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January 4, 2010

Neringa Design Architects
105 W. Merchant Street
New Buffalo, MI 49117

Attn: Ms. Neringa Peseckas

RE: GEOTECHNICAL REPORT
NEW BUFFALO TOWNSHIP LIBRARY PROJECT

Dear Ms. Peseckas:

We have completed the work as described in Option 2 of our proposal dated November 23, 2009. Following is a description of the work completed along with our recommendations for the proposed development.

1.0 BACKGROUND INFORMATION

The firm of Wightman Environmental, Inc. (WEI) was retained to perform a geotechnical investigation for the development of a building addition with a full basement to the existing New Buffalo Township Library building and related site and parking improvements located at 33 N. Thompson Street in the city of New Buffalo. The following activities were completed as part of this project.

- Installed three soil borings across the property with a truck mounted hollow-stem auger drill rig. The soil borings were installed in the locations as provided to us, except Soil Boring Number 1 (SB-1)was moved to the northeastern corner of the existing building due to utility conflicts. The soil borings were installed to a depth of 30-feet below ground surface (bgs) and soil samples were collected at 2.5-foot intervals to a depth of 10-feet, and at 5-foot intervals thereafter. Soil samples were obtained by the Standard Penetration Test Method (ASTM D-1586) where a 2-inch outside diameter split-barrel sampler is driven into the soil with a 140-pound weight falling freely through a distance

of 30-inches. The soil sampler is driven three consecutive 6-inch increments, with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12-inches is termed the Standard Penetration Resistance, or "N" value

- Classified soil samples according to the Unified Soil Classification System (USCS) based on visual examination of grain size, texture and composition.
- Reviewed the appropriate soil and geologic reference materials for soil types and background subsurface information.
- Provided recommendations for the type of foundation to be utilized as well as other concerns of the site as they relate to the proposed project.

2.0 REVIEW OF EXISTING INFORMATION

The bedrock beneath the site likely lies at a depth of greater than 100 feet bgs and will not be a consideration in the design. The surface geology of Berrien County is dominated by glacial and post-glacial activity. Geological maps show that the site lies in an area of wind blown fine sand on top of clayey silt till deposits of the Covert Ridge. Glacial till is unsorted glacial sediment and generally consists of a mixture of sand, silt and gravel in a clay rich matrix.

The Soil Survey of Berrien County shows that the soils in the area of the project are composed of the Plainfield-Urban land complex. This map unit consists of nearly level and gently sloping excessively drained soils and urban land. The Plainfield soil is suited to most building site developments.

3.0 REVIEW OF THE SOIL BORING LOGS

The logs of the three soil borings installed for this project are attached to this report along with a Soil Boring Location Plan. All three soil borings were installed to a depth of 30-feet bgs.

In summary the subsurface consists of loose to medium dense granular fill and native fine sand on top of stiff silty clays containing a trace of gravel. The sand was found to range from 4.6 to 6.8 feet thick. Perched ground water was identified in the bottom of the sand unit in all three soil borings. Following is a description of the soil types encountered at each soil boring installed for this project.

The log for SB-1 shows dark brown sandy topsoil from the surface to a depth of 0.5-feet below ground surface (bgs). Stiff silty clay with a trace of gravel was identified from 0.5 to 1.2-feet bgs. A layer of loose dark brown sandy topsoil was identified from 1.2 to 1.5-feet bgs. Loose to medium dense fine to coarse sand was discovered from 1.5 to 6.6-feet bgs. Stiff gray silty clay with a trace of gravel was discovered from 6.6 to 30.0-feet bgs, the total drilled depth of SB-1.

Perched ground water was identified between the depths of 5.8 and 6.6-feet bgs at SB-1.

The log for SB-2 shows dark brown sandy topsoil to a depth of 0.7-feet. Loose brown fine to medium granular fill was identified from 0.7 to 1.8-feet bgs. Dark brown sandy topsoil was discovered from 1.8 to 2.2-feet bgs. Loose to medium dense fine to medium sand was identified from 2.2 to 6.8-feet bgs. Stiff gray silty clay with a trace of gravel was identified from 6.8 to 30.0-feet bgs, the total drilled depth of SB-2.

Perched ground water was identified between the depths of 4.6 and 6.8-feet bgs at SB-2.

The log for SB-3 shows asphalt covering this location to a depth of 0.4-feet. Loose brown fine to coarse sand and gravel fill was present from 0.4 to 0.9-feet bgs. Dark brown sandy topsoil was present from 0.9 to 1.3-feet bgs. Loose to medium brown fine to medium sand was present from 1.3 to 4.6-feet bgs. Stiff brown to gray silty clay with a trace of gravel was identified from 4.6 to 30.0-feet bgs, the total drilled depth of SB-3.

Perched ground water was identified between the depths of 3.9 and 4.6-feet bgs at SB-3.

4.0 RECOMMENDATIONS

It is our understanding that the proposed development will include a full basement and that the bottom of footing elevation will be approximately 11 feet below existing grade. Therefore, the footings will rest on the stiff silty clay found at that depth across the site.

The stiff silty clay has a bearing capacity of 3,000 pounds per square foot. Unfortunately the loose sands above the clay contain a perched water table. Temporary construction dewatering will be required to remove the loose sands and construct a foundation on the stiff silty clay. A permanent gravity dewatering system shall be installed around the foundation of the proposed development to allow for the construction of below-grade portion of the structure. The dewatering system shall consist of a minimum 6-inch diameter slotted flexible pipe installed in a basket of stone (greater than 1-inch average particle size diameter with less than 5 percent fines) that completely surrounds the pipe, and the stone basket wrapped with a geotextile filter cloth to prevent fines from clogging the system. We would also recommend that consideration be given to the installation of a backup duplex pumping system in the lower level of the development along with the appropriate waterproofing requirements for the foundation walls. The backfill above the drain shall consist of a clean granular fill (MDOT Class II).

The initial action would be to strip the topsoil and other organic or deleterious material from the surface of the building and paved areas. This material should be stockpiled for reuse for landscaping and earth balancing requirements.

Foundation excavation and construction will then proceed as required. The footing excavation will consist of stiff silty clay. It is possible some areas of the foundation will need to be over-excavated and the resultant void filled with granular fill installed as engineered fill in thin lifts no greater than 9-inches in loose thickness and compacted to 98 percent of its maximum density as determined by the Modified Proctor test.

If any soil supporting a load bearing structure becomes softened by moisture for any reason, the soft soils shall be removed and replaced. If any over excavation of structurally incompetent soil is performed, it shall be done so that the resultant sidewalls of the over excavation have a minimum slope of 1V to 1H from the edge of the footing down to competent soil. The on-site sand can be utilized as structural fill. Any fill material installed beneath any structural element shall be installed as engineered fill in the manner discussed above.

If raising the grade is required, it is recommended to use engineered fill consisting of granular soil compacted in thin lifts (less than 9-inches in loose thickness) to 98 percent of its maximum density as determined by the Modified Proctor Test.

The footing sizes shall be determined by a licensed architect or engineer based on the soil criteria contained within this report and the appropriate building code criteria. Exterior footings shall be a minimum of 42-inches bgs for frost protection. Footing excavations shall be kept well drained at all times. Any soft soil encountered shall be removed and replaced with engineered fill.

The soil immediately beneath any concrete floor slab shall consist of a 6-inch thick layer of clean free-draining granular soil. Consideration shall be given to the placement of a vapor barrier below the floor slab to minimize floor dampness.

The subgrade pavement conditions are likely to consist of loose sands. These soils shall provide adequate support for pavements provided the subgrade is prepared as discussed in this report. Bituminous concrete pavements (asphalt) shall be placed on 12-inches of compacted sand (less than 7 percent fines compacted in thin lifts to 98 percent of its maximum density as determined by the Modified Proctor Test) to act as a sub-base. All pavement areas shall be proof-rolled with a heavy, rubber-tired piece of equipment and visually inspected before the sub-base is placed. Areas determined to be incompetent shall be removed and replaced with engineered fill.

For automobile traffic, above the 12-inch thick sand sub-base shall be a 6-inch layer of dense graded aggregate such as Michigan Department of Transportation (MDOT) 22A gravel, 22A slag, limestone, crushed concrete or milled bituminous pavement approximating a 22A gradation and approved by the design engineer. A 4-inch thick layer of a hot bituminous mixture shall act as the surface layer (2-1/2-inches of leveling and 1-1/2-inches of top course). For truck traffic, the layer of aggregate shall be 8-inches thick, and the bituminous surface layers shall be 3-inches and 2-inches thick, respectively. Concrete pavements shall have the same sand sub-base. Above the sand sub-base the concrete pavement shall be 6-inches thick for automobile traffic and increased by at least 2-inches for truck traffic. Appropriate reinforcing steel shall be installed as required for concrete pavements.

The discussion and recommendations contained in this report are based upon the data gathered from the soil borings installed for this project. The data contained in this report is for general design purposes. This report does not reflect variations in the soil that may occur. The nature and extent of the variations may not be evident until construction. If significant variations become evident, it may be necessary to reevaluate the recommendations made in this report.

We hope that this report meets with your needs. Please call if you have any questions or comments regarding this matter.

Sincerely:

WIGHTMAN ENVIRONMENTAL, INC.

Jon M. Hermann
Enc.