

# **REQUEST FOR PROPOSALS**

**LTRC No. 18-1GT, SIO No. DOTLT1000208**

## **ANALYSIS OF DRIVEN PILE CAPACITY WITHIN PRE-BORED SOIL**

### **PROBLEM STATEMENT**

Pre-boring is a method used to facilitate large displacement pile driving in hard/dense soils. By pre-boring a pilot hole, the end bearing and side friction within the pre-bore zone are reduced, thus aiding pile driving installation. However, pre-boring complicates (a) the prediction of long-term pile capacity (specifically side friction) within the pre-bored zone and (b) the Wave Equation Analysis of Pile (WEAP) analysis, which aims to predict pile drivability.

There are in general three major unknowns that accompany the pre-bored zone: (1) Reduction of end bearing as it pertains to pile driving within the zone, (2) reduction of side friction as it pertains to pile driving within the zone, and (3) reduction of side friction as it pertains to long-term pile capacity within the zone. It is assumed that long-term end bearing within the pre-bored zone will not be an issue, as specifications prohibit predrilling to the tip elevation. It is expected that the relative strength of the soil as well as the diameter of the pilot hole relative to the pile will have an impact on pile drivability and its long term capacity. Quantifying such an impact will greatly help geotechnical design engineers to understand the interactions among the factors of pre-boring, pile size, soil conditions, pile driving, etc.; and improve the design and construction qualities of pile foundations in hard/dense soils. As said, the geotechnical design section in the Louisiana Department of Transportation and Development (LADOTD) needs a feasible protocol that determines the reduction of side friction for pre-bore piles as it pertains to pile driving as well as long-term pile capacity within the zone. Due to the availability of field testing data, this study will be scoped with a numerical analysis approach.

### **OBJECTIVES**

The objective of this project is to develop a feasible protocol that determines the reduction factors of side friction for pre-bore piles as it pertains to pile driving as well as long-term pile capacity within the pre-bored zone. The research is anticipated to encompass, at a minimum, the following tasks:

#### **TASK 1 - Literature Review**

This will include a literature search of previous and on-going nationwide research projects and case studies on the subject. A search on the TRIS database is a minimum.

#### **TASK 2 – Work with Louisiana Construction Experts to Develop Analytic Models**

The research team is expected to work closely with the geotechnical engineers and staff of LADOTD to develop analytical models that represent the field conditions of Louisiana.

It is important for the research team to understand the current practice of using the pre-boring procedures in the Department to accomplish the study satisfactorily.

### **TASK 3 –Numerical Analysis**

The research team will conduct the numerical analyses on various scenarios for pre-bore piles with different soil conditions to determine the reduction factors of shear strengths caused by pre-boring. The project review committee (PRC) of this research project is seeking the insight of proposers on how best to achieve the research objectives. Proposers are expected to describe the details of a proposed numerical analysis that can be realistically accomplished within the constraints of available funds and contract time. Proposals must present the proposer's current thinking in sufficient detail to demonstrate their understanding of the problem and the soundness of their approach.

### **TASK 4 –Protocol to Determine the Reduction Factors of Side Friction for Pre-Bore Piles**

The research team will develop a feasible protocol that determines the reduction factors of side friction for pre-bore piles according to Louisiana's geological and geotechnical conditions using the analytical results obtained in Task 3.

### **TASK 5 – Implementation Guidelines**

The research team will work with the geotechnical engineers and staff of LADOTD to develop implementation guidelines, including real world examples if used in design phase and plans for future field testing and data collection so that the results of numerical analysis can be compared, verified, and improved further accordingly.

### **TASK 6 – Final Report and Technical Summary**

The research team will prepare a final report to document the entire research effort. The final report should include all the data, results, and recommendation generated by this study.

### **DELIVERABLES**

The proposal shall include project deliverables for appropriate tasks. Deliverables shall be due as defined in the proposal. The proposal shall include at a minimum the following deliverables:

- Task 1: Literature Review
- Task 5: Implementation Guidelines
- Task 6: Final Report, Technical Summary, and Summary Presentation

### **SPECIAL NOTES**

- A.** LTRC research projects will be conducted in accordance with the LTRC Manual of Research Procedures, 2016 edition.

([http://www.ltrc.lsu.edu/pdf/2016/LTRC\\_RESEARCH\\_MANUAL\\_FINAL.pdf](http://www.ltrc.lsu.edu/pdf/2016/LTRC_RESEARCH_MANUAL_FINAL.pdf))

- B.** Task descriptions are intended to provide a framework for conducting the research. Louisiana Transportation Research Center (LTRC) is seeking the insight of proposers on how best to achieve the research objectives. Proposers are expected to describe research plans that can be realistically accomplished within the constraints of available funds and contract time as highlighted on page 4. Proposals must

present the candidate's current thinking in sufficient detail to demonstrate their understanding of the problem and the soundness of their approach. **Any work that is anticipated to be required from LTRC or DOTD forces shall be specifically detailed in the proposal.**

- C. LTRC projects are intended to produce results that will be applied in practice. It is expected that the implementation of the results of this research into practice will evolve as a concerted effort during this project. The final report must contain an implementation plan to include, as a minimum, the following:
  - a. The "product" expected from the research;
  - b. A realistic assessment of impediments to successful implementation;
  - c. The activities necessary for successful implementation; and
  - d. The criteria for judging the progress and consequences of implementation.
- D. To assist in the implementation process, the investigators of this research shall present the results to LA DOTD/LHSC officials in an oral presentation to be held in Baton Rouge, Louisiana at LA DOTD Headquarters after acceptance of the final report.
- E. The proposal should include travel to meet with the Project Review Committee for a "kick off" meeting, presentation of interim report, and presentation of the final report at a minimum. Funds budgeted for travel shall be limited to what is necessary for the conduct of the research. Funds shall not be budgeted for conference travel. Funding for technology transfer of research results are available upon request subject to LTRC approval and available funds.
- F. LTRC's mission includes the support of higher education in Louisiana. Consultant and out-of-state institutions submitting proposals are encouraged to cooperate and collaborate with Louisiana universities for the purpose of sharing of knowledge and increasing transportation expertise in the academic community.
- G. Graduate assistance stipends are allowed. Tuition reimbursement or tuition remission rates applied to stipends are not allowed.
- H. To equitably answer any questions regarding this Request for Proposals, the Louisiana Department of Transportation and Development (LA DOTD) website will be updated with questions and answers and related documents regarding the project.  
<http://webmail.dotd.louisiana.gov/agrestat.nsf/WebAdvertisements?OpenPage>  
LA DOTD makes these documents available for informational purposes only to aid in the efficient dissemination of information to interested parties. LA DOTD does not warrant the documents against deficiencies of any kind. The data contained within this web site will be periodically updated. Interested parties are responsible to be aware of any updates. Questions regarding this RFP should be submitted in writing to the LTRC contact person. Questions must be received by close of business seven calendar days prior to deadline date.
- I. Consultants and business entities shall be registered with the Secretary of State in order to be able to work in Louisiana prior to award of contract.  
<http://www.sos.la.gov/tabid/1011/Default.aspx>
- J. If Sub-Consultants/Entities are used, the Prime Consultant/Entity must perform a

minimum of 51% of the work for the overall project.

- K.** LTRC reserves the right to withhold invoice payments for delinquent deliverables as defined in the proposal.

**ESTIMATED COST OF RESEARCH**

\$130,000

**ESTIMATED COMPLETION TIME**

18 months: The draft final report is due 15 months after the initiation of the study. Last three months of the contract is for LTRC review and approval of the final report.

**LTRC PRIMARY CONTACT**

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**AUTHORIZATION TO BEGIN WORK**

August 1, 2017 (Estimated)

**PROPOSAL FORMAT**

All proposals are required to be formatted according to LTRC Manual of Research Procedures. Chapter 3 of that manual provides guidance on proposal development.

**PROPOSAL SELECTION**

The Project Review Committee selected for this project will review, evaluate, and rank all proposals received using the criteria established on the attached proposal review form.

**DEADLINE FOR RECEIPT OF PROPOSALS**

Ten copies of the proposal must be received by LTRC by the close of business June 30, 2017. Proposals to be submitted to:

Sam Cooper, Ph.D., P.E.  
Director  
Louisiana Transportation Research Center  
4101 Gourrier Ave.  
Baton Rouge, LA 70808