February 14, 2017

City of Tampa
Stormwater Engineering
306 E. Jackson St., 6N
Tampa, FL 33602
Attn: Michael Miller

Re: WO#1, MEG Project No. 12883.1
Geotechnical Engineering Report
Proposed Wet Well Improvements at Robles Park
Tampa, Florida

Dear Mr. Miller:

Madrid Engineering Group, Inc. (MEG) is pleased to submit this Geotechnical Engineering report summarizing the results of our geotechnical subsurface exploration and engineering evaluation services completed for the above referenced project. The work was completed in general accordance with the authorized scope of work in our cost estimate proposal dated January 4, 2017 and provides general geotechnical recommendations regarding the proposed design and construction.

We appreciate the opportunity to be of service to you on this project, and look forward to working with you on future projects. If you have any questions please do not hesitate to contact us.

Sincerely,

Madrid Engineering Group, Inc. (EB 6509)

Kevin M. Hill, P.E.
Sr. Project Manager
Florida P.E. No. 72949

John E. Delashaw, P.E.
Chief Geotechnical Engineer

Attachment: Geotechnical Engineering Report
Geotechnical Engineering Report

Robles Park Wet Well Improvements, Tampa, Florida

Prepared for:

City of Tampa – Stormwater Engineering

Prepared by:

MADRID ENGINEERING GROUP, INC.
2030 State Road 60 East
Bartow, FL 33830
863-533-9007

Project No. 12883.1
February 2017
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**ATTACHMENTS**

- Figure 1  Site Location Map
- Figure 2  Field Exploration Map
- Figure 3  NRCS-USDA Soils Map

**APPENDICES**

- Appendix A  SPT and Hand Auger Soil Boring Logs, Test Pit Log
- Appendix B  Laboratory Test Results
- Appendix C  GeoBlock®5150 Design & Construction Overview (Presto GeoSystems)
1.0 INTRODUCTION

1.1 General

Madrid Engineering Group (MEG) is pleased to submit this report summarizing the results from our subsurface soil exploration and geotechnical engineering evaluation for the proposed Wet Well improvements at Robles Park in Tampa, Florida. Our conclusions and recommendations are based on the results of our field exploration, laboratory tests, and appropriate engineering analyses.

We were provided with a copy of the original Pumping Station Plan, dated July 13, 1957, and a site survey, completed on November 15, 2016, by Polaris Associates, Inc. Additionally, we were provided a previous Geotechnical Engineering Services Report for this park, dated September 26, 2013, by Tierra.

1.2 Site Location and Description

The site is generally located approximately 2/3 mile north-northwest of the interchange between I-4 and I-275 in Tampa, Florida (Figure 1, Site Location Map). The project area in the park is currently covered by grass. The park is relatively flat and level with ground surface elevations ranging from about 26 feet (NAVD 88) along the top of bank for the lake to the east to about 30 feet at the west end of the park. East Janette Avenue, between North Jefferson Street and North Avon Avenue, is a brick road and the pipeline is proposed to continue beneath this roadway. Elevations along the roadway range from about 29 to 31 feet. Specifically, the site is located in Section 12, Township 29 South, Range 18 East in Hillsborough County.

1.3 Purpose and Scope of Work

The purpose of the program was to provide an evaluation of the existing subsurface conditions at the boring locations, to identify constraints or limitations (to the extent possible) that the subsurface conditions may impose on the planned construction and develop general geotechnical recommendations for the proposed improvements. The scope of work included review of existing geotechnical and geological data, a field exploration and laboratory testing program, and general site development recommendations summarized in this report.

We understand that the proposed wet well will be located approximately 60 feet southwest of the existing one. The improvements include a wet well/pump station, an inlet structure (reported invert elevation of 18 feet) within Robles Park Lake that will connect to the wet well with a 36-inch pipe, a force main installed beyond the wet well along East Janette Ave, and a new access drive to the wet well. It is anticipated that minimal, if any, fill will be required to achieve site grades. MEG was requested to complete soil borings/testing at the wet well, near the inlet structure and along East
Janette Avenue to provide soil data and recommendations for the proposed design and construction. No specific testing was requested along the proposed access drive; however, the City has requested the access drive be constructed with GeoBlock®5150, manufactured by Presto GeoSystems and MEG has been requested to provide general installation recommendations for this vegetated block system.

2.0 FIELD EXPLORATION

2.1 Standard Penetration Test Borings

MEG conducted the subsurface exploration at the site on January 31, 2017 by drilling two (2) Standard Penetration Test (SPT) borings. Boring SPT-1 was completed to a depth of 30 feet below ground surface (bgs) at the proposed wet well location and boring SPT-2 was completed to a depth of 15 feet bgs near the proposed inlet structure along the edge of the lake. The SPT borings were completed using a small track mounted drilling rig outfitted with a safety hammer. The borings were located by measuring from existing site features, as shown on Figure 2, Field Exploration Plan.

Disturbed samples from the SPT boring were obtained using a split-spoon sampler in general accordance with ASTM Specification D 1586, using a 1.4-inch I.D. split-spoon sampler driven with a 140-pound slide hammer falling a distance of 30 inches. An engineering technician familiar with soil classification and field evaluations logged the boring in the field and placed samples in sealed containers and returned them to MEG’s laboratory for further classification. Upon completion, the borehole was backfilled in general accordance with industry standards. SPT boring logs are included in Appendix A.

2.2 Hand Auger Borings

Five (5) hand auger borings, HA-1 through HA-5, were completed on January 31, 2017 within the roadway of East Janette Avenue between North Avon Avenue and North Jefferson Avenue, at the locations shown on Figure 2. Surface bricks were removed at the boring locations and replaced after completion of the borings. The borings were advanced to a depth of 7 feet bgs using a bucket auger, and were completed in general accordance with ASTM D 1452. Hand auger boring logs are included in Appendix A.

2.3 Test Pit Excavation

On January 31, 2017, MEG personnel completed one shallow test pit excavation at the location shown on Figure 2. The test pit was excavated to a depth of about 28 inches. The side faces of the test pit excavation were examined for historical indicators of a seasonal high water table (SHWT). The Test Pit Log is included in Appendix A.
2.4 **Bulk Sample Collection**

A bulk soil sample from the near-surface was collected approximately 17 feet north of a small maintenance building on the west side of the park in the general vicinity of the proposed access drive. The sample was returned to our laboratory for Limerock Bearing Ratio (LBR) testing.

### 3.0 SUBSURFACE CONDITIONS

3.1 **Soil Survey Map Review**

The Natural Resources Conservation Services (NRCS) Soil Survey for Hillsborough County reports provide a general description of the typical shallow soil strata (about 6 feet) encountered within each particular soil mapping unit and reports typical depth to seasonal high water levels. The NRCS defines seasonal high water as “a zone of saturation at the highest average depth during the wettest season that is at least six inches thick, persists for more than a few weeks, and is within six feet of the soil surface.” The Soil Survey for Hillsborough County indicates that one (1) soil type exists within the general exploration limits of the proposed project site. **Figure 3, NRCS/USDA Soils Map** shows the locations of the different soil types within the project limits. The following is a description of the soil type listed in the soil survey manual, utilizing a soil number map unit system for easy identification on maps.

**Tavares-Urban Land Complex** (Map Unit 55). According to the NRCS, *Tavares-Urban Land Complex is nearly level to gently sloping and moderately well drained and of areas of Urban land. Slopes are 0 to 5 percent. Typically, the surface layer of Tavares soil is very dark gray fine sand about 6 inches thick. The upper part of the underlying material, to a depth of about 18 inches, is light yellowish brown fine sand. The middle part, to a depth of about 46 inches, is very pale brown fine sand. The lower part to a depth of about 80 inches is white, mottled fine sand. In some areas, the surface layer is more than 9 inches thick. In places, the lower part of the underlying material is brown or dark brown. In some of the lower parts of the landscape, the soil is somewhat poorly drained. The undrained areas have a seasonal high water table at a depth of 40 to 80 inches for more than 6 months. The high water table recedes to a depth of more than 80 inches during prolonged dry periods.*

3.2 **Subsurface Conditions**

At the wet well, the SPT boring (SPT-1) encountered loose organic silty sand (SM) from the ground surface to a depth of 2 feet bgs followed by medium dense to loose slightly silty sand (SP-SM) and sand (SP) to a depth of approximately 12 feet bgs.
Below this was medium dense clayey sand (SC) to a depth of approximately 17 feet bgs followed by soft to stiff clay (CH) to the termination depth of 35 feet bgs.

Near the inlet structure, the SPT boring (SPT-2) encountered slightly organic silty sand (SM) from the ground surface to a depth of 2 feet bgs followed by loose to medium dense sand to a depth of approximately 12 feet bgs. This was underlain by medium dense slightly silty sand (SP-SM) to the termination depth of 15 feet bgs. It should be noted that this boring was completed near the top of the bank along the edge of the lake. Ground surface conditions within the lake may differ from that found in boring SPT-2. The inlet structure is proposed to be constructed within the lake. It should be anticipated that soft lake-bottom sediments will be encountered but the soil conditions along the shoreline do not suggest a driven pile foundation is required for the very lightly loaded inlet structure.

Along East Janette Avenue, the hand auger borings generally encountered a thin layer of sand and shell (mixed) base material below the brick surface pavers followed by sand (SP) or slightly silty sand (SP-SM). This shell layer was poorly defined and difficult to determine a thickness but was typically less than 6 inches.

The soil boring logs are presented in Appendix A. The general soil profile described above and as presented on the boring logs is based on our interpretation of subsurface conditions encountered at the boring locations only. Boundaries between soil layers are approximate and for illustration purposes only. Variations in soil conditions in both horizontal and vertical directions different from those presented are likely to exist between boring locations. The relative elevation references above should be considered approximate and are based on elevations from the Polaris survey.

3.3 Groundwater Conditions and Seasonal High Ground Water

The water table was encountered at a depth of approximately 4 feet at SPT-1 and also 4 feet at boring SPT-2 (adjacent to the lake) and at depths ranging from approximately 4 to 6 feet bgs along East Janette Ave. Seasonal fluctuations in the groundwater level should be anticipated due to variations in rainfall.

The Soil Survey for Hillsborough County, Florida describes the Seasonal High Water Table (SHWT) to be at a depth of 40 to 80 inches for more than 6 months during most years. Evaluation of shallow soil within Test Pit TP-1, completed at an approximate elevation of 27.5 feet, revealed a soil layer containing organics beginning at a depth of about 1 foot bgs. A very clear indicator of a SHWT was not readily apparent in the test pit, although a possible spodo-soil with fluctuation zone above it
was noted at about 12 inches bgs. Due to minor differences in ground surface elevation and proximity to the lake, actual SHWT depths may vary across the site. We recommend a design high SHWT at a depth of about 1 foot bgs at the wet well, which corresponds to a lake surface elevation of about 26 (about 6 inches higher than the water level reported on the Polaris survey). Along East Janette Avenue, ground surface elevations are slightly higher than at the park, and a SHWT elevation of about 27 feet (about 3 feet depth) is appropriate.

3.4 Laboratory Test Results

Soil samples collected from the field program were returned to our laboratory for further classification and testing to confirm field classifications and help evaluate engineering properties of the materials encountered. Laboratory testing of selected representative samples was performed in general accordance with ASTM standards.

Laboratory tests for natural water content (ASTM D2216), percent passing the No. 200 sieve (ASTM D1140) and organic content (ASTM D2974) were performed on selected samples from the SPT borings to verify the visual and tactile soil classifications. Limerock Bearing Ratio (LBR) testing (FM 5-515) was performed on a bulk soil sample collected in the area of the proposed access drive. Laboratory test reports are included in Appendix B. A summary of the test results is presented below:

- Percent passing the No. 200 sieve for samples tested ranges from 15.1 to 86.4 percent.
- Organic content from samples tested ranged between 6.3 and 22.7 percent.
- Moisture Content ranged from 28.7 to 54.9 percent for the samples tested.
- LBR testing revealed an LBR value of approximately 15, maximum dry density of 101pcf, and optimum moisture content for compaction at about 14%. This sample was obtained from near the ground surface and was visually classified as slightly silty sand (SP-SM) with trace organics. Although there is not a direct correlation of LBR to CBR, this result suggests a CBR≥4.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General

The following conclusions and recommendations are based on our understanding of the proposed project scope of work, the data obtained from the limited exploration, experience with similar conditions, and generally accepted principles and practices of geotechnical engineering. Based on the results of the exploration and our professional opinion, the site is generally suitable for the proposed development. Shallow organic soils may be encountered and should be removed and replaced with
clean fill where observed. The water table is generally shallow at this site, controlled by the water level in the nearby lake, and dewatering should be anticipated.

4.2 Wet Well Foundation, Settlement and Uplift

Generally, the soil conditions encountered at the wet well foundation depth should be suitable for foundation support. The lift station structure is anticipated to have light foundation loads (on the order of 2,000 pounds per square foot (psf) or less). The soil conditions below the anticipated wet well foundation depth consist of medium dense clayey sand and soft to stiff clay. Long-term minor settlement should be anticipated and the magnitude will be dependent on the actual loading conditions. Although clayey soil is not ideal, conditions appear to be acceptable for lightly-loaded foundation support. It is noted that loose soils are present within the surficial 4 feet and compaction should be performed for ancillary facilities.

Mat foundations and/or spread footers should be a minimum of 4-feet wide by 4-feet long and have at least 1-foot of embedment and should be designed with a maximum allowable bearing pressure of 2,000 psf. The foundation recommendations assume site preparation in accordance with the recommendation below and a design water level of 1-foot bgs. This bearing pressure should result in foundation settlement on the order of 1 inch (dependent on actual loading) with most of the settlement occurring over a period of several months after first loading. If this magnitude of settlement cannot be tolerated, a wider spread footing may be used to reduce the bearing pressure. As an example, reducing the bearing pressure to a maximum of 1,000 psf would reduce the anticipated maximum settlement to about 0.5 inch.

It should be noted that given the potential variability of subsurface conditions, limited field and laboratory data, and limitations of the numerical model, settlement predictions developed by MEG are approximate. Actual settlements observed during loading will depend on variations in subsurface conditions. Foundation plans were not provided to MEG.

The lift station structure should be designed to resist uplift caused by buoyancy. We recommend a design water table at the ground surface be assumed for all uplift calculations. Uplift forces can be resisted by either adding dead weight to the structure, or mobilizing the weight of the surrounding soil by extending the footing width further beyond the structure. The latter solution has the added benefit of reducing applied loading above the clayey soil.
4.3 Foundation for Inlet Structure

MEG understands that the inlet structure will be founded below the water level within the lake, but near the shoreline in the vicinity of boring SPT-2. Based on this information and our experience, we recommend the following foundation preparation procedures to enable the use of shallow foundations:

1. Dewater the work area to a depth of 3 feet below the footing, (i.e. construct a coffer dam).
2. Over-excavate at least 2 feet below the bottom of the proposed structure and confirm that deleterious soft organic or clay soils are not present. The excavation should extend at least 2 feet in plan dimension beyond the proposed structure/foundation limits.
3. Place Mirafi®140N or equivalent non-woven geotextile separator on the exposed surface with extra material on all sides to fold up (wrap) around gravel layer.
4. Install a 2-foot thick layer of gravel (#57 stone or equivalent) in two 1-foot lifts.
5. Wrap geotextile over gravel and secure with at least 2 feet of overlap.
6. Compact and level top surface of wrapped gravel as much as practical (sled compactor).
7. Adjust/level structure as necessary to attain design invert elevation and position.

4.4 Recommendations for Vegetated Access Drive

Traffic loading, service level or design life information was not provided; however, we assume that occasional heavy fire truck access will be required. The City desires to have a vegetated access drive constructed using the GeoBlock®5150 Porous Pavement System. Based on the field exploration and our experience of similar sites, we recommend the following typical access drive section (presented from the top down) which is consistent with the Design 2 from the manufacturer:

- Topsoil with grass sod (topsoil not compacted)
- GeoBlock®5150 Porous Pavement System (2-inches thick)
- 4” Engineered Base compacted to ~95% Standard Proctor Density (density testing not required). This is a homogenous mixture consisting of gravel, FDOT #5 or similar, blended with pulverized topsoil - see attached GeoBlock “Design & Construction Overview” (product guide) in Appendix C for additional details.
- Mirafi®140N or equivalent non-woven geotextile separator
- 12” compacted subgrade (compacted to 95% of Modified Proctor)
Notes:
1. The GeoBlock®5150 product guide includes many helpful installation recommendations from the manufacturer that the contractor should be familiar with prior to installation. Recommendations for care of the system are also included in the guide that the City should become familiar with.
2. Sub-drain is not required.
3. Install GeoBlock®5150 using “Bricklayer Pattern”, as shown on attached product guide for areas of linear traffic patterns. If there are areas where vehicles will be changing direction or turning around, use the “Herringbone Pattern” in those areas. Anchoring the perimeter units is recommended.
4. “Design 2” has been selected as the recommended cross-section, as shown on the attached product guide.
5. Contractor should note the recommended installation adjustments for “Thermal Expansion” in the product guide.
6. Care should be taken to properly prepare the “Engineered Base” material as specified. The base must be stable yet loose enough to facilitate root penetration.
7. Do not overfill the cells.

4.5 Site Preparation and Earthwork

4.5.1 Clearing and Stripping
All construction areas should be cleared of any trees, scrub vegetation, existing debris and topsoil stripped as necessary to remove roots and other deleterious material to the satisfaction of MEG. Topsoil should be discarded or may be stockpiled for future reuse in landscape areas if desired. Any abandoned utilities, if encountered, should be removed as open conduits can lead to soil erosion.

4.5.2 Proof-Rolling
After clearing and grubbing, including 5 to 10 feet horizontally from the plan limits (i.e., beneath shallow foundations, slabs-on-grade, and access drive areas), should be evaluated and methodically proof-rolled, as directed by representatives of MEG, with compaction equipment or with heavy construction equipment (i.e. large vibratory smooth roller) capable of achieving the required compaction. However, vibrations should be eliminated within 15 feet of the existing structures. Rolling should continue until a density of at least 95 percent of modified Proctor maximum dry density (ASTM D-1557) is achieved. Any soft, rolling or otherwise suspect areas should be investigated and any
unsuitable soils and/or unstable soil conditions should be removed and replaced with structural fill.

4.5.3 Excavation and Dewatering

The anticipated depth of excavation at the wet well is approximately 12 feet below existing grade, or slightly deeper, in order to place and compact foundation material. Dewatering will also likely be required for the proposed pipeline installations. All excavations and shoring should conform to the Occupational and Safety Health Act (OSHA) requirements. Design of a shoring system is the responsibility of the selected contractor. A number of variable factors, such as nature and strength of excavated soils, depth of excavation and groundwater, proximity of adjacent structures, and economics of construction method, etc., will affect the choice of support method.

All vertical shoring or prefabricated trench lining systems should be continuous and maintained in place to assure adequate temporary stability during backfilling of the trench as recommended subsequently. Excavated soils should not be stockpiled within 15 feet (horizontally) of the shored excavations, unless specific provisions for surcharge loading have been included in the design of the shoring system. The final decision on appropriate excavation methods and design of shoring systems is the responsibility of the contractor.

Based upon our recommended design water table and depending upon the time of year, it appears that groundwater should be anticipated for excavation and construction of the lift station. We recommend that a dewatering system be designed and installed to draw the groundwater table down to a depth sufficient enough to achieve compaction requirements for the foundation; this typically requires lowering the water to 2 to 3 feet below the foundation subgrade level. The contractor should employ a registered professional engineer to design all shoring and dewatering systems.

4.5.4 Pipe Bedding and Backfilling

If the City does not already have pipe bedding, compaction and backfilling requirements for this project, the following recommended procedures may be implemented:
Clean fine sands (SP) containing less than five percent passing the U.S. standard No. 200 sieve and less than four percent organic matter (as determined by ASTM D2974) may be used as select sand pipe bedding material. Much of the soils encountered at this site should meet this criterion. Suitable pipe bedding should be free of stones, gravel, organics, vegetation and other deleterious material, placed in uniform loose lifts not exceeding six inches thick and compacted to at least 100 percent of its maximum dry density as determined by ASTM D6987 (Standard Proctor-SPMDD). Bedding material within the middle 1/3 of the pipe diameter should be loosened for better seating of the pipe in the bedding soil. Pipe bedding material should be placed from one foot below to at least half-way up the pipe. Particular care needs to be exercised during pipe bedding placement and compaction around pipe haunches, elbows, and curves. Loose bedding materials may subsequently compact in-service, if subjected to dynamic or vibrational loading due to surge pressures, resulting in excessive pipe deflections and possibly failure. Soils in the cover zone (from half-way up the pipe to 1-foot over the pipe, as shown on the graphic above) should consist of clean to relatively clean sand (SP) or slightly silty sand (SP-SM) with no more than 12% silty fines passing the No. 200 sieve and less than 4% organic content, and also compacted to 100% of the SPMDD in lifts no greater than 6-inch compacted thickness.

Excavation backfill material more than 1 foot above the pipe should consist of granular soils with less than 15 percent fines content passing the No. 200 sieve and an organic content of not more than 4 percent generally conforming to USCS soil types SP to SP-SM/SP-SC and SM; use of Clayey Sand (SC) may present moisture conditioning problems and is not recommended. It appears that much of the excavated soils will meet these requirements. Organic soils are not suitable backfill soils in any location and should be replaced with suitable fill. Excavation backfill typically should be placed
in lifts no greater than 12 inches in compacted thickness and compacted to 100 percent of SPMDD. Common fill used more than 3 feet above the top of pipe and outside of structure or roadway areas can have up to 20% fines and be compacted to 90 percent of SPMDD. Excavated spoil material intended for reuse as backfill will likely require moisture conditioning to permit adequate compaction.

4.5.5 Earthwork and Compaction (except for pipes)

All structural soils (existing or placed) within 2 feet beneath the bottom of shallow foundations, floor slabs, and pavement “Engineered Base” should meet gradation (no more than 12 percent fines or 4 percent organics) and compaction requirements as stated herein. Based on the boring logs, the in-situ sandy soils (SP, SP-SM, and SM) to a depth of about 12 feet likely meet gradation requirement, but will likely need to be compacted to achieve the minimum density requirement of 95% of modified proctor maximum dry density (MPMDD). Testing indicates some higher clay content soils may be encountered at or just below the wet well foundation depth and any such clayey soils encountered should be over-excavated to a depth of at least 2 feet below the foundation and replaced with clean fill as described below.

Fill placement in large areas should be completed in lifts no greater than 12 inches in thickness and compacted to at least 95 percent of the MPMDD. If compaction cannot be achieved at 12 inch lifts, thinner lifts may be required. It is noted that heavy vibratory compaction near other structures has the potential to cause damage. Foundation soils in smaller footing excavations where compaction must be achieved with smaller hand operated equipment should be compacted in lifts no greater than 6 inches in thickness and compacted to at least 95 percent of the MPMDD.

Prior to construction, bulk samples representative of in-situ and/or fill soils should be collected and subjected to Modified Proctor testing. Existing clean sand soils excavated from the project site intended for reuse as fill may require moisture conditioning to permit adequate compaction.

4.5.6 Unsuitable Materials

In general, when encountered, high organic content soils, mostly at/near the ground surface, were minor to high in concentration along the study area for this report and should be removed where encountered. Clayey soil and/or very soft and unstable soils may be encountered at the base of the wet well or pipe inlet structure foundation and should be removed as discussed above. Classification of soils as suitable for use as backfill should be monitored continuously during construction because the limited
exploration performed for this study will not have identified all areas with unsuitable soils.

4.6 Quality Assurance

We recommend implementing a comprehensive quality assurance program to verify that all site preparation is conducted in accordance with the recommendations herein and the appropriate plans and specifications. It is strongly recommended that MEG be retained to perform materials testing and inspection services to observe that the subsurface conditions are as we have discussed herein and that ground excavation and soil compaction is in accordance with our recommendations and the project requirements. This is absolutely critical for observing all aspects of the compaction operations. MEG cannot accept responsibility for any conditions which deviate from those described in this report if not engaged to provide construction observation and testing for this project. An on-site engineering technician should monitor all site preparation to verify that all deleterious materials have been removed and/or properly remediated and should observe earthwork activities to verify that the subgrade soils conform to the recommendations herein. In-situ density tests should be conducted during filling or compaction activities to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for natural and fill soils to confirm they meet minimum compaction requirements.

5.0 LIMITATIONS

This report has been prepared for The City of Tampa for the proposed Robles Park Wet Well improvement project. The information in this report is intended for the sole use of the addressees and their assigns or agents, and may not be relied upon or used by any third party without expressed written consent. The recommendations presented herein are based on MEG’s interpretation and understanding of site conditions and proposed construction. This report is intended for use by the designers of this project; it is not a specification document and is not intended for use as a part of the specifications. Varying degrees of non-uniformity of the horizontal and vertical soil conditions are likely to exist between boring locations. The study reported herein has been conducted in accordance with the generally accepted standards, principles and practices in the geotechnical engineering profession. No other warranty, expressed or implied, is made. MEG is not responsible for the independent conclusions, opinions, and/or recommendations made by others based on the field investigation and laboratory testing data presented in this report. Any variations in site location from those indicated in this report should be brought to MEG’s attention as such changes may affect MEG
conclusions and recommendations. If MEG is not retained to perform these functions, MEG will not be responsible for the impact of those conditions. This study is based on a relatively shallow exploration and is not intended to be an evaluation for sinkhole potential.
FIGURES
FIGURE 2
Field Exploration Map
Robles Park Wet Well Improvements
Tampa, Florida

City Of Tampa

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Bartow, Florida 33830
863 533-8007 Fax: 863 533-8997
EB-000609

MADRID Project Number
12883.1

Notes:

Drawn By: BJN
Checked By: JED

Legend

HA-1  Hand Auger Boring Location
TP-1  Test Pit Location
SPT-1  SPT Boring Location

Notes: Boring Locations Are Approximate
Aerial Provided By Google Earth

Hand Auger Boring Location
Test Pit Location
SPT Boring Location

Notes: Boring Locations Are Approximate
Aerial Provided By Google Earth
FIGURE 3
NRCS/USDA Soils Map
Robles Park Wet Well Improvements
Tampa, Florida

Legend
Soils
musym, MUNAME
- 55, TAVARES-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
- 9, CANDLER-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
- 99, WATER

Sources: GIS Information (ESRI), Photograph Date 2006 Soils Information (SCS/USGS)

City Of Tampa

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EB-0006509

MEG Project Number 12883.1
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>DESCRIPTION</th>
<th>Blows</th>
<th>N-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Loose, dark brown, silty sand with trace organics. (SM) 15.7% &lt;#200 sieve, Organic Content = 22.7%</td>
<td>4-4-2-3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Medium dense, brown, slightly silty sand. (SP-SM)</td>
<td>4-5-6-6</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Loose, pale brown.</td>
<td>3-4-4-5</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Loose, gray, sand. (SP)</td>
<td>4-5-5-5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Medium dense, gray, clayey sand. (SC)</td>
<td>4-3-5-4</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>Firm, brown, clay. (CH)</td>
<td>6-7-12</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Soft. 86.5% &lt;#200 sieve.</td>
<td>3-2-4</td>
<td>6</td>
</tr>
<tr>
<td>17</td>
<td>Firm.</td>
<td>2-1-2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Stiff, gray, with sand.</td>
<td>2-3-4</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-4-5</td>
<td>9</td>
</tr>
</tbody>
</table>

BORING LOCATION: Wet Well, 27deg 58.406'N, 82deg 27.35'W

REMARKS: Safety Hammer Used. Water table was encountered at 4 feet bgs.
**STANDARD PENETRATION TEST**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Very loose, very dark gray, silty sand. (SM) 15.1% &lt;#200 sieve. Organic Content = 6.3%</td>
</tr>
<tr>
<td>2</td>
<td>Loose, brown, sand. (SP) With silty sand.</td>
</tr>
<tr>
<td>12</td>
<td>Gray. Medium dense.</td>
</tr>
<tr>
<td>12</td>
<td>Medium dense, gray, slightly silty sand. (SP-SM)</td>
</tr>
</tbody>
</table>

**BORING LOCATION:** Top of bank of lake near proposed inlet. 27°58.4'N, 82°27.338'W

**BORING NUMBER** B-2  
**DATE DRILLED** 1/31/2017  
**PROJECT NUMBER** 12883.1  
**PROJECT** Robles Park Wet Well

**REMARKS:** Safety Hammer Used. Water table was encountered at 4 feet bgs.
Very loose, grayish brown, sand with shell fragments near the surface. (SP)

Gray.

Grayish brown.

**STANDARD PENETRATION TEST**

<table>
<thead>
<tr>
<th>BORING LOCATION:</th>
<th>Janette Street, 39.5 feet east of HA-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORING NUMBER</td>
<td>HA-1</td>
</tr>
<tr>
<td>DATE DRILLED</td>
<td>1/31/2017</td>
</tr>
<tr>
<td>PROJECT NUMBER</td>
<td>12883.1</td>
</tr>
<tr>
<td>PROJECT</td>
<td>Robles Park Wet Well</td>
</tr>
<tr>
<td>REMARKS:</td>
<td>Water table was encountered at 4 feet bgs.</td>
</tr>
</tbody>
</table>

**TEST BORING RECORD**

MEG
Very loose, gray, sand with shell fragments near the surface. (SP)
### Description

- Very loose, grayish brown, sand with shell fragments near the surface. (SP)
- White.
- Gray.

### Test Boring Record

**BORING LOCATION:** Janette Street, 53.5 feet east of HA-4

**BORING NUMBER:** HA-3

**DATE DRILLED:** 1/31/2017

**PROJECT NUMBER:** 12883.1

**PROJECT:** Robles Park Wet Well

**REMARKS:** Water table was encountered at 5 feet bgs.
Very loose, gray, sand with trace shell fragments near the surface. (SP)

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
<th>Blows</th>
<th>N-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Light gray.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Dark gray.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STANDARD PENETRATION TEST**

**BORING LOCATION:** Janette Street, 37.5 feet east of HA-5.

**MEG WITH BLOW COUNTS**

**BORING NUMBER** HA-4
**DATE DRILLED** 1/31/2017
**PROJECT NUMBER** 12883.1
**PROJECT** Robles Park Wet Well

**REMARKS:** Water table was encountered at 6 feet bgs.
Very loose, grayish brown, sand with shell fragments near the surface. (SP)

Light gray.

Very loose, dark brown, slightly silty sand. (SP-SM)

BORING LOCATION: Janette Street. 6 feet east of edge of pavement of N. Jefferson St.

BORING NUMBER: HA-5
DATE DRILLED: 1/31/2017
PROJECT NUMBER: 12883.1
PROJECT: Robles Park Wet Well

REMARKS: Water table was encountered at 5 feet bgs.
## REPORT OF HAND AUGER/TEST PIT LOG

<table>
<thead>
<tr>
<th>Depth (Inches)</th>
<th>Soil Description</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 6</td>
<td>Brownish gray (10YR-5/2) sand.</td>
<td>SP</td>
</tr>
<tr>
<td>6 – 12</td>
<td>Brownish gray (10YR-5/2) and very pale brown (10YR-8/2) mottled sand.</td>
<td>SP</td>
</tr>
<tr>
<td>12 – 28</td>
<td>Black (10YR-2/1) slightly organic, slightly silty sand.</td>
<td>SP-SM</td>
</tr>
<tr>
<td>28 – 40</td>
<td>Gray (10YR-4/1) to Dark Gray (10YR-3/1) sand.</td>
<td>SP</td>
</tr>
<tr>
<td>40 – 48</td>
<td>Brown (10YR-4/3) sand.</td>
<td>SP</td>
</tr>
</tbody>
</table>

**Water Table Depth:** 48 inches  
**Estimated SHWT:** Not readily apparent, but use 1' bgs for design.  
**Approximate Elevation:** 27.5 feet
### ASTM C117-13 MOISTURE / PERCENT < No. 200 SIEVE

**Project Number:** 12883.1  
**Project Name:** Robles Park Wet Well  
**Project Location:** Tampa  
**Client:** C.O.T Storm Water  
**Date Tested:** 2/2/2017  
**Tested By:** Doug P.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Cont Name</th>
<th>W_C + S_W (g)</th>
<th>W_C + S_D (g)</th>
<th>W_C (g)</th>
<th>Solids Content (%)</th>
<th>Moisture Content (%)</th>
<th>W_C + S_R (g)</th>
<th>&lt;#200 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1 0-2'</td>
<td>X-21</td>
<td>178.36</td>
<td>135.63</td>
<td>7.46</td>
<td>75.0%</td>
<td>33.3%</td>
<td>115.52</td>
<td>15.7%</td>
</tr>
<tr>
<td>B-1 23.5-25'</td>
<td>X-22</td>
<td>163.77</td>
<td>110.16</td>
<td>7.49</td>
<td>65.7%</td>
<td>52.2%</td>
<td>21.41</td>
<td>86.4%</td>
</tr>
<tr>
<td>B-2 0-2'</td>
<td>X-26</td>
<td>161.92</td>
<td>111.69</td>
<td>7.46</td>
<td>67.5%</td>
<td>48.2%</td>
<td>95.92</td>
<td>15.1%</td>
</tr>
</tbody>
</table>

**Formulae:**

- Solids Content (%) = \( \frac{S_D}{S_W} \times 100 \)
- Moisture Content (%) = \( \frac{W_{H_2O}}{S_D} \times 100 \)
- < # 200 Sieve (%) = \( \frac{(S_D - S_R)}{S_D} \times 100 \)

\( W_C \rightarrow \) Weight of Container  
\( S_W \rightarrow \) Weight of Wet Sample  
\( S_D \rightarrow \) Weight of Dry Sample  
\( S_R \rightarrow \) Weight of Sample Retained
## AASHTO T267 ORGANIC CONTENT

<table>
<thead>
<tr>
<th>Sample</th>
<th>Cont. ID</th>
<th>WC + SW (g)</th>
<th>WC + SD (g)</th>
<th>WC (g)</th>
<th>Solids Content (%)</th>
<th>Moist. Content (%)</th>
<th>FC ID</th>
<th>WC + S (g)</th>
<th>WC + SFD (g)</th>
<th>WC (g)</th>
<th>Organic Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1 0-2'</td>
<td>X-17</td>
<td>96.97</td>
<td>65.26</td>
<td>7.55</td>
<td>64.5%</td>
<td>54.9%</td>
<td>E</td>
<td>135.11</td>
<td>122.00</td>
<td>77.40</td>
<td>22.7%</td>
</tr>
<tr>
<td>B-2 0-2'</td>
<td>X-18</td>
<td>112.49</td>
<td>89.09</td>
<td>7.54</td>
<td>77.7%</td>
<td>28.7%</td>
<td>B</td>
<td>158.29</td>
<td>153.17</td>
<td>76.71</td>
<td>6.3%</td>
</tr>
</tbody>
</table>

\[
 WC = \text{Weight of Container} \\
 SW = \text{Weight of Wet Sample} \\
 SD = \text{Weight of Dry Sample} \\
 WC = \text{Weight of Furnace Container} \\
 SFD = \text{Weight of Furnace Dried Sample} \\

\[
 \text{Solids Content (\%)} = \frac{SD}{SW} \times 100 \\
 \text{Moisture Content (\%)} = \frac{(SW - SD)}{SD} \times 100 \\
 \text{Organic Content (\%)} = \frac{(SD - SFD)}{SD} \times 100
\]
LIMEROCK BEARING RATIO FM 5-515

Project Number: 12883.1  
Project Name: Robles Park  
Project Location: Hillsborough  
Client: City of Tampa

MEG Report Number: 12883.1-LBR001  
Date Sampled: 2/6/2017  
Date Finished: 2/9/2017  
Technician: MAS

Sample Number: LBR001  
Soil Description: Dark brown slightly silty sand w/trace organics

Sample Location: N:27.97349 W:82.42603  
AASHTO Code: N/A  
Mold Diameter: 6.0 inch

Moisture/Density Relationship

<table>
<thead>
<tr>
<th>Moisture Content (%)</th>
<th>Optimum Moisture</th>
<th>Max Dry Density</th>
<th>LBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0%</td>
<td>14%</td>
<td>101</td>
<td>15</td>
</tr>
<tr>
<td>8.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dry Unit Wt v Moisture

LBR Value v Moisture