APPLIED
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June 04, 2020
Project No. 125-485-20

Mr. Keith Parson
PO Box 34912
Reno, Nevada 89533-4912

Re: Geotechnical Engineering Services
Proposed Parson Commercial Metal Shop Building Parcel
23 PPF Way (APN: 016-424-06)
Mound House (Lyon County), Nevada

Dear Mr. Parson:

This letter presents the results of our Geotechnical Engineering Services we provided during the subsurface soil review for the proposed Parson Commercial Metal Shop Building Parcel to be located on 23 PPF Way (APN: 016-424-06) in Mound House (Lyon County), Nevada.

The proposed metal building is planned to be 6,000 square feet (50- feet wide by 120- feet long) with a 22- foot high eave height and is assumed to have typical foundation and wall loadings. A concrete mass block retaining wall approximately 200- feet long is to be placed adjacent to the western property line to assist in controlling the storm water precipitation runoff from the adjoining western property and improving site drainage from the metal building. We understand that the Commercial Parcel is 0.66 acres in size and was graded along with the surrounding properties during the mass grading of the Diamondback Parcels, Phase 2 - Lot 30. Block C development. A site plan has been attached showing the commercial parcel including the building and test pit locations.

Our scope of services was to provide a cursory site review of the subsoils exposed within four (4) shallow tests pits excavated within the vicinity of the building's corners and adjacent to the western property line to provide recommendations for the commercial building's site foundation system, including footing grade soil preparation and the concrete mass block retaining wall. The exposed soils within the test pits indicted that the entire building location and the majority of the commercial parcel's surface soils, including the western slope, consisted of the native cut dense granular sands (hardpan) with gravels and cobbles. The southeastern pad corner appears to be in fill materials placed during the mass grading operations and consists of clayey sands and sandy clays which would be considered the typical native surface soil horizon. Site grading of the parcel is assumed to be minimal with footing and slab-on-grade elevations bearing onto the medium dense to dense granular sands.

The project is located in Mound House east of Carson City, which is within the eastern portion of Eagle Valley and the western portion of the Great Basin Geomorphic Province. Eagle Valley is a structural basin bounded to the west by Carson Range (a spur of the Sierra Nevada Mountains), to the north by the Virginia Range and to the east by the Pine Nut Mountains. To the south, an alluvial divide separates Eagle Valley from Carson Valley.

The property is identified to be within valley sediments consisting of a majority of Quaternary aged older pediment gravel comprised of grayish orange to dark yellow-brown small cobble to muddy sandy pebble gravel and minor very poorly sorted bouldery cobble gravel. The Geology Map of the Carson City 30X60 Minute Quadrangle, Nevada by John H. Stewart, 1999.

The Soil Conservation Service – Soil Survey of Lyon County Area Nevada indicates that the soils within the vicinity of the subject parcel is within Soil Map Unit #572 (Reno Cobbly Sandy Loam). The map units indicate slow percolation infiltration rates and expansive clays for the upper 2- feet of the in-situ soils which are in turn underlain by granular hardpan. The hardpan is considered to be rippable with heavy equipment and the suitability of the hardpan soils for infiltration disposal can be improved by ripping the exposed hardpan layer to increase the in-place permeability. Typical native soils in the vicinity of the commercial parcel consist of 1- to 2- feet of expansive clays underlain by clayey sands and granular hardpan.

Early to mid- Pleistocene aged fault lineaments (approximately 100,000- to 1.8 m.y. old) are mapped east of the proposed commercial parcel. The locations of these fault lineaments are dashed or dotted and queried indicating that their presence is uncertain or concealed with young alluvial deposits or that their locations are approximated. Indeterminate/predominately bedrock faults with last probable movement of pre-Pleistocene age are located to the north and west. These faults are considered potentially active since their most recent occurrence is between 100,000 to 1.8 million years ago. No evidence of highly active Holocene Age (<10,000 years) faults were found to transect our exploratory pits or the proposed parcel. The Earthquake Hazard Map for the parcel by John W. Bell and Dennis Trexler, 1979.

We would recommend that the structural seismic design be evaluated in accordance with the 2018 International Building Code (IBC) as adopted by the Lyon County Building Department. The following Site Specific OSHPD (Office of Statewide Health Planning and Development) IAW the Structural Engineers Association of California (SEAOC) Geotechnical Seismic Design Parameters should be utilized for the site profile classification of a Site Class C soil with a Risk Category of II. A Seismic Source Type B may be assumed for the site.

IBC SEISMIC DESIGN PARAMETERS

Parameter	Factors	IBC Reference
Site Class	C	ASCE7-16
Spectral Acceleration	$S_S = 1.861$ $S_1 = 0.662$	
Seismic Coefficient, F_a	$F_a = 1.2$	
Seismic Coefficient, F_v	$F_v = 1.4$ See Project Structural Engineer's Design Parameters	
Spectral Response Acceleration Parameter	$S_{MS} = 2.231$ ($S_{M1} = 0.926$) See Project Structural Engineer's Design Parameters	
Design Special Response Acceleration Parameter	$S_{DS} = 1.489$ ($S_{D1} = 0.618$) See Project Structural Engineer's Design Parameters	

The subsurface soils exposed after the required grading operations should be maintained at approximate optimum in-place moisture content and compacted to at least 90 percent (%) relative of the maximum laboratory dry density (as determined by ASTM D-1557). If excessive moisture contents exist within the exposed soils, which prohibit obtaining acceptable in-place relative compaction, these soils may require to be scarified and allowed to dry prior to recompaction.

All structural fill materials shall be approved by our office and conform to the following gradation and plasticity specifications:

Sieve Size	**Percent Passing – By Weight**
4-inch	100
¾-inch	70-100
No. 4	45-75
No. 40	15-50
No. 200	5-20
Liquid Limit	12 Maximum
Plasticity Index	6 Maximum

The majority of the subsurface soils encountered (excluding the expansive clays) meet the intent of the structural fill gradation requirements and are recommended for use as structural fill materials. All native and import fill materials shall be reviewed by our office to verify compliance with the before-mentioned requirements prior to being brought on-site for placement. The above listed gradation requirements are intended to be a guideline of readily available materials. These guidelines can be adjusted to allow for the use of other proposed structural fill materials pending review of grading contractors intended fill placement methodology and type of compaction equipment. Any adjustments to the structural fill material requirements, must be approved by our office prior to importing or utilizing the proposed fill material.

Following acceptable preparation of the subsoils, the approved structural fill soils shall be evenly placed in 6- to 8- inch loose lifts. During placement, they should be properly moisture conditioned to within 2% of the approximate optimum moisture content and compacted to not less than 90% relative of the maximum laboratory density (ASTM D-1557 test procedure) up to approximate footing grade, slab-on-grade or pavement subgrade. All other structural fill, stemwell or utility trench backfill should be compacted to not less than 90% relative compaction. All proposed backfill soils should be approved prior to placement on-site.

The concrete slab-on-grade should be supported by at least six (6) inches of Type 2, Class B Aggregate Base which has been densified to at least 95% relative compaction. We are assuming that that the Portland cement concrete slab thickness would be six (6-) inches supported by at least 6- inches of acceptable aggregate base materials placed above acceptable prepared subgrade elevations. We are assuming a Modulus of Subgrade Reaction (K-value) of 250 pounds per cubic inch for the design of the Portland cement slab-on-grade.

If the above site specific recommendations are followed, we believe that the proposed structure can be supported by conventional spread footings designed for a maximum allowable bearing pressure of 1,500 pounds per square foot. A one-third increase in allowable bearing pressure may also be used for short duration loads, such as wind or seismic. The spread footing should also be a minimum twenty-four (24) inches below adjacent finished grade for frost depth protection. Total anticipated settlements utilizing the allowable bearing pressures should be on the order of 3/4- of an inch. Differential settlements between similarly loaded and dimensioned footing should not exceed two-thirds of the total anticipated settlements. Bearing capacities for the concrete mass block footings or walls can be supported by conventional spread footings designed for a maximum allowable bearing pressure of 1,500 pounds per square foot. The lower concrete mass block should be excavated into the granular hardpan to provide passive earth pressures on the eastern lower block face to assist in resisting the horizontal soil lateral forces

Lateral loads may be resisted by friction between the footing base and supporting soils and lateral bearing pressure against the sides of the footings. For design purposes, a coefficient of friction of 0.40 and active and passive equivalent fluid pressures of 35 and 350 pounds per cubic foot per foot of depth unrestricted and 500 pounds per cubic foot of depth top restricted are applicable. These values do not include any additional surcharge loading due to construction traffic or operational uses such as forklift, storage racks or general floor loads. If the structural design makes use of passive earth pressures, it is important that representative of this office be present during the placement of any backfill against footings to observe the placement and test the backfill.

Our firm should be allowed to provide field quality control services during construction to confirm that our recommendations are correct. Our office should also be immediately notified of variations in soil conditions, such as buried debris or unexpected items, are encountered, during site grading for the single family residence so that we may have the opportunity to determine if our recommendations as presented herein are valid or require to be re-evaluated.

This geotechnical report is not intended for use as a bid document. Any person or firm involved prior to or during the construction of this project should perform all necessary independent investigations to satisfy themselves as to the subsurface conditions, the earth work requirements, or the required procedures to be utilized in successfully completing the proposed single family residence structure including de-watering practices, if required.

We trust this provides the information needed at this time. However, if you require additional information or have any further questions, please contact our office at your earliest convenience.

Sincerely,

Gary L. Hopper, P.E.
Principal Engineer

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