

**F-6**

**IIHR FLUME  
STUDY**

**SCOPE OF WORK  
(DRAFT 1)**

**rgaines**

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**From:** rgaines [rgaines@umr.edu]  
**Sent:** Wednesday, March 15, 2000 8:37 AM  
**To:** 'Maynard, Stephen T WES'  
**Cc:** 'Davinroy, Robert D MVS'  
**Subject:** Fixed-Flume\_ScopeofWork-Ver2



Fixed-Flume\_Scopeof  
Work-Ver2.d

Steve,

Here is a revised scope for the fixed-flume work. I've made changes based on our phone discussion. I haven't gotten any "written" comments/changes from anyone, so hopefully this will be OK with both you and Rob.

I'm sending this DRAFT to Dr. Smith at Univ. Memphis to facilitate discussion of what their capabilities/interests are.

Andy  
rgaines@umr.edu  
573-341-6751

**rgaines**

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**From:** rgaines [rgaines@umr.edu]  
**Sent:** Thursday, March 09, 2000 5:07 PM  
**To:** 'Davinroy, Robert D MVS'  
**Cc:** 'Maynord, Stephen T WES'  
**Subject:** RE: Vicksburg Front

Rob,

From the scales this is approximately a 10:1 Horiz./Vert. scale distortion, correct? What flows/velocities/Froude numbers were you running in the model versus the prototype numbers? I haven't had opportunity to process any of the data collected on Feb. 26th yet. Both "threads" appear similar. It appears that the prototype has a break toward the right bank after passing under the bridge, but the ADCP data doesn't extend far enough downstream to tell. Is there more ADCP data that could define this area? You should have that covered with the model photo. How do the lines you've drawn relate to each other when plotted on the same file?

Separate Note:

Since your phones are out, have you had an opportunity to look at what I sent earlier today? I'd like to talk to MVD about some of this (after getting your input) before E-Action next week.

Andy

-----Original Message-----

From: Davinroy, Robert D MVS  
[mailto:Robert.D.Davinroy@mvs02.usace.army.mil]  
Sent: Thursday, March 09, 2000 4:07 PM  
To: Maynord, Stephen T WES; 'rgaines@umr.EDU'  
Subject: Vicksburg Front

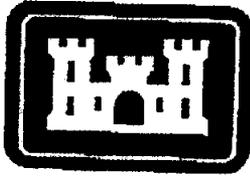
Research team,

Attached is a flow visualization comparison of the Vicksburg Model at Low Flow with the prototype ADCP data also taken at Low Flow. We "lightly seeded" the model to capture the main flowline through the bridge span. Compare the two flow threads and give me your comments. If you notice, both the model and prototype indicate that the main flow actually favors the right descending pier of the bridge span (although the prototype photo does not show the locations of the piers, we had other aeriels that pinpointed the locations, and the model pier locations are reflective of this).

If the Froude number is an issue, one would think that the jagged bankline and rock outcropping along the outside of the bend in the micro model would heavily influence the distribution of approach flow through the bridge. The flow does not appear to be negatively influenced.

Scale of the model is 1:12,400 horz, 1:1200 vert. Comments?

<<VicksburgFront.ppt>>



**US Army Corps  
of Engineers**  
St. Louis District

**Applied River Engineering Center**

Foot of Arsenal Street  
St. Louis, MO 63118  
Phone: (314) 263-4230  
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[www.mvs.usace.army.mil/river/river.htm](http://www.mvs.usace.army.mil/river/river.htm)

# Fax

To: <u>Andy Gaines</u>	From: <u>Dave Gordon</u>
Fax: <u>901-544-4102</u>	Pages: <u>5</u>
Phone: _____	Date: <u>1/4/99</u>
Re: _____	CC: _____

Urgent   
 For Review   
 Please Comment   
 Please Reply

• Comments: \_\_\_\_\_

**River Design for the 21<sup>st</sup> Century**

## SCOPE OF WORK

### Micro-Model Evaluation

#### FLUME STUDIES TO DETERMINE FRICTION FACTORS, SCALE EFFECTS, AND ~~TURBULENT ZONES~~

*redo* ↗

PROJECT AREA: The project consists of an evaluation of micro-model technologies as they pertain to model horizontal and vertical scale and scale distortion.

PROJECT DESCRIPTION: The project includes research efforts to establish applications and limitations of the micro-model technology. The proposed work includes fixed boundary flume experimentation.

PROJECT PURPOSE: The project would provide fundamental information necessary to establish applications suitable for micro-model methodology. Limitations on use of the micro-model concept would also result from the project.

SCOPE OF STUDIES: Studies would include two phases of fixed boundary flume research. The final objective of the proposed work is to obtain wall and bed roughness parameters for specified flow depths, discharges, and channel dimensions and to obtain detailed information regarding scale/experimental effects, fluid property effects, structure effects and velocity and velocity patterns.

Phase I includes basic flume experimentation utilizing the following parameters:

Phase Ia

- 1) Three Froude Numbers
- 2) Three flow depths for each flume
- 3) Two flume widths
- 4) One boundary Roughness

Phase Ib

- 5) Three flow depths for each flume
- 6) One Froude number
- 7) Four flume widths
- 8) Two boundary roughnesses

Phase Ic

- 9) One surfactant
- 10) One flume width
- 11) Three flow depths
- 12) Three Froude numbers
- 13) One boundary roughness

Phase II includes basic flume experimentation utilizing the following parameters:

Phase IIa

- 1) Three flow depths for each flume
- 2) One boundary roughness
- 3) Two flume widths
- 4) Three Froude numbers
- 5) Two structure lengths
- 6) Three structure materials

Phase IIb

- 7) One flow depth for each flume
- 8) Two flume widths
- 9) Three Froude numbers
- 10) One structure length
- 11) Two structure materials

Phase IIc

- 12) One surfactant
- 13) One flume width
- 14) Three flow depths
- 15) Three Froude numbers
- 16) One boundary roughness
- 17) One structure length
- 18) One structure material

Examples of data which would be accumulated and analyzed are: 1) highly precise flume bed slope; 2) Highly precise water surface elevations/slopes; 3) detailed descriptions of flow separation zones (including, but not limited to, transverse and lateral water surface slopes, separation dimensions, and flow patterns); 4) boundary shear stresses; and 5) fluid properties (including temperature, viscosity, and surface tension).

*calculate from flow parameters not measure*  
*add 5) surface velo & flow*

The expected output of these studies is a summary report that includes: a synopsis of collected data, an estimation of wall and bed friction factors, a tabulation of calculated flow parameters (such as slopes, velocities, discharges, Froude numbers, Reynolds numbers, boundary shear stresses), an indexed appendix of time-exposure photography to document surface flow patterns and surface velocities, a tabulation of information describing flow separation zones, and an evaluation of how that data is/is not impacted by scale and experimental effects.

*Add - all data and reports to be in hardcopy & digital formats on CD.*