# SPR RESEARCH PROGRAM
# SECOND-STAGE PROBLEM STATEMENT
# FY 2009

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**I. PROBLEM NUMBER**

GHE-10-18

**II. PROBLEM TITLE**

Effect of implementation of the fluvial performance standard on maintenance of bridges and culverts

**III. RESEARCH PROBLEM STATEMENT**

The "fluvial performance standard", developed for the OTIA III Bridge Program Programmatic Biological Opinion and incorporated into SLOPES IV, sets a minimum opening width for bridges and culverts that is intended to protect channel processes and in-stream habitat. A concern with the imposition of this standard on all ODOT projects is the additional cost arising from having to build longer bridges and place abutment protection away from the actual channel. While these costs are being tracked, no analysis has been done of the potential benefits of longer bridges/wider culverts. For example, the frequency of sediment cleanout at inlets to culverts, removal of drift accumulation on bridge piers, and repair of scour at both culverts and bridges may, in some cases, be substantially reduced compared to bridges and culverts that do not meet the standards. Without this information any analysis of the true cost of implementing the fluvial performance standard will be incomplete and flawed.

**IV. RESEARCH OBJECTIVES**

This project would include a comparative study of types and frequency of maintenance actions and costs of those actions between bridges and culverts that meet the fluvial performance standard and those that do not. The objective is two fold. The primary objective is to determine the cost of maintaining bridges and culverts that are built to the fluvial performance standard as compared to those built according to the prior design standards. This would provide data to complement what is already known about the increased cost of the larger structures and the cost reductions due to streamlined permitting of the construction. The secondary objective is to begin the process of gathering data that will validate that the new standard is accomplishing its intended hydrologic/environmental objectives.

**V. WORK TASKS, COST ESTIMATE AND DURATION**

Accomplishing the objectives of this research project will first require examination of bridge and culvert plans to classify them as conforming to fluvial performance standards, conforming to the prior standards, or not conforming to standards. The members of the former two groups would constitute the study population. A sample of sites would be selected from this population for site visits to identify groups of bridges and culverts with similar stream conditions. From this information several sample groups would be identified with each having similar designs and streams.

The next task would be to compile a list of maintenance related issues that are likely to arise from impaired stream function. For example, the necessity to frequently remove debris of sediment from a culvert opening or a bridge deck is likely an indication of impaired function. For the members of the sample groups, maintenance records will be analyzed to determine what information is available to use for comparative metrics for the structures selected. Analysis would focus on determining if there is a substantial difference in maintenance requirements and costs given similar stream conditions. The metrics selected will possibly be a combination of qualitative, categorical, and quantitative.

Another approach here would be to develop a sample, from the population of all bridges or culverts, that has anomalously frequent stream function related maintenance issues and another sample that has anomalously infrequent maintenance issues of the same type. The physical attributes (as related to the fluvial performance

standard) of these two samples could then be compared. It is hoped, but not required, that there are structures that were built before OTIA III that none-the-less conform to the current fluvial performance standard so that maintenance records for a longer period of time will be available for that group. This research will need to also gather some basic data that will relate to the actual hydrologic performance of the bridge-stream system.

It is estimated that this project will require 18 months to complete at a cost of $82,000.

## VI. IMPLEMENTATION

The research results will guide ODOT in the continued use of, or modification to, the fluvial performance standard based on better understanding of its maintenance implications. The results will also begin to inform the process of validating other aspects of the cost-benefit equation for the fluvial performance standard and thereby influence future practice.

## VII. POTENTIAL BENEFITS

Future discussions on the requirements and use of the fluvial performance standard would be informed by actual performance data. A complete cost-benefit evaluation is important in evaluating the impact of environmental performance standards on transportation projects. If the fluvial performance standard is also saving ODOT in maintenance costs, that adds greater impetus to continue to finding benefits from streamlining through programmatic agreements. Conversely, if added maintenance costs are found, ODOT would be able to more accurately evaluate the cost-benefit of future programmatic streamlining and perhaps pursue more effective approaches. The maintenance issues themselves are often indicators of impaired stream function. The eventual assessment of the hydrologic/environmental benefits of the fluvial performance standard will also either better quantify some of the benefits of guide the path to correctly achieving the desired objectives.

## VIII. SUBMITTED BY

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