May 19, 2016

Jose DeJesus, P.E.
Port Tampa Bay
1101 Channelside Drive
Tampa, Florida 33602

E: jdejesus@Tampaport.com

Re: Geotechnical Engineering Report
Kracker Avenue east of US 41
Gibsonton, Hillsborough County, Florida
Terracon Project No: H4155066

Dear Mr. DeJesus:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. Services were performed in general accordance with our proposal number PH4150187 dated July 1, 2015. This geotechnical engineering report presents the results of our analysis and recommendations for the design and construction of Kracker Avenue east of US 41 in Gibsonton, Florida.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

[Signature]

[Stamp: Professional Engineer]

[Stamp: Florida Department of State]

Stephen C. Knauss, P.E., P.G.
Senior Engineer
FL Registration No: 28202

Keith D. Bennett, P.E.
Senior Engineer
FL Registration No: 33075

Terracon Consultants, Inc.
504 E. Tyler Street
Tampa, Florida 33602
P (813) 221 0050 F (813) 221 0051 terracon.com
1.0 INTRODUCTION

A geotechnical engineering report has been completed for the flexible pavement design of Kracker Avenue in the Gibsonton area of Hillsborough County, Florida. The site is shown on the Topographic Vicinity Map included as Exhibit A-1 in Appendix A. Previously, auger borings, standard penetration test (SPT) borings and roadway cores were conducted along Kracker Avenue and a report dated December 8, 2015, was prepared by Terracon. That report noted that the existing pavement consisted of 5 to 7.5 inches of asphalt pavement with no apparent base material. It is our understanding that a flexible pavement is to be constructed.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- pavement design
- construction recommendations

2.0 PROJECT INFORMATION

2.1 Project Description

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Proposed construction</td>
<td>The proposed construction will consist of the rebuilding of Kracker Avenue from US 41 to about ¼ mile east of US 41. The existing asphalt pavement will be removed, the roadway subgrade replaced as necessary and a flexible pavement constructed with the existing grade maintained.</td>
</tr>
<tr>
<td>Traffic Loads</td>
<td>A projected Average Daily Traffic (ADT) and percentage of trucks was provided by Port Tampa Bay.</td>
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</table>
2.2 Site Location and Description

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>Location</td>
<td>Kracker Avenue is located to the north of the Port Redwing facility of the Tampa Port Authority in the Gibsonton area of Hillsborough County, Florida. It extends to the east and west of US 41, but this pavement design is limited to the section to the east of US 41. Exhibit A-1 in the Appendix shows the site location utilizing the USGS Gibsonton and Riverview, Florida quadrangle maps.</td>
</tr>
<tr>
<td>Existing Improvements</td>
<td>Kracker Avenue is a narrow, two lane asphalt paved roadway.</td>
</tr>
<tr>
<td>Existing topography</td>
<td>The USGS quadrangle maps Gibsonton, Florida, photorevised 1998 and Riverview, Florida, photorevised 1987, depicts the area as flat. Contour elevations indicate the ground surface elevation at the site to be approximately +5 feet as referenced to the National Geodetic Vertical Datum (NGVD 1929).</td>
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3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

For the December 8, 2015 exploration, two roadway cores, two standard penetration test (SPT) borings and six hand auger borings were conducted. Based on that work, the subsurface conditions are summarized as follows:

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Approximate Depth to Bottom of Stratum</th>
<th>Material Description</th>
<th>Consistency/Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement</td>
<td>N/A</td>
<td>5 to 7.5 inches asphaltic concrete</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>1.5 feet to termination of the borings at 15.5 feet</td>
<td>Poorly graded fine sand (SP), fine sand with silt (SP-SM) and silty sand (SM)</td>
<td>Loose to medium dense</td>
</tr>
<tr>
<td>2</td>
<td>Termination of the borings at 3.5 feet to 6 feet</td>
<td>Fine sand with clay (SP-SC) and clayey sand (SC)</td>
<td>Loose</td>
</tr>
<tr>
<td>3</td>
<td>Termination of the borings at 5 to 15.5 feet</td>
<td>Poorly graded fine sand (SP) and fine sand with silt (SP-SM)</td>
<td>Loose</td>
</tr>
</tbody>
</table>
3.2 Groundwater

The boreholes were observed during drilling for the presence and level of groundwater. Groundwater was observed at depths ranging from 1.1 to 3 feet in the hand auger borings. The groundwater level was not noted in the SPT borings.

4.0 RECOMMENDATIONS FOR PAVEMENT DESIGN AND CONSTRUCTION

4.1 Traffic Analysis

In preparing this report, we were provided with Traffic Study prepared by Jose DeJesus of Port Tampa Bay.

Traffic data was provided in Average Daily Traffic (ADT) and this data was converted to Equivalent 18 kip Single Axle Loads (ESAL’s). In accordance with FDOT procedures, the following equation was used:

\[
\text{ESAL}_D = \sum_{y=1}^{y=x} (\text{AADT} \times T_{24} \times D_F \times L_F \times E_{18} \times 365)
\]

Where:

\( \text{ESAL}_D \) = Number of accumulated 18-kip Equivalent Single axle Loads in the design lane for the design period.

\( y = \) The year the calculation is made for.

\( x = \) The Design Year

\( \text{AADT} = \) Average Annual Daily Traffic as provided by Port Tampa Bay.

\( T_{24} = \) Percent Heavy Trucks in 24 hour period as provided by Port Tampa Bay.

\( D_F = \) Directional Distribution Factor. Use 1 if data is for one-way traffic and 0.5 if data is for two-way traffic. As previously noted the traffic is essentially two-way.

\( L_F = \) Lane Factor converts directional trucks to design lane truck. Use 1.0 for 2 lane 2 way roads.
E_{18} = Equivalency Factor which is damage caused by one average heavy truck measured in 18-kip Equivalent Single Axle Loads. The Kracker Avenue roadway was considered to be an Arterial and with an rural section and a value of 0.96 was used.

The design calculations utilizing this methodology are included in the Appendix. The calculated values were rounded the nearest value shown in the FDOT design tables. Based on the analysis, the number of 18 kip ESAL’s for Kracker Avenue was:

<table>
<thead>
<tr>
<th>Calculated</th>
<th>Design value</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 kip ESAL</td>
<td>3.515 x 10^6</td>
</tr>
</tbody>
</table>

**4.2 Pavement Design**

Utilizing the traffic data developed, Terracon has prepared a flexible pavement design utilizing the design methodology presented in FDOT Flexible Pavement Design Manual dated March 2015.

Based on the soils exploration and our recommendations for construction presented in that report, we have utilized an subgrade LBR value of 20 for the design. For flexible pavement design, this value was equilibrated to a Resilient Modulus (M_R) value of 7,500 psi. Reliability, a measure of the probability that the design life will be achieved, typically ranges from 75% to 95%. We recommend that 90% be used and have used that value for the design. Due to the anticipated high seasonal high groundwater table, we recommend that a base that is relatively insensitive to deterioration by water be used. Thus, we recommend that crushed concrete or Caliche (Mexican) limestone be used for a base material. In addition, we recommend that the subgrade be stabilized using aggregate rather than a clayey soil for the same reason.

Based on our analysis, we recommend that one of the following designs be utilized for the roadway.

<table>
<thead>
<tr>
<th>Minimum Pavement Section (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asphalt Surface</strong></td>
</tr>
<tr>
<td>Alternative 1</td>
</tr>
<tr>
<td>Alternative 2</td>
</tr>
</tbody>
</table>

1. FDOT Asphalt mix SP 12.5.
2. Caliche limestone.
3. Crushed concrete (LBR ≥ 150).
4. Subgrade stabilized to ≥ 40.
5. Placed in lifts of 2 and 1½ inches.
6. Placed in a single 2½ inch lift.
The pavement analysis is included as Exhibit B-2 in Appendix B.

Note that due to the relatively high groundwater level at this site, we recommend that the Caliche limestone be used in lieu of Florida limestone because it does not break down when wetted, unlike the Florida limestone.

4.3 Earthwork

Initial site work will include demolition and removal of the existing pavement. The existing subgrade should be removed as necessary to achieve the finished grade. Suitable soils may be stockpiled for use as subgrade material. Any unsuitable material should be disposed off-site. Any existing underground utilities that will not be used in the new construction should be removed and backfilled or filled with an inert material.

Once subgrade removal has been completed, the exposed subgrade should be observed, tested, and proof-rolled utilizing a vibratory roller. The vibratory drum roller should have a minimum static weight of 20,000 pounds. At least 10 overlapping passes shall be completed in the roadway area. The proof-roll should continue until the exposed subgrade has achieved at least 95 percent of the material’s maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). Prior to proof-rolling, the subgrade soils should be moisture conditioned to within ±3 percent of the optimum moisture content. Proof-rolling aids in providing a firm base for compaction of new fill and delineating soft or disturbed areas that may exist at or near the exposed subgrade level. Proof-rolling should be performed in the presence of a Terracon representative to aid in evaluating unstable subgrade areas. Unstable areas observed at this time should be improved as recommended by the engineer based on field conditions and typically includes scarification and re-compaction or by undercutting and replacement with suitable compacted fill.

Once the exposed subgrade has been compacted, fill materials required can be placed and compacted in lifts not exceeding 12 inches in loose thickness. Unless otherwise specified, new fill materials required at the site should consist of approved materials, free of organic matter and debris. The fill should be non-plastic, with a fines content of less than 12 percent. The maximum particle size should not exceed 2 inches.

Engineered fill should meet the following material property requirements:

<table>
<thead>
<tr>
<th>Fill Type</th>
<th>USCS Classification</th>
<th>Acceptable Location for Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>General 1</td>
<td>SP, SP-SM or GP, GP-GM (fines content &lt; 12 percent, maximum particle size &lt; 2 inches, organic content &lt; 5 percent)</td>
<td>All locations and elevations</td>
</tr>
</tbody>
</table>

1. On-site soils of Stratum 1 meet these properties. Soils with fines content > 5 percent may retain
moisture and be difficult to compact and achieve specified density and stability. These soils may need to be maintained dry of optimum to properly compact.

4.3.1 Compaction Requirements

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fill Lift Thickness</strong></td>
<td>12 inches or less in loose thickness when heavy vibratory compaction equipment is used. Maximum particle size should not exceed 2 inches in a 12-inch lift. In excavations of limited size, lift thicknesses should be limited to 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used. Maximum particle size should not exceed 1 inch in a 4- to 6-inch lift.</td>
</tr>
<tr>
<td><strong>Minimum Compaction Requirements</strong></td>
<td>More than one foot below pavement subgrade elevation should be compacted to at least 95 percent of the maximum dry density as determined by the modified Proctor Test (ASTM D-1557). The upper one foot of pavement subgrades should be compacted to at least 98 percent of the maximum dry density as determined by the modified Proctor Test (ASTM D-1557).</td>
</tr>
<tr>
<td><strong>Moisture Content</strong></td>
<td>Within ±3 percent of optimum moisture content as determined by the modified Proctor test, at the time of placement and compaction</td>
</tr>
<tr>
<td><strong>Minimum Testing Frequency</strong></td>
<td>One field density test per 100 lineal feet of roadway (or fraction thereof) per lift.</td>
</tr>
</tbody>
</table>

1 We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate compaction limits have not been met, the area represented by the test should be reworked and retested as required until the compaction requirements are achieved.

4.3.2 Construction Considerations

Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be re-compacted prior to pavement construction.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Health and Safety Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required,
to maintain stability of both the excavation sides and bottom. All excavations should comply with
applicable local, state and federal safety regulations, including the current OSHA Excavation and
Trench Safety Standards.

The geotechnical engineer should be retained during the construction phase of the project to
observe earthwork and to perform necessary tests and observations during subgrade preparation;
proofrolling; placement and compaction of controlled compacted fills.

4.4 Temporary Dewatering

Dewatering may be needed to facilitate excavations and compaction operations for this
project. The necessity for dewatering will be dependent on the depth of excavation below
existing grade and the groundwater levels at the time of construction. Actual dewatering
means and methods should be left up to a contractor experienced in installation and
operation of dewatering systems. The contractor should provide a dewatering plan for
review and approval by the engineer prior to the installation of the dewatering systems.

5.0 GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained
from the borings previously performed and from other information discussed in this report. This
report does not reflect variations that may occur between borings, across the site, or due to the
modifying effects of construction or weather. The nature and extent of such variations may not
become evident until during or after construction. If variations appear, we should be
immediately notified so that further evaluation and supplemental recommendations can be
provided.

The scope of services for this project does not include either specifically or by implication any
environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or
prevention of pollutants, hazardous materials or conditions. If there is concern about the
potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the
project discussed and has been prepared in accordance with generally accepted geotechnical
engineering practices. No warranties, express or implied, are intended or made. Site safety,
excavation support, and dewatering requirements are the responsibility of others. In the event
that changes in the nature, design, or location of the project as outlined in this report are
planned, the conclusions and recommendations contained in this report shall not be considered
valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this
report in writing.
APPENDIX
SUPPORTING INFORMATION
Southport Warehouse
Kracker Avenue
Gibson, FL

504 E. Tyler St.
Tampa, FL 33602

Project No.: A4155066
Scale: 1"=24,000 SF
File Name: CAD
Date: 12/7/2015

Exhibit A-1
<table>
<thead>
<tr>
<th>Year</th>
<th>AADT</th>
<th>T24</th>
<th>Df</th>
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</tbody>
</table>

At 20 years 2035 ~3,515,801 → Use 3,500,000 ESAL's
From Traffic Analysis: 3,5 x 10^8 ESALs 2,174

Cut Traffic Level C

Use LBL 20 for S-6 Grade \( M_r = 7,500 \) psi.

Use Reliability of 90%

Use Table A.4A and Interpolate for \( M_n \).

\[
\begin{align*}
M_n &= 4.25 \\
M_n &= 7.5 \\
4.35 &< 4.19
\end{align*}
\]

For 300,000 to 3,500,000 ESALs:

MAX ASPHALT = 2" BASE GROUP 6

\[
4.25 = x(0.05) + y(0.04) + z(0.03)
\]

MAX 12" 5"x2" + 10" base

\[
4.25 = 12( 0.06 ) + 10( 0.03 ) + x( 0.04 )
\]

\[
x = 3.39 \text{ use 3.5" Asphalt}
\]

MAX 12" 5"x6" + 12" base

\[
4.25 = 12( 0.06 ) + 12( 0.03 ) + x( 0.04 )
\]

\[
x = 2.57 \text{ use 2.5"}
\]