

March 12, 2020

Mr. Luke Berman
Big Canyon Homes
791 North 100 East
Lehi, Utah 84003

RE: Geotechnical Recommendations
Huntsville Lot
407 South 8600 East
Huntsville, Utah
CMT Job No. 9672

Mr. Berman,

As requested and authorized, this letter presents geotechnical recommendations for the subject site located at about 407 South 8600 East in Huntsville, Utah. Based on our field exploration and experience in the site vicinity, it is our opinion the site is suitable for the proposed construction.

Field Exploration

The subsurface soil conditions were explored by excavating two test pits on the site at the approximate locations shown on **Site Map, Figure 1** (attached). The test pits extended to depths of approximately 10 to 11 feet below the existing ground surface. The subsurface soils encountered in the test pits were logged and described in general accordance with ASTM D 2488. The subsurface conditions encountered in the field exploration are discussed below. Logs of the test pits, including a description of the soil strata encountered, is presented on each individual **Test Pit Log, Figures 2 and 3**. A **Key to Symbols** sheet defining the terms and symbols used on the logs is provided as **Figure 4**, attached.

Subsurface Conditions

At the test pit locations we encountered approximately 6 inches of topsoil containing roots and organic material at the surface. Natural soils were encountered below the topsoil consisting of moist, stiff (estimated), brown Silty CLAY with sand (CL) overlying brown Sandy SILT (ML) and Sandy GRAVEL with silt (GP-GM), extending to the maximum depths explored of 10 to 11 feet below the existing ground surface. Groundwater was not encountered in the test pits and is not anticipated to affect construction. For a detailed description of the soil profile encountered in our exploration, see the Test Pit Logs (Figures 2 and 3), attached.

Earthwork Recommendations

All deleterious materials should be stripped from the site prior to commencement of construction activities. This includes loose and disturbed soils, topsoil/organic soils, vegetation, etc. Based upon the conditions observed in the test pits there is topsoil/organic soils on the surface of the site extending to a depth of about 6 inches below the existing ground surface. We estimate that topsoil stripping will need to include the upper 6 inches except in local areas where roots/organics may extend deeper.

Huntsville Lot, Huntsville, Utah
 CMT Project No. 12366

The exploratory test pits dug as part of our explorations will likely contain loose and disturbed soils and possibly vegetation. If these conditions are encountered in excavations, the loose and disturbed soils should be removed and replaced with structural fill.

For temporary excavations less than 5 feet deep, either in the native soils or structural fill, slopes should not be steeper than 0.5:1 (horizontal to vertical). Deeper excavations are not anticipated. If loose sandy soils and/or groundwater are encountered, flatter slopes, shoring, bracing, and/or dewatering may be required for all conditions. All excavations should be made following OSHA safety guidelines.

Imported structural fill should consist of well-graded sandy gravel material with a maximum 20% passing the #200 sieve, a minimum 70% passing the 3/4-inch sieve, a maximum particle size of 4 inches, and a maximum plasticity index of 10. The on-site sandy gravel soils appear suitable for use as structural fill if larger particles are removed/screened.

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:

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	95
Site grading fill outside area defined above	0 to 5	92
Utility trenches within structural areas	--	96
Roadbase and subbase	-	96
Non-structural fill	0 to 5	90

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.

Foundation Recommendations

We recommend that footings be constructed on suitable undisturbed natural soils or on structural/ engineered fill which extends to natural soils. Footings may then be designed using a net bearing pressure of 2,000 psf. 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.

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that settlement of footings founded as recommended above will be 1 inch or less. We expect approximately 50 percent of this settlement to take place during construction.

Seismic Recommendations

There are no faults that are mapped crossing or projecting toward the subject site. The nearest mapped fault trace is the Weber segment of the Wasatch fault, located approximately 9.7 miles west of the site.

The 2014 USGS mapping utilized by the IBC provides values of peak ground, short period and long period accelerations for the Site Class B/C 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 Seismic Design Categories in the International Residential Code (IRC 2018 Table R301.2.2.1.1) are based upon the Site Class as addressed in the previous section. For Site Class D at site grid coordinates of 41.2573 degrees north latitude and -111.7434 degrees west longitude, S_{Ds} is 0.617 and the **Seismic Design Category** is D₀.

Drainage Recommendations

The International Residential Code recommends that drains be provided around “foundations that retain earth and enclose habitable or usable space below grade.” An exception is allowed if the foundation is installed on “well drained” ground consisting of Group 1 soils. These soils include those defined by the Unified Soil Classification System as GW, GP, GM, SW, SP and SM. The natural soils below depths of about 2 to 6 feet consist of Group 1 soils (GP-GM). Thus, it is our opinion that foundation drains are not needed.

Limitations/Closure

The recommendations provided herein were developed by evaluating the information obtained from the test pit and site exploration. Soil and groundwater 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.


Geotechnical Engineering Recommendations

Huntsville Lot, Huntsville, Utah
CMT Project No. 12366

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.

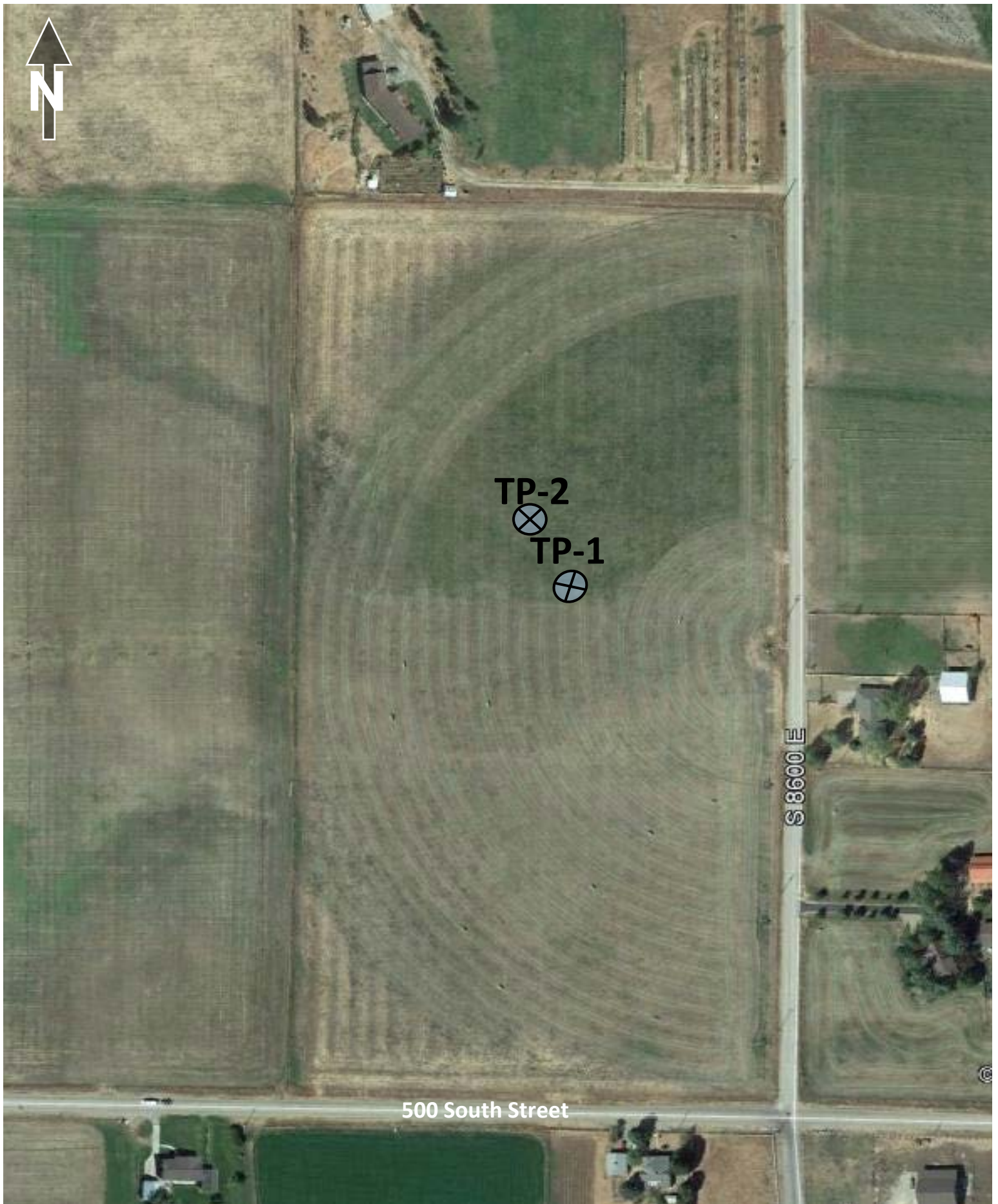
If you have any questions, please call.

Sincerely,
CMT Engineering Laboratories



William G. Turner, P.E.
Senior Geotechnical Engineer

Encl: Figure 1, Site Map
Figures 2-3, Test Pit Log
Figure 4, Key to Symbols



Huntsville Lot

407 South 8600 East, Huntsville, Utah

CMTENGINEERING
LABORATORIES

Site Map

Date: 6-Mar-20
Job # 12366

Figure:

1

Huntsville Lot

407 South 8600 East, Huntsville, Utah

Test Pit Log

TP-1

Equipment: Trackhoe
Surface Elev. (approx):

Total Depth: 11'
Water Depth: (see Remarks)

Date: 2/18/20
Job #: 12366

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL										
1		Brown Silty Clay with sand (CL) moist, stiff (estimated)										
2		Brown Sandy GRAVEL with silt (GP-GM), some cobble dry to slightly moist, medium dense (estimated)										
3				1								
4												
5												
6												
7												
8				2								
9												
10												
11		END AT 11'										
12												
13												
14												

Remarks: Groundwater not encountered during excavation.

Figure:

Huntsville Lot

Test Pit Log

TP-2

407 South 8600 East, Huntsville, Utah

Equipment: Trackhoe
Surface Elev. (approx):

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

Date: 2/18/20
Job #: 12366

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		TOPSOIL										
1		Brown Silty Clay with sand (CL) moist, stiff (estimated)										
2		Brown Fine Sandy SILT (ML), trace gravel moist, stiff (estimated)										
3				3	11				52			
4												
5												
6		Brown Sandy GRAVEL with silt (GP-GM), some cobble dry to slightly moist, medium dense (estimated)										
7				4	3				9			
8												
9												
10		END AT 10'										
11												
12												
13												
14												

Remarks: Groundwater not encountered during excavation.

Figure:

Huntsville Lot

Key to Symbols

407 South 8600 East, Huntsville, Utah

Date: 2/18/20

Job #: 12366

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density (pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	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	Dry: Absence of moisture, dusty, dry to the touch.
Seam	Up to ½ inch	<5%	Moist: Damp / moist to the touch, but no visible water.
Lense	Up to 12 inches	Some	
Layer	Greater than 12 in.	5-12%	Saturated: Visible water, usually soil below groundwater.
Occasional	1 or less per foot	With	
Frequent	More than 1 per foot	> 12%	

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)	MAJOR DIVISIONS		USCS SYMBOLS	②	TYPICAL DESCRIPTIONS	SAMPLER SYMBOLS		
	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
GRAVELS WITH FINES (≥ 12% fines)			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines				
SANDS The coarse fraction passing through No. 4 sieve.			CLEAN SANDS (< 5% fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures			
				GC	Clayey Gravels, Gravel-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%	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines		
				SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines		
				SM		Silty Sands, Sand-Silt Mixtures		
		SILTS AND CLAYS Liquid Limit greater than 50%	SANDS WITH FINES (≥ 12% fines)	SANDS WITH FINES (≥ 12% fines)	SC		Clayey Sands, Sand-Clay Mixtures	
					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	
HIGHLY ORGANIC SOILS	SILTS AND CLAYS Liquid Limit greater than 50%	SANDS WITH FINES (≥ 12% fines)	PT		OL	Organic Silts and Organic Silty Clays of Low Plasticity		
					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		
					PT	Peat, Soils with High Organic Contents		

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.