November 10, 2016 Project # DMR-141

MEMORANDUM

To: Potential Bidders

From: Louis Zuegner

Ref: Preliminary Geotechnical Engineering Report

Summary

A Preliminary Geotechnical investigation was performed on the property known as Lot C in order to provide guidance on means and costs for potential future redevelopment. The result of this investigation determined that an unsuitable layer of soils extends to approximately 25', and that bedrock is greater than 50' deep. It is probable that the foundation for any new structure would need to be supported by piles. Once specifics for a proposed building are known (footprint, height, loading), supplementary investigations would be necessary to further pinpoint a specific foundation design and costs.

Property & Region

The property is a 4.2 acre site owned by the City of Hackensack, and is identified as Parking Area 'C' being Block 308.01, Lot 3 on the tax assessment maps. Based on past knowledge of the area and published data, there is a significant change in subsurface conditions as one moves further from the river. While it cannot be considered conclusive information, common knowledge suggests that bedrock nearest the river can be as deep as 150', with bedrock on our property likely in the 100' depth range, and then bedrock rapidly shallowing and being near or at the surface once west of Main Street.

The published soils and geologic information also indicates that this site lies near the boundary of two distinctly different soil areas, describing the area as:

> *Marine tidal marsh soils which are characterized by deep deposits of very soft and highly compressible silts and clays with a significant amount of organic material at or near the surface are present along the Hackensack River to the east of the site. Glacial stratified drift deposits attributed to the most recent Wisconsin glacier and characterized by silts and silty sands with a significant amount of gravel are present to the west of the site. Due to the urban nature of the site, fill material of unknown composition and thickness may be present over the tidal marsh and/or drift soils. The underlying bedrock at this site is identified as sandstone and/or shale of the Brunswick formation. The depth to bedrock may be on the order of 100 feet in the tidal marsh soil area and 10 to 20 feet in the glacial stratified drift area.*

Investigation & Conclusions

In March of 2014, SOR Consulting Engineers performed a preliminary subsurface investigation. Four (4) borings were conducted, ranging from 27 ft. to 47 ft. in depth where each showed similar engineering properties. Due to the variable composition and relative density of the existing fill on site, it was determined that the upper soil layer is unsuitable to support new structures, therefore driven piles are recommended in the conclusion.

The preliminary investigation intended for one boring to be deep but not to exceed 50 ft. as the required permit from the state was not obtained. These borings were sufficient to draw preliminary conclusions.

The nature and intent of any redevelopment is not yet known. However, making certain assumptions, such as the assumption that the proposed buildings will be low rise apartments or similar buildings, it is likely that timber piles would be the most cost effective solution for supporting a structure. This method would allow the existing fill and underlying peat and organic silt to remain in place. Building foundations and floor slabs would be supported on a system of driven piles that extend through the existing unsuitable bearing materials to derive their support from the underlying natural stiff silt and clay. Timber piles driven to depths of 35 to 45 ft. would be appropriate for support of light to moderate loads. These piles deriving frictional support from the natural silt and clay soils would have typical ultimate capacities on the order of 20 to 25 tons. Pile capacities would have to be reduced by an estimated 5 to 10 tons due to the effects of downdrag.

If proposed development is intended to be a mid or high rise structure, greater capacity piles will be needed, such as higher capacity steel pipe or H-piles. These would be feasible if supported on the bedrock below the overburden soils. Deep piles supported on the underlying competent bedrock could typically achieve capacities on the order of 100 tons. Additional deep borings would be required to further define the bearing materials and evaluate design pile capacities. Once specifics for a proposed building are known (footprint, height, loading), supplementary investigations would be necessary to further pinpoint a specific foundation design and costs. Note that IBC will require a minimum of one boring per 2,500 SF of building footprint.