



**June 26, 2018
GPGT-18-075**

**To: Marianne Beck Memorial Library
112 West Central Avenue
Howey-In-The-Hills, Florida 34737**

Attention: Mrs. Tara Hall

**Subject: Geotechnical Investigation, Proposed Community Room Building Addition
Area, Marianne Beck Memorial Library, 112 West Central Avenue, Howey-In-
The-Hills, Lake County, Florida**

Dear Mrs. Hall:

As requested, Andreyev Engineering, Inc. (AEI) has completed a geotechnical investigation for the above referenced project location. We understand that the subject development will include one single-story, 1,949 square foot building addition.

This report presents the results of our geotechnical investigation along with an evaluation of the soil and groundwater conditions encountered. In addition, it provides geotechnical engineering recommendations for site preparation and foundation design.

SITE LOCATION AND DESCRIPTION

The subject site is located in Section 26, Township 20 South, and Range 25 East, at 112 West Central Avenue, in Howey-In-The-Hills, Lake County, Florida. We have included the Natural Resources Conservation Service (NRCS) Soil Map, which depicts the location and general soil types of the subject site, and is presented on the attached **Figure 1**. In addition, the U.S.G.S. Topographic Map, which depicts the location of the site, is presented on the on the attached **Figure 2**.

PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to explore subsurface soil and groundwater conditions at this site for foundation support of the proposed building addition supported on shallow foundations and provide general recommendations for site preparation.

The scope of this investigation included:

- Drilled two (2) Standard Penetration Test (SPT) borings, designated as TB-1 and TB-2, to a depth of 20 feet below ground surface, within the proposed building addition foundation area, for general foundation evaluation.

Samples were recovered from the borings and returned to AEI's laboratory for visual classification and stratification. Soil strata were classified according to the Unified Soil Classification System (USCS). Approximate boring locations are shown on **Figure 3**, results of the Standard Penetration Test (SPT) borings, in profile form, are presented on **Figure 4**. On the profiles, horizontal lines designating the interface between differing materials represent approximate boundaries. The actual transition between layers is typically gradual.

NATURAL RESOURCES CONSERVATION SERVICE SOIL SURVEY

The publication titled "Soil Survey of Lake County, Florida" published by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) was reviewed. For your reference, we have included a portion of the NRCS Soil Map which depicts the location of the subject site on the attached **Figure 1**. The two soil map units for the subject project location are identified as:

Soil Map Unit 8: *Candler Sand, 0 to 5 Percent Slopes

Brief Description: "This soil is nearly level to gently sloping and is excessively drained. It is on ridges, knolls, and broad uplands. The slopes range from smooth to broken. Typically, the surface layer is dark grayish brown sand about 6 inches thick. The subsurface layer, to a depth of about 63 inches is light yellowish brown and yellowish brown sand. The next layers to a depth of 80 inches or more are yellow sand that has thin strong textural bands. This soil does not have a high water table within 80 inches of the surface. The available water capacity is very low throughout. Permeability is high to very high."

Soil Map Unit 9: *Candler Sand, 5 to 12 Percent Slopes

Brief Description: "This soil is a sloping to strongly sloping, excessively drained soil found on rolling uplands of the central ridge. Typically, the surface layer of this soil type consists of sand about 5 inches thick. The next layer is sand about 62 inches thick followed by a layer of sand about 13 inches thick. The water table for this soil type is at a depth of more than 80 inches. Available water capacity is very low and permeability is considered to be rapid to very rapid throughout the profile of this soil type."

* This soil map unit description is not presented in the 1975 NRCS "Soil Survey of Lake County, Florida" publication including revisions made to soil descriptions in 2004. These soil descriptions are interpreted from corresponding soil survey map units published from adjacent or nearby counties.

Soil Conditions

The soil types encountered at the boring locations are presented in the form of soil profiles on the attached **Figure 4**. The stratification presented is based on visual examination of the recovered soil samples and the interpretation of the field logs by a geotechnical engineer.

In general, the borings encountered the following soil Strata:

- Grayish brown to brown fine sand (Stratum 1)
- Light gray to light brown fine sand (Stratum 2)

Standard Penetration Test (SPT) borings measure soil density using a split spoon sampler advanced by a 140-pound hammer dropped repeatedly a distance of 30 inches. The N-value, which is shown next to the corresponding depths of the boring profile, is the number of blows by the hammer required to advance the split spoon sampler one (1) foot. Split spoon sampling was conducted continuously in the upper 10 feet and at 5-foot intervals thereafter. Also included, adjacent to the SPT borings, are the blow counts or "N" values. The "N" values have been empirically correlated with various soil properties and are considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive material. The upper four feet of the SPT borings were performed manually to avoid possible damage to underground utilities. Upon completion of drilling, the SPT boreholes were backfilled with additional bentonite and soil materials.

Correlation of the SPT-N values with relative density, unconfined compressive strength and consistency are provided in the following table:

Coarse-Grained Soils		Fine Grained Soils		
Penetration Resistance N (blows/ft)	Relative Density of Sand	Penetration Resistance N (blows/ft)	Unconfined Compressive Strength of Clay (tons/ft ²)	Consistency of Clay
0-4	Very Loose	<2	<0.25	Very Soft
4-10	Loose	2-4	0.25-0.50	Soft
10-30	Medium-Dense	4-8	0.50-1.00	Medium
30-50	Dense	8-15	1.00-2.00	Stiff
>50	Very Dense	15-30	2.00-4.00	Very Stiff
		>30	>4.00	Hard

Please refer to **Figures 3 and 4** for boring locations, strata depths, and encountered soil conditions. The stratification lines represent the approximate boundaries between soil types. The actual transition may be gradual. Minor variations not considered important to our engineering evaluations may have been abbreviated or omitted for clarity.

Groundwater Conditions

Groundwater was not encountered between the ground surface and a depth of 10 feet at TB-1 and TB-2. The groundwater level was not measured below the 10-foot depth at TB-1 and TB-2, due to the drilling method mud rotary, which uses a thick bentonite drilling slurry to maintain an open borehole.

EVALUATIONS AND RECOMMENDATIONS

General

Based on the results of this investigation and our evaluation of the encountered subsurface conditions, it is our opinion that the site soils are suitable to support the proposed building addition as planned, provided that proper site soil preparation and soil densification are carried. It is critical that site preparation and soil densification procedures are thorough to ensure consistent and uniform support conditions for the proposed site improvements. Use of vibratory compaction equipment will be limited at this site in order to prevent possible damage to the existing adjacent library building and nearby buildings. Also, care should be taken not to undermine the foundation supporting soils of the existing library building during construction of the building addition.

Site Preparation

The proposed building addition area, plus a minimum margin of 5 feet beyond their outer lines, should be cleared and stripped to remove all surface vegetation, roots, topsoil, organic debris, or any other encountered deleterious materials. After clearing and grubbing, the entire building foundation area, including a 5-foot perimeter from the edge of the building areas, should be improved by proof rolling, to a depth of 2 feet below the exposed subgrade, to provide uniform subgrade conditions, in order to limit total and differential building settlements. Use of vibratory compaction equipment will be limited at this site in order to prevent possible damage to the existing adjacent library building and nearby building structures. The foundation subgrade soils for the building addition area should be proof rolled and compacted to a minimum of 95% of the soil's modified Proctor maximum dry density as determined by ASTM Specification D-1557 before any fill material is placed. Compaction should be completed to a depth of 2 feet below exposed subgrade. All fill required to bring the site to final grade should be inorganic, non-plastic, granular soil (clean sands) with less than 10% passing a U.S #200 sieve. In structural areas, the fill should be placed in level lifts not to exceed 12 inches loose and should be compacted to a minimum of 95% of the soil's modified Proctor maximum dry density as determined by ASTM Specification D-1557. In-place density tests should be performed on each lift by an experienced engineering technician working under the direction of a registered geotechnical engineer to verify that the recommended degree of compaction has been achieved. We suggest a minimum testing frequency of one (1) test per lift per 2,500 square feet of area within structural limits. This fill should extend a minimum of 5 feet beyond building lines to prevent possible erosion or undermining of footing bearing soils. Further, fill slopes should not exceed 2 horizontal to 1 vertical (2H: 1V). All fill placed in utility line trenches and adjacent to footings beneath slabs on grade should also be properly placed and compacted to the specifications stated above. However, in these restricted working areas, compaction should be accomplished with lightweight, hand-guided compaction equipment and lift thicknesses should be limited to a maximum of 4 inches loose thickness.

Foundation Design

Once the existing subgrade and new fill soils in the proposed structural support areas have been prepared in accordance with the preceding recommendations, the proposed building addition can be constructed on a system of conventional shallow spread or strip footings bearing at minimum depths below the finished floor elevations. Some minor settlement of the existing foundation shall be expected due to the stress induced by the new foundations. As previously noted; Care should be taken not to undermine the foundation supporting soils of the existing building during construction of the building addition. Shoring may be necessary to prevent undermining of the existing, adjacent building foundation supporting soils. Footings, which bear in densified existing soils, or in new structural fill, may be designed based on a maximum allowable bearing pressure of 2,000 pounds

per square foot. Minimum footing dimensions of 18 inches for strip footings and 24 inches for column footings should be used even though the maximum allowable bearing pressures may not be fully developed in all cases. Footings should bear at least 18 inches below finished exterior grades. Footing subgrade soils should be approved by the geotechnical engineer prior to placement of concrete and steel. As a minimum acceptance criterium, the footing subgrade soils should be compacted to a minimum density of 95% of the soils modified Proctor maximum dry density for a depth of 24 inches.

Excavations

Any and all excavations should be constructed in accordance with applicable local, state and federal regulation including those outlined by the Occupational Safety and Health Administration (OSHA). It is the contractor's sole responsibility for designing and constructing safe and stable excavations. Excavations should be sloped, benched or braced as required to maintain stability of the excavation sides and bottoms. Excavations should take into account loads resulting from equipment, fill stockpiles and existing construction. Any shoring need to maintain a safe excavation should be designed by a professional engineer registered in the State of Florida in accordance with local, state and federal guidelines.

LIMITATIONS

This report has been prepared for the exclusive use of the City of Howey-In-The-Hills and their designers, based on our understanding of the project as stated in this report. Any modifications in design concepts from the description stated in this report should be made known to AEI for possible modification of recommendations presented in this report. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made as to the professional advice presented herein. Statements regarding all geotechnical recommendations are for use by the designers and are not intended for use by potential contractors. The geotechnical exploration and recommendations submitted herein are based on the data obtained from the soil borings presented on **Figure 4**. The report does not reflect any variations which may occur adjacent to, between, or away from the borings. The nature and extent of the variations between the borings may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report. An on-site visit may be required by a geotechnical engineer to note the characteristics of the variations during the construction period. This geotechnical study investigated the soil conditions within the proposed building addition area, to drilled depth of 20 feet below ground surface, and was not intended to investigate deeper soil conditions with regards to the presence or absence of Karst activity.

CLOSURE

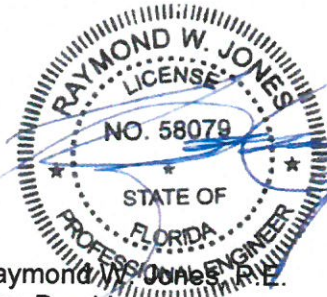
AEI appreciates the opportunity to participate in this project, and we trust that the information herein is sufficient for your immediate needs. If you have any questions or comments concerning the contents of this report, please do not hesitate to contact the undersigned.

Sincerely,

ANDREYEV ENGINEERING, INC.

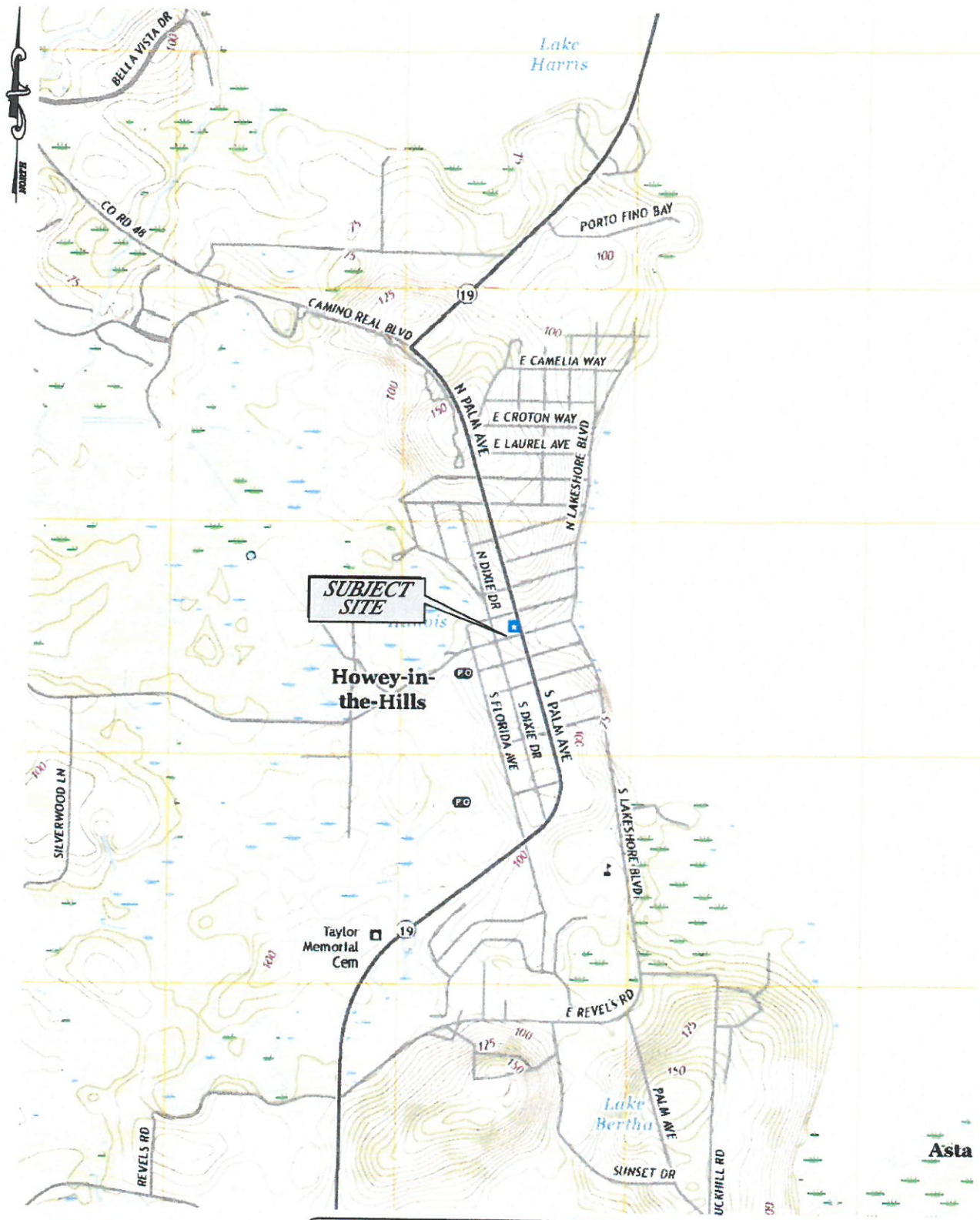


Mark L. Jung
Senior Project Manager



Raymond W. Jones, P.E.
Vice President
Florida Registration No. 58079

FIGURES



REFERENCE:
 U.S.G.S. HOWEY IN THE
 HILLS, FLA.
 QUADRANGLE MAP
 DATED 2018
 SECTION 26
 TOWNSHIP 20 SOUTH
 RANGE 25 EAST



**Andreyev
 Engineering,
 Inc.**

APPROXIMATE SCALE:
 1"=2000'

DATE: 06/26/18
 PN: GPQT-18-075

ENGINEER: RJ
 DRAWN BY: DLS

GEOTECHNICAL INVESTIGATION
 PROPOSED COMMUNITY ROOM BUILDING ADDITION
**MARIANNE BECK
 MEMORIAL LIBRARY**
 112 WEST CENTRAL AVENUE
 HOWEY-IN-THE-HILLS, LAKE COUNTY, FL

U.S.G.S. TOPOGRAPHIC MAP

FIGURE 1



REFERENCE:
U.S.D.A. N.R.C.S. WEB SOIL SURVEY

LEGEND:

- 8 CANDLER SAND
0 TO 5% SLOPES
- 9 CANDLER SAND
5 TO 12% SLOPES
- 17 ARENTS
- 99 WATER



**Andreyev
Engineering,
Inc.**

APPROXIMATE SCALE:

1" = XXX'

DATE: 06/26/18

ENGINEER: RJ

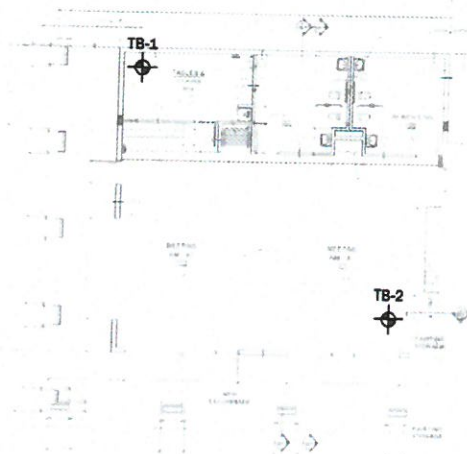
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DRAWN BY: DLS

GEOTECHNICAL INVESTIGATION
PROPOSED COMMUNITY ROOM BUILDING ADDITION
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MEMORIAL LIBRARY**
112 WEST CENTRAL AVENUE
HOWEY-IN-THE-HILLS, LAKE COUNTY, FL

N.R.C.S. SOIL SURVEY MAP

FIGURE 2



LEGEND:

⊕ APPROXIMATE LOCATION OF SPT BORING



GRAPHIC SCALE: 1"=20'

SOURCE:
SITE PLAN PROVIDED BY OTHERS



**Andreyev
Engineering,
Inc.**

APPROXIMATE SCALE:

1"=20'

DATE: 06/26/18

ENGINEER: RJ

PN: GPGT-18-075

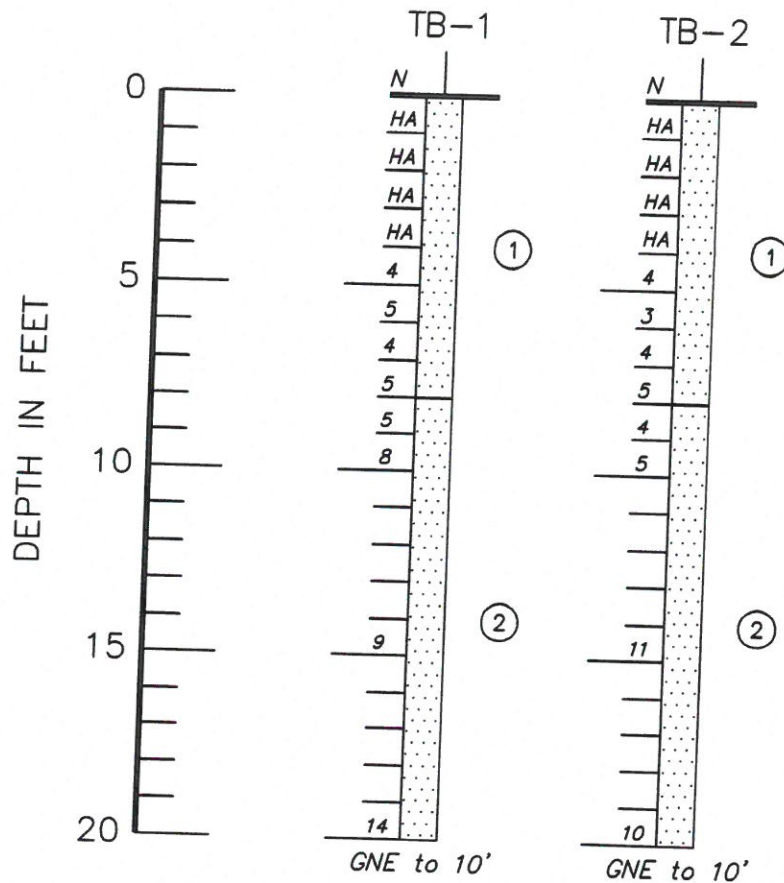
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GEOTECHNICAL INVESTIGATION
PROPOSED COMMUNITY ROOM BUILDING ADDITION

**MARIANNE BECK
MEMORIAL LIBRARY**
112 WEST CENTRAL AVENUE
HOWEY-IN-THE-HILLS, LAKE COUNTY, FL

BORING LOCATION PLAN

FIGURE 3



LEGEND:

- ① GRAYISH BROWN TO BROWN FINE SAND (SP)
- ② LIGHT BROWN TO LIGHT GRAY FINE SAND (SP)
- (SP) UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL
- GNE GROUNDWATER NOT ENCOUNTERED
- N STANDARD PENETRATION RESISTANCE, IN BLOWS PER FOOT
- HA BORING ADVANCED USING HAND AUGER



**Andreyev
Engineering,
Inc.**

APPROXIMATE SCALE:

1"=5'

DATE: 06/26/18

PN: GPGT-18-075

ENGINEER: RJ

DRAWN BY: DLS

GEOTECHNICAL INVESTIGATION
PROPOSED COMMUNITY ROOM BUILDING ADDITION
**MARIANNE BECK
MEMORIAL LIBRARY**
112 WEST CENTRAL AVENUE
HOWEY-IN-THE-HILLS, LAKE COUNTY, FL

SOIL PROFILES

FIGURE 4



Invoice

Invoice Number:
GPGT-18-075-JUN

Invoice Date:
06/26/18

Andrejev Engineering, Inc.

Marianne Beck Memorial Library
112 W Central Avenue
Howey-in-the-Hills, FL 34737

Attention: Tara Hall

Phone: 352-324-0254

Fax:

Send Payment To:

Andrejev Engineering, Inc.

4055 St. Johns Parkway

Sanford, Florida 32771

Phone: (407) 330-7763 (407) 330-7765 fax

Customer PO		Payment Terms	Sales Rep ID	Due Date
		Net 30 Days	MJ	7/26/2018
Quantity	Description		Unit Price	Extension
	GEOTECHNICAL INVESTIGATION Proposed Community Room Building Addition Area, Marianne Beck Memorial Library, 112 West Central Avenue, Howey-in-the-Hills, Lake County, FL			
1.0	LUMP SUM:		\$2,358.75	\$2,358.75
Check No:			Total Invoice Amount \$2,358.75	