MEMORANDUM

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TO:	Eric Galley, Olsson Associates
FROM:	Tim Jensen, P.E., Olsson Associates Edward Schnackenberg P.E., Olsson Associates
RE:	Geotechnical Design Memo – City Centre – Lot 15
DATE:	1/20/2017
PROJECT #:	016-0546

BUILDING PAD LOCATION AND PROJECT DESCRIPTION

This memo provides additional deign recommendations specific to the proposed building located on Lot 15 within the City Centre development in La Vista, Nebraska. Olsson understands the proposed building is a 6-story structure consisting of 4 stories of residential space over 2 levels of retail and parking. The building will be a slab on grade structure. As planned, the lower 2 levels will be constructed from concrete and steel while the upper 4 floors will utilize either wood or light gauge steel framing. The building will wrap around the north and west sides of a future 2-story parking garage on Lot 17.

The structural building loads provided by Mr. Troy Nissen of TD2 indicated a maximum column load of 400 kips and a maximum wall load of 12k/ft. Finish floor elevations for this structure are anticipated to range from 1125 feet in the south wing and step down across the building to 1122 feet in the east wing. Exposed or below grade foundations are anticipated to be less than 1 foot where the building steps in FFE. The existing grades across Lot 15 range from about 1123 feet near the east corner to 1127 feet near the south corner. Up to 4 feet of cut and minimal new fill are anticipated across Lot 15.

This memo was prepared under the direct supervision of a Professional Engineer registered in the State of Nebraska with the firm of Olsson Associates (Olsson). The conclusions and recommendations contained herein are based on generally accepted, professional, geotechnical engineering practices at the time of this report, within this geographic area. The recommendations provided in this geotechnical design memo should be used in conjunction with

the recommendations provided in Olsson Associate's Report of Geotechnical Exploration titled La Vista City Centre Project and dated September 9, 2016.

GEOTECHNICAL DESIGN CONSIDERATIONS

Old fill materials were documented in both soil borings complete completed near Lot 15. Boring B-5 encountered old fill to elevation 1120 feet and boring B-6 encountered old fill to elevation 1112 feet. The old fill was documented to have varying moisture contents, dry densities, and strengths across the building lot. When constructing over undocumented, suspect old fill materials, there is an increased risk of variable settlement and building movement associated with the unknowns and variability within the old fill materials. Undocumented old fill is generally recommended to be identified, completed removed, and replaced with compacted structural fill in accordance with the recommendations of Olsson's geotechnical report. The old fill materials can typically be reused as structural fill in other areas of the site after the soils have been moisture conditioned and compacted to the project specifications. Given the variable depths of the old fill materials, complete removal and replacement is not generally recommended or cost effective. In these situations, the use of an intermediate foundation system such as rammed aggregate stone columns (Geopiers) or vibro-replacement stone columns can provide improvement to the existing undocumented fill materials. This allows the suspect fill materials to remain in place, becoming densified during the stone column installation process. For this situation, ground improvement can typically be completed for less cost than overexcavation and replacement and can also provide increased allowable soil bearing pressures to reduce the overall sizes of the conventional spread foundations supported by the stone columns.

INTERMEDIATE FOUNDATION DESIGN

The building on Lot 15 is recommended to be supported by an intermediate foundation system to increase the allowable soil bearing capacity and reduce overall building settlement. The design of a specific stone column system is proprietary and typically completed by the installing or specialty contractor. The intermediate foundation contractor should design the stone column diameter, spacing, depths, and aggregate properties of the foundation system. At a minimum, the stone column foundations should be designed to limit total settlement to 1-inch and differential settlement to ½-inch. The applicable net allowable soil bearing pressure for shallow spread foundations will be determined by the specialty contractor after review of the building loads and FFE's. Based on local experience with similar projects, allowable soil bearing pressures ranging from 3,500 to 5,000 psf can typically be achieved for shallow foundations supported by a stone

column system. Contact information is provided below for stone column installers/designers familiar with the soils in the Omaha area and the specific details regarding this project site.

Company	Contact	Phone Number	Email Address
Subsurface Constructors	Lyle Simonton	(315) 421-2460	lsimonton@subsurfaceconstructors.com
Ground Improvement Engineering	Deanna Baker	(402) 651-1673	dbaker@groundimprovementeng.com

The intermediate foundation system should include the total costs associated with design, mobilization, installation, demobilization, and removal or disposal of spoils, as necessary. To establish a final cost estimate for the stone column design, the installer will typically require the final site and grading plans, the original geotechnical report, this design memo, and the applicable foundation plans.

Footings should have minimum dimensions in accordance with local building codes. Olsson recommends minimum dimensions of 16 inches for continuous footings and 30 inches for isolated column footings to minimize the potential for localized bearing failure. Footings in unheated areas should bear at a minimum depth of 42 inches below the lowest adjacent final ground surface. Interior footings in heated areas can bear at a depth as shallow as required below floor slabs.

SEISMIC CLASSIFICATION - SOIL PROFILE

According to the International Building Code (IBC), soils within the upper 100 feet determine the seismic structural design criteria for the project site. Based on the soils encountered in the test borings and our experience with the local geology, Olsson estimated the soil properties below the deepest boring to a depth of 100 feet. The soil shear strengths and N values were estimated based on the results of the laboratory testing program and the assumed soil properties on undocumented soils below the lowest boring. For this project site, we recommend the use of Site Class D (Stiff Soil) in accordance with Table 20.3-1 Site Classifications in ASCE 7-10 as referenced within the 2012 IBC.

LIMITATIONS

The conclusions and recommendations presented in this memo are based on the information available regarding the proposed construction, the results obtained from our soil test borings and sampling procedures, the results of the laboratory testing program, and our experience with similar projects. The soil test borings represent a very small statistical sampling of subsurface soils and it is possible that conditions may be encountered during construction that are substantially different from those indicated by the soil test borings. In these instances, adjustments to design and construction may be necessary. This memo is based on the information provided to Olsson Associates and our understanding of the project as noted in this report. Olsson's Geotechnical engineer may alter the recommendation of this memo at any time depending on the actual field conditions encountered during earthwork or construction.

Respectfully Submitted,

Tim Jensen, P.E.
Geotechnical Engineer

Reviewed by,

Edward Schnackenberg, P.E.
Geotechnical Engineer

ATTACHMENTS

None

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