer	Greater than 12 in.	5-12%	
Occasional	1 or less per foot	<b>With</b>	
Frequent	More than 1 per foot	> 12%	<b>Wet:</b> Visible water, usually soil below groundwater.

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

- ### 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)

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

- The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
- 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.
- The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

Figure:

July 6, 2021  
 Jeremy Krause  
 2166 E. Wild Pine Dr.  
 Ogden, UT 84403

## California Bearing Ratio

ASTM D-1883

Job No: 900090

Date Tested: 6/18/2021

Lab No: 897339

Technician: EV

Project: Charly's Acres

Soil Description: Silty Clay

Proctor Method: T-180      Blows:      56

Location: Existing

Visual Soil Classification:

Dry Density:      112.1      PCF

Proctor Values

Moisture Content as compacted:      11.8      %

Maximum Dry Density (pcf):      115.3

Percent Compaction:      97.2      %

Optimum Moisture (%):      11.7

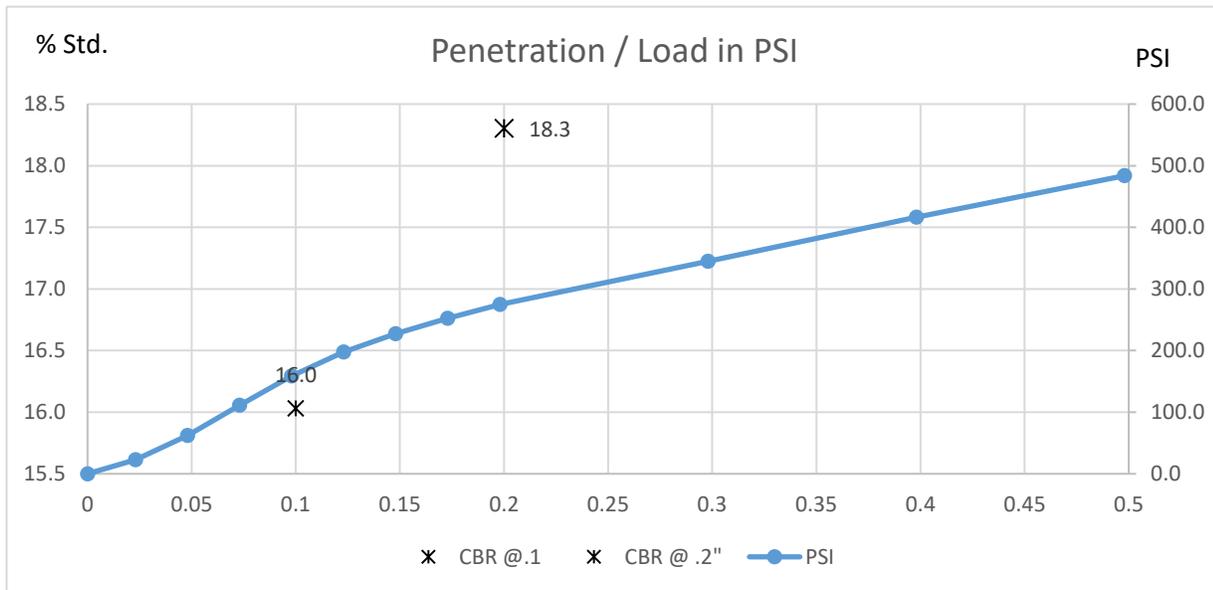
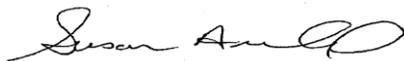
Surcharge (lbs.):      10      Lbs.

Immersion duration:      96      hrs.

### CBR Test Results

CBR Value@ 0.1":      **16**      %  
 CBR Value@ 0.2":      **18**      %

Percent Swell:      **1.89%**

Manager

July 6, 2021  
 Jeremy Krause  
 2166 E. Wild Pine Dr.  
 Ogden, UT 84403

## California Bearing Ratio

ASTM D-1883

Job No: 900090

Date Tested: 6/18/2021

Lab No: 897339

Technician: EV

Project: Charly's Acres

Soil Description: Silty Clayey Sand with Gravel

Proctor Method: T-180      Blows:      56

Location: Existing

Visual Soil Classification:

Dry Density:      118.9      PCF

Proctor Values

Moisture Content as compacted:      8.8      %

Maximum Dry Density (pcf):      126.6

Percent Compaction:      93.9      %

Optimum Moisture (%):      9.7

Surcharge (lbs.):      10      Lbs.

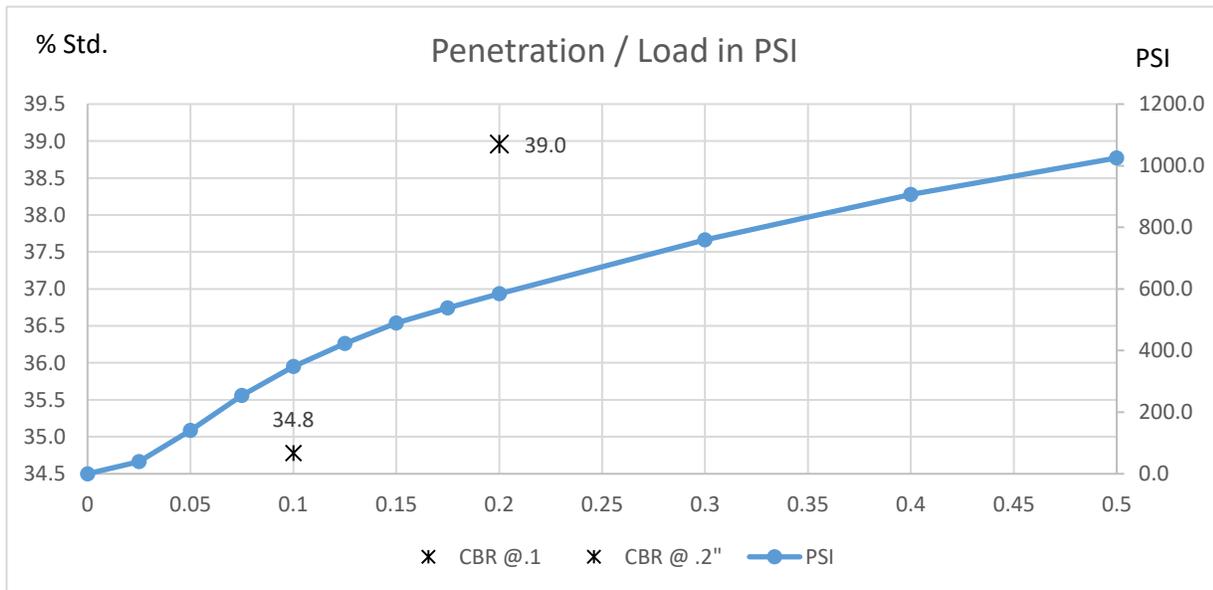
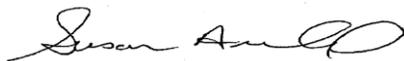
Immersion duration:      96      hrs.

### CBR Test Results

CBR Value@ 0.1":      **35**      %

Percent Swell:      **0.89%**

CBR Value@ 0.2":      **39**      %

Manager

CMT Form 302

Rev 5-01-19