GCME

Memo

To: Ms. Soheila Sadough, P.E.

From: Partha Ghosh, P.E.

Date: January 21, 2020

Re: **State Road A1A Bridge over Sebastian Inlet Replacement Feasibility Assessment; CA322-TWO-006**

The information provided by your office was reviewed and analyzed for the subject project, and our evaluations are provided for your immediate use:

1. Exiting Information provided by your office:

   - As-built - Bridge Repair 2003
   - Bridge As-built – 1963
   - Bridge As-built - 1978

2. USCS Soil Report (Ref: Appendix – A)

   Research of the U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS) Soil Survey of the Brevard County and Indian River County area indicates the presence of different soil map units along the roadway sections. The soil map units present along the project corridor are described in details in Appendix – A.

   Based on the soil map, there is no unsuitable soils in the area.

3. Existing Soil Profiles (Ref: Appendix – B)

   The existing bridge borings on land were drilled 70 feet to 85 feet below ground surface. The existing bridge borings in water were drilled 40 feet to 45 feet below mudline.

   The profiles generally indicated the site to be underlain with the interlayering of sands with shells to about elevation -5 feet, followed by interlayering of coquina rock and shell marl and limestone to about elevation -50 feet. The subsoils encountered plastic clay soils to about elevation -60 feet, and then followed by sands with shells to termination depths of exploration.

4. 18 and 24 – inch PSC Pile Capacity (Ref: Appendix - C)

   We have considered 18-inch and 24-inch square, precast concrete piles of various lengths in order to provide a range of design compressive capacities. The capacities were estimated from a computer-generated analysis based on a method to predict Davisson vertical pile capacity versus depth in sand. Computer program "FB-Deep Version 2.06" developed by Florida Bridge Software Institute, University of Florida was utilized to perform the axial capacity analysis of the driven concrete piles. The analysis was done for two (2) representative existing boring drilled at the project site. The capacities (program outputs) for 18-inch and 24-inch square piles with reference to pile tip elevations at the boring locations for the bridge site are graphically presented in Appendix C.

5. 48 and 60 – inch Drilled Shaft Capacity (Ref: Appendix - D)

   Drilled cast-in-place straight-sided concrete shafts are also a technically feasible foundation alternative for the project. Installation procedures for drilled shafts in cohesionless soils normally involve helical auger drilling in combination with bentonite slurry and sometimes steel casing for stabilization of borehole walls. Drilled shaft diameter 4 and 5 feet were considered for our analysis. Vertical (axial) capacity of drilled shafts is normally obtained through a combination of side shear and end bearing.

   The ultimate vertical capacities were calculated by utilizing the computer program "FB-Deep, Version 2.06" developed by Florida Bridge Software Institute, University of Florida. The analysis was done using SPT N-values and subsoil information developed for two (2) representative existing boring drilled at the bridge site and with varying shaft lengths in order to provide a range of design compressive capacities.

   The ultimate capacities for 48-inch and 60-inch diameter drilled shafts are graphically presented in Appendix D. The drilled shaft length mentioned in our analysis results indicates shaft length embedded in the ground at two (2) respective bridge boring location.

   Thank you.