REQUEST FOR PROPOSALS

EVALUATION OF DESIGN METHODS TO DETERMINE SCOUR DEPTHS FOR BRIDGE STRUCTURES

PROBLEM STATEMENT

The most common cause of bridge failure is due to bridge scour of the foundation. Scour is a natural phenomenon caused by the erosive action of flowing water on sedimentary river beds. Failure of bridges due to scour at their foundations is a common occurrence. Approximately 575,000 bridges are built over waterways in the US. In 1993, the upper Mississippi flooding caused 23 bridge failures. In 1994, flooding in Georgia (Alberto storm) 500 bridges were scour damaged. Thirty-one (31) experienced 15-20 feet of scour. An FHWA study concluded that of 383 bridge failures, 25% involved pier damage and 72% involved abutment damage (Richardson *et al* 1993). Currently, Louisiana uses modeling software, HEC 18 and WSPRO, provided by the FHWA. Costs associated with current design methods that account for scour depths can be very high. Louisiana has developed and maintained a large database for a large number of bridge structures that are scour prone. Those bridges were monitored and hydraulic and hydrologic data collected. As the LRFD approach is being implemented, a large emphasis is placed on reliability of the estimated scour data and the actual time it takes to reach those estimated scour profiles since such data is needed for predicting pile length for those bridges. Different materials scour at a different rate, and because of this fact, HEC 18 does not always accurately predict the scour rate. A more reliable scour prediction is needed, especially for the clay and silty-clay soils common to Louisiana.

OBJECTIVE

The objective of this research is to develop a more reliable tool for scour and scour rate prediction. The scope of the project shall be limited to evaluation of "pile bent" supported bridges (i.e., bridges with footings will not be included in this study). Specific objectives include analysis of historical scour data vs. current LADOTD prediction methods (HEC 18) and evaluation of alternative design methodology for prediction of bridge scour.
It is anticipated that the research will encompass at minimum the following tasks:

Task 1 Perform an extensive literature search to identify all potential technology available in predicting bridge scour, scour rate, and time to scour. Review should include state-of-practice of alternative method used in other state DOTs.

Task 2 Using data from the LA DOTD bridge scour database and the current LADOTD prediction methods, compare historical scour data to predicted scour results for selected structures. It is anticipated that soil type will be the key variable in this

study. Structures should be selected based on variable soil types as available in the LADOTD bridge scour database (Sand, Clay Sand, Clay, Stiff Clay, Soft Clay, and Silty-Clay).

Task 3 Submit a summary report within the first 6 months of the study. . The summary report shall document the work performed in Task 1 and 2 and include recommendations for alternative methodology and a plan for evaluating such methodology. The report shall include any requirements needed for field measurements, laboratory analysis, and software that may be required to complete in task 4 and 5. Invoice amounts for Tasks 1 – 3 will be limited to a maximum of 20% of the project budget. The researchers shall not proceed beyond this limit without written approval from LTRC.

Task 4 Evaluate alternative methodologies for scour prediction methods as approved by the PRC. Scour prediction results shall be compared to historical field data for reliability.

Task 5 Perform a cost- benefit analysis of implementing the new scour prediction methodology into standard practice for LADOTD. Results shall include recommendations for structure size, channel flow and soil characteristics that would provide a cost saving by implementation of new methods.

Task 6 Prepare a final report documenting the entire research effort. Based on the performed work, the final report should include guidelines regarding the application and/ or limitation of such methods on new and existing structures.

SPECIAL NOTES

A. Task descriptions are intended to provide a framework for conducting the research. LTRC is seeking the insights of the researchers on how best to achieve the research objectives. Researchers are expected to describe research plans that can realistically be accomplished within the constraints of available funds and contract time. Proposals must present the researchers' current thinking in sufficient detail to demonstrate their understanding of the problem and the soundness of their approach.

B. A detailed work plan for Task 4, 5 & 6 will be developed in Task 3. However, proposals must include a tentative plan for those tasks. (i.e. type of field (and laboratory) tests, analysis techniques, and other details) **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 an implementation plan for moving the results of the 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 researcher shall be prepared to present the final results to DOTD officials in an oral presentation to be held in Baton Rouge DOTD Headquarters after acceptance of the final report. One workshop will be provided to DOTD engineers and consultants in order to familiarize them with the findings and recommendations (this will be based on the PRC's recommendations).

E. The successful investigators will be required to complete an LTRC course on Microsoft Wood for LTRC report formatting.

DELIVERABLES

- Summary Report and work plan documenting results of Tasks 1 and 2.
- Final report with recommendations to the LADOTD for scour prediction.
- Presentation to PRC on findings.

ESTIMATED COST OF RESEARCH

$ 200,000

ESTIMATED COMPLETION TIME

24 Months ***(includes one month for review and approval of interim report and three months for review and approval of final report - i.e. final report due 21 months)***

LTRC PRIMARY CONTACT

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AUTHORIZATION TO BEGIN WORK:

January 2009 (Estimated)

PROPOSAL FORMAT

All proposals are required to be formatted according to LTRC Manual of Research Procedures. Chapter 2 provides guidance on proposal development. A copy of the Manual may be downloaded from our website (http://www.ltrc.lsu.edu/publications.html).

PROPOSAL SELECTION

The Project Review Committee selected for this project will review, evaluate and rank all proposals received using the criteria established on the LTRC proposal review form. (http://www.ltrc.lsu.edu/publications.html).

DEADLINE FOR RECEIPT OF PROPOSALS

Ten copies of the proposal must be received by LTRC by the close of business day December 1, 2008.

Proposals should be submitted to:

Mr. Harold R. Paul, P.E.
Director
Louisiana Transportation Research Center
4101 Gourrier Ave.
Baton Rouge, LA 70808