ADDENDUM TO SCOUR EVALUATION REPORT

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 1
DISTRICTWIDE SCOUR EVALUATIONS
FAP NO.: N/A; FPID: 427343-1-72-01 (LOCAL OFF-SYSTEM BRIDGE)

WILFREDO ACEVEDO-DIAZ, P.E. PROJECT MANAGER

BRIDGE NUMBER: 014052
OWNERS: CHARLOTTE COUNTY
BRIDGE NAME: EISENHOWER DR. OVER CHESHIRE WATERWAY
LOCATION: 100 FT EAST OF MARCH DRIVE
COUNTY: CHARLOTTE

SCOUR VULNERABILITY

SCOUR MODE: ☐ Riverine ☒ Tidal ☐ Both
SCOUR CRITICAL: ☐ Yes ☒ No
SCOUR RATING: Scour Susceptible: ☐ Yes ☒ No
Low Risk: ☒ Yes ☐ No
Foundations: ☐ Known ☒ Unknown

BID CODING 17 (113) Scour Critical

Previous Current
U 8

RECOMMENDATION:
The bridge’s Scour Vulnerability Rating is Low Risk (Low Priority). As such, a Phase 2 Scour Evaluation is not recommended. Continued measurement of the bed cross-section is recommended as part of the scheduled bridge inspection program. A value of 8 is recommended for item 113 due to the bridge’s low potential for scour, stable cross-section, and sufficient computed embedment depth. Scour that has occurred at the bridge has been determined to be above the top of the footings.

☐ PHASE 1
QUALITATIVE EVALUATION/HYDRAULIC/HYDROLOGIC
ASSESSMENT
DATE: 11/30/1994
ADDENDUM: 12/08/2011

☐ PHASE 2
HYDRAULIC/HYDROLOGIC ASSESSMENT
DATE: _____

☐ PHASE 3
STRUCTURAL/GEOTECHNICAL ASSESSMENT
DATE: _____

☐ PHASE 4
PLAN OF ACTION
DATE: _____

CHECKED BY: MARK GOSSELIN, P.E., PH.D.
BACKCHECKED BY: MAX SHEPPARD, PH.D.
CORRECTED BY: TOM GLASSER, E.I.
APPROVED BY: MARK GOSSELIN, P.E., PH.D.

Ocean Engineering Associates, Inc.
1.0 PURPOSE

The purpose of this document is to revise the existing Phase 1 Scour Evaluation Report with the new information about the pile embedments (either located or developed) from the application of procedure for reclassifying bridges with unknown foundations. The recommendations developed in this document will supersede those from the original Phase 1 Scour Evaluation Report.

2.0 SUMMARY OF FINDINGS

The 1994 Phase 1 Scour Evaluation Report determined that Bridge Number 014052 is Scour Susceptible (Low Priority) due to foundations of unknown embedment, tidal waterway, erodible bed material, and documented scour. As a result of Step 5.2 of the procedure “Reclassifying Bridges with Unknown Foundations”, Tierra, Inc. has computed the minimum embedment depth at the time of construction of 16 ft. Analysis of the bridge’s cross-section from 1985 to 2009 in Step 6.1 of the procedure indicated a relatively stable cross-section, scouring only 0.3 ft over the duration of the measurements at only one bent. As a result of Step 6.1, the computed adjustment to the minimum embedment depth is -0.4 ft. This results in a 2011 minimum embedment depth for the bridge of 15.4 ft.

The bridge is supported by two spill-through abutments, protected by concrete slope paving. The 1994 field reviewer observed the abutment slope protection to be in good condition at the east abutment and fair condition at the west. The 2008 Bridge Inspection Report (BIR) documented the majority of the abutment slope protection as showing little or no deterioration. However, minor cracks were observed up to a ¼ in. wide in panels 1, 6, and 7 at Abutment 1 and in panels 4, 5, and 8 at Abutment 2. Some of the panels were fractured up to 3 in. wide and settlement has occurred to the panels located at the east abutment. The BIR recommended repairing all of the fractured and settled panels.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The Scour Vulnerability Rating for the bridge has been revised from Scour Susceptible (Low Priority) to Low Risk (Low Priority) as a result of the procedure for reclassifying bridges with unknown foundations. As per the 1994 Phase 1 Scour evaluation, observed flow through the bridge was low, the tidal range is low (<1 ft), and the waterway is categorized as nonaggressive. These characteristics indicate a Low Risk category bridge. It is rated as Low Priority because the computed embedment depth is deemed sufficient, the cross-section is stable, and the bridge’s low potential for scour.

Given a Scour Vulnerability Rating of Low Risk (Low Priority), a Phase 2 Analysis is not recommended for the bridge. Continued measurement of the bed cross-section is recommended as part of the scheduled bridge inspection program. A value of 8 is recommended for item 113 due to the bridge’s low potential for scour, stable cross-section, and sufficient computed embedment depth. Scour that has occurred at the bridge has been determined to be above the top of the footings.

4.0 REFERENCES

1994 Scour Evaluation Report – Phase 1
2008 Bridge Inspection Report

5.0 ATTACHMENTS

ATTACHMENT A ADJUSTED PILE EMBEDMENT WORKSHEET
ATTACHMENT B SUPPORTING STRUCTURAL AND GEOTECHNICAL DATA
1.0 Adjustment Justification

Bridge Number 014052 was built in 1972. The original design plans, pile driving logs and soil boring data are unavailable for this bridge. Analysis of the bridge’s cross-section from 1977 to 2009 indicates a relatively stable bed. The maximum scour that has occurred over the duration of the measurements is -0.8 ft at Bent 4 on the upstream side of the bridge in 2004. However, the bent aggraded 1.5 ft according to the 2008 measurements. The maximum net scour occurred at Bent 2 which experienced 0.3 ft of scour when comparing the 2008 measurements with the 1977 measurements. This equates to an annual erosional rate of -0.01 ft/year. Employing the annual erosional rate and extrapolating out over 8 years that data is missing (1972-1977 and 2009-2011) results in an additional -0.1 ft of scour. The computed adjustment to the minimum embedment depth Tierra, Inc. provided of 16 ft is therefore -0.4 ft. The resulting 2011 minimum embedment depth for the bridge is 15.6 ft.

<table>
<thead>
<tr>
<th>Bent</th>
<th>Embedment (ft)</th>
<th>Adjustment (ft)</th>
<th>Adjusted Embedment (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16</td>
<td>-0.4</td>
<td>15.6</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>-0.4</td>
<td>15.6</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>-0.4</td>
<td>15.6</td>
</tr>
<tr>
<td>5</td>
<td>16</td>
<td>-0.4</td>
<td>15.6</td>
</tr>
</tbody>
</table>

Table 1 Minimum Embedment Depths for Bridge 014052

Note: Embedment depths were not provided for the abutments
Figure 1  Sketch of Bridge 014052 from the 1994 Phase 1 Scour Evaluation Report
Figure 2  Upstream Cross-Section

Figure 3  Downstream Cross-Section
Figure 4  Upstream Bed Change

Figure 5  Downstream Bed Change
Table 2  Bed Cross-Section Measurements from the 1994 Phase 1 Scour Evaluation Report and the 2008 Bridge Inspection Report

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-17.7</td>
<td>-17.6</td>
<td>-17.4</td>
<td>-18.04</td>
<td>-18</td>
<td>-18</td>
<td>-18.2</td>
<td>-18</td>
</tr>
<tr>
<td>3</td>
<td>-22.1</td>
<td>-20.7</td>
<td>-21</td>
<td>-21</td>
<td>-20.7</td>
<td>-21.1</td>
<td>-21.2</td>
<td>-21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-18.6</td>
<td>-18.3</td>
<td>-18.3</td>
<td>-18.37</td>
<td>-18.5</td>
<td>-18.5</td>
<td>-18.5</td>
<td>-18</td>
</tr>
<tr>
<td>4</td>
<td>-21.9</td>
<td>-21.6</td>
<td>-21.4</td>
<td>-21.65</td>
<td>-21.4</td>
<td>-21.4</td>
<td>-21.4</td>
<td>-21.5</td>
</tr>
</tbody>
</table>
ATTACHMENT B  SUPPORTING STRUCTURAL AND GEOTECHNICAL DATA
Tierra

September 9, 2011

EC Driver & Associates, Inc.
500 N. Westshore Boulevard, Suite 500
Tampa, Florida 33609

Attn: Mr. Timothy J. Farrell, P.E.

RE: Scour Evaluation for Bridges with Unknown Foundations
    Work Authorization No. 8
    FPN: 427343-1-72-1
    Step 5.2
    Bridge Number 014052
    Eisenhower Drive over Cheshire Waterway
    Charlotte County, Florida
    Tierra Project No.: 6511-09-184

Mr. Farrell:

Tierra, Inc. (Tierra) has performed geotechnical engineering services consisting of evaluating the pile foundation embedment for the above referenced bridge structure. The services were performed in general accordance with the project Scope of Services and Step 5.2 of the “Procedural Manual: Reclassify Unknown Foundation Bridges”. Pile loads and sizes were provided by EC Driver & Associates, Inc. (ECDA)/URS. A review of existing bridge information and the results of Tierra’s evaluations are discussed herein.

Review of Existing Bridge Information

Partial bridge plans were available for review for this bridge, however no soil borings boring data or information on pile minimum tip was indicated. Based on the Comprehensive Inventory Data Report (CIDR) the existing bridge was constructed in 1972. The bridge structure is supported on 14-inch pre-stressed square concrete (PSC) piles. The design service loads for the existing piles were estimated by ECDA/URS to be 29 tons per pile. The results of the estimated design load using the PLOAD procedures by ECDA/URS are included in the Attachments.

Soil boring data and/or pile driving records were not available for review for the subject bridge. If plans and/or pile driving records become available, Tierra requests the information be provided for our review and to amend the estimated pile embedment depths in this report, if necessary.

Pile Foundation Embedment Estimate

Based on Tierra’s scope of services, the Geotechnical Method as defined in Step 5.2 of the “Procedural Manual: Reclassify Unknown Foundation Bridges” and the Allowable Stress Design (ASD) methodology were used to estimate the minimum pile embedment for the existing bridge.
Following Step 5.2 of the “Procedural Manual: Reclassify Unknown Foundation Bridges” and directives from the project team, “Standardized Curves” were used to estimate pile embedment depths since boring data was not available for this specific bridge. It should be noted that areas within Charlotte County are known to have an intermittent near-surface limestone layer colloquially known as “caprock”. If caprock and/or near-surface limestone is present at this bridge site, the “Standardized Curves” may provide unconservative pile embedment estimates. The standard curve for 14-inch piles is presented in the Attachments. The following table summarizes the results of the estimated pile embedments for the existing bridge.

<table>
<thead>
<tr>
<th>Bent Location</th>
<th>Pile Type and Size</th>
<th>Pile Design Load (tons)</th>
<th>Estimated Pile Embedment Depth From Standardized Curve (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate Bents</td>
<td>14” PSC</td>
<td>29</td>
<td>16</td>
</tr>
</tbody>
</table>

Since the existing bridge consists of concrete pile bents with concrete piles in a single row, the pile embedment estimate using the CPILE program is also required. ECDA/URS has completed the pile estimated embedment using the CPILE program. The results of the CPILE analyses indicated that the minimum pile embedment was estimated to be 32 feet. The results are included in the Attachments.

Based on Step 5.2 of the “Procedural Manual: Reclassify Unknown Foundation Bridges”, the smaller of the two pile embedment values estimated from both the Geotechnical Method and the CPILE program should be used as the pile embedment depth for the intermediate bent piles for the existing bridge. The following table summarizes the results of the final estimated pile embeddings for the existing bridge to be used in Step 6 of the “Procedural Manual: Reclassify Unknown Foundation Bridges”. Tierra understands that the final results will need to be concurred with by the District Geotechnical Engineer.

<table>
<thead>
<tr>
<th>Bent Location</th>
<th>Pile Type and Size</th>
<th>Estimated Minimum Pile Embedment Depth (Geotechnical Method) (ft)</th>
<th>Estimated Minimum Pile Embedment Depth (CPILE Method) (ft)</th>
<th>Final Estimated Minimum Pile Embedment Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate Bents</td>
<td>14” PSC</td>
<td>16</td>
<td>32</td>
<td>16</td>
</tr>
</tbody>
</table>
Scour Evaluation for Bridges with Unknown Foundations
Work Authorization No. 8
FPN: 427343-1-72-1
Step 5.2
Bridge Number 014052
Eisenhower Drive over Cheshire Waterway
Charlotte County, Florida
Tierra Project No.: 6511-09-184
Page 3 of 3

Tierra appreciates the opportunity to be of service to you. If you have any questions regarding this letter, please contact us at your earliest convenience.

Respectfully Submitted,

TIERRA, INC.

Joseph R. Antinori, P.E.
Geotechnical Engineer
Florida License No. 73176

Attachments: "Standardized Curve" for 14-in Piles
PLCAD and CPILE analyses performed by ECDA/URS
“Standardized Curve” for 14-in. Piles
Figure 1: 12 inch Piles - “Standardized Curve”

Figure 2: 14 inch Piles - “Standardized Curve”
PLOAD and CPILE analyses performed by ECDA/URS
STEP 5.1: ESTIMATE THE DESIGN PILE LOAD for RECLASSIFYING UNKNOWN FOUNDATION BRIDGES

BRIDGE NUMBER: 014052
COUNTY: CHARLOTTE
FACILITY CARRIED: EISENHOWER DR
FEATURE INTERSECTED: CHESHIRE WATERWAY
LOCATION: 100 FT EAST OF MARCH DR

Prepared By: T. Farrell 11/15/2010
Checked By: S. Chogle 11/18/2010

The following steps are based on Procedural Manual: Reclassify Unknown Foundation Bridges, FHWA & FDOT, November 2009.

STEP 5.1: ESTIMATE THE DESIGN PILE LOAD
Can the Design Pile Load be found in the Plans? No
Does the bridge include pile bents (bents with piles in a single row)? Yes
Is the pile height above ground significant? No
Can the bridge be defined by the classifications in Table 1? Yes

Estimating Pile Load Procedures (PLOAD)

Input Data:
Bridge Number: 014052
Pile Installation Year: 1972
Average Span Length: 26.0 ft.
Deck Width: 36.5 ft.
Bridge Material (Table 1): 1
Bridge Design (Table 1): 1
Pile Size 1: 14 in.
Pile Size 2: lb/ft
Number of Piles per Bent: 7
Pile Type (Table 1): 3

Output Results:
Pile Design Load = 29 tons (incl. 0.8 correction factor)

Reverse Engineering Procedure

Task 1: Data Gathering:
Data Gathered From (Check All That Apply):
- Plans or Sketches
- Inspection and Scour Evaluation Reports
- Site Visit

Structures Dimensions: See Attached Field Sketch or Copy of Plan Sheet(s)

Task 2: Determine Design Live Load for Pile Loads:
Is Design Live Load Available from Plans or Barrier End Post? If Yes, Design Live Load =
If No:
- For Bridges Constructed Before 1986, Design Live Load = H15
- For Bridges Constructed After 1986 and Before 2002, Design Live Load = HS20-44
- For Bridges Constructed After 2002, Design Live Load = HL-93

Design Live Load =

Task 3: Calculate Pile Loads:
Pile Design Load = _______ tons (Allowable Stress Design)

RESULTS OF STEP 5.1

PILE DESIGN LOAD = 29 tons (incl. 0.8 correction factor)
ANALYSIS PROCEDURE = PLOAD
PILE TYPE = Prestressed Concrete
PILE SIZE = 14 in.

Timothy J. Farrell, P.E.
PE Number 37264
<table>
<thead>
<tr>
<th>Brdg structnum</th>
<th>Pile yearbuilt</th>
<th>Average Span Length</th>
<th>Deck Width (ft)</th>
<th>Brdg Material</th>
<th>Brdg Design</th>
<th>Pile Size 1 (in)</th>
<th>Pile Size 2 (lb/ft)</th>
<th>Piles per bent</th>
<th>Pile Type</th>
<th>Notes</th>
<th>Errors and Warnings</th>
<th>Errors and Warnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>14052</td>
<td>1972</td>
<td>26.00</td>
<td>36.50</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brdg structnum</td>
<td>Pile yearbuilt</td>
<td>Average Span Length</td>
<td>Deck Width (ft)</td>
<td>Brdg Material</td>
<td>Brdg Design</td>
<td>Pile Tip Area (sq feet)</td>
<td>Piles per bent</td>
<td>Pile Type</td>
<td>Load with 0.8 correction factor (Tons)</td>
<td>Errors and Warnings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>-------------</td>
<td>------------------------</td>
<td>----------------</td>
<td>-----------</td>
<td>--------------------------------------</td>
<td>-------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14052</td>
<td>1972</td>
<td>26.00</td>
<td>36.50</td>
<td>1</td>
<td>1</td>
<td>1.36</td>
<td>7</td>
<td>3</td>
<td>29</td>
<td>Calculated on 15-Nov-2010 12:46:17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STEP 5.2: ESTIMATE THE PILE EMBEDMENT (CPILE)
for RECLASSIFYING UNKNOWN FOUNDATION BRIDGES

BRIDGE NUMBER: 014052
COUNTY: CHARLOTTE
FEATURE CARRIED: EISENHOWER DR
FEATURE INTERSECTED: CHESHIRE WATERWAY
LOCATION: 100 FT EAST OF MARCH DR

The following steps are based on Procedural Manual: Reclassify Unknown Foundation Bridges, FHWA & HDOT, November 2009.

STEP 5.2: ESTIMATE THE PILE EMBEDMENT (CPILE)

Is the bridge more than one span? Yes
Does the bridge include pile bents with piles in a single row? Yes
Are the piles concrete? Yes

USE CPILE PROCEDURE

Estimating Pile Embedment (CPILE)
Critical Bent Number = 4
Critical Pile Number = 7

Pile Input Data:
Bridge Number: 014052
Pile Installation Year: 1972
Design Load: 29 tons
Bent Station: 10078.00 (Assume Bridge Begins STA 100+00.00)
Pile Offset: 18.00 ft.
Pile Size: 14 in.
Pile Ground Elevation: 78.50 ft. (Assume Top of Rail EL 100.00)

Boring Input Data:
Bridge Number: 014052
Boring Station: 10078.00
Boring Offset: 18.00 ft.
Boring Ground Elevation: 78.50 ft.
Boring Layer Bottom Elevation: 0 ft.
Boring N Value: 12
Boring Soil Type (Table 2): 2

{No Boring Data. Use Soil Type 2 and SPT N value 12.}

RESULTS OF STEP 5.2

MINIMUM PILE EMBEDMENT FOR BRIDGE = 32 ft. (without correction)
MINIMUM PILE EMBEDMENT FOR EENT = 39 ft. (without correction)

ERRORS AND WARNINGS =
MINIMUM BENT EMBEDMENT STOPPED AT ROCK? =
MINIMUM BRIDGE EMBEDMENT STOPPED AT ROCK? =

Timothy J. Farrell, P.E.
PE Number 37264
<table>
<thead>
<tr>
<th>Bridge Structure</th>
<th>Pile Yearbuilt</th>
<th>Design Load (Tons)</th>
<th>Bent Station (ft)</th>
<th>Pile Offset (ft)</th>
<th>Pile Size (in)</th>
<th>Pile Ground Elevation (ft)</th>
<th>Bent ID</th>
<th>Notes</th>
<th>Warnings and Errors</th>
<th>Warnings and Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>14052</td>
<td>1972</td>
<td>30</td>
<td>10078</td>
<td>18</td>
<td>14</td>
<td>-3.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bridge Structure</td>
<td>Bore Station (ft)</td>
<td>Bore Offset (ft)</td>
<td>Bore Ground Elevation (ft)</td>
<td>Bore Layer Bottom Elevation (ft)</td>
<td>Bore Value</td>
<td>Bore Soil Type</td>
<td>Bore Layer</td>
<td>Warnings and Errors</td>
<td>Warnings and Errors</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>---------------------------</td>
<td>---------------------------------</td>
<td>------------</td>
<td>----------------</td>
<td>------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>14052</td>
<td>10078</td>
<td>18</td>
<td>-3.25</td>
<td>-50</td>
<td>12</td>
<td>2</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bridge number</td>
<td>Pile year built</td>
<td>Design load (Tons)</td>
<td>Bent station (ft)</td>
<td>Pile size (in)</td>
<td>Minimum per bent without correction (ft)</td>
<td>Minimum per bridge without correction (ft)</td>
<td>39</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>---------------</td>
<td>-----------------------------------------</td>
<td>-------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>14052</td>
<td>1972</td>
<td>30</td>
<td>10078.00</td>
<td>14.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>