

7301-EN-01

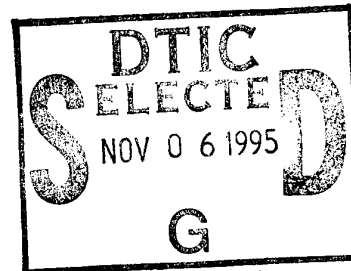
DTIC

**DEVELOPMENT OF AN INUNDATION MAPPING CAPABILITY USING  
HIGH RESOLUTION FINITE ELEMENT MODELLING**

by

**C. SMITH, P.D. BATES AND M.G. ANDERSON**

Interim Report 0004  
September 1995



United States Army

European Research Office of the U.S. Army  
London, England

**CONTRACT NUMBER N681710-94-C-9109**

Professor M G Anderson

Approved for Public Release: distribution unlimited.

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification .....	
By .....	
Distribution / .....	
Availability Codes	
Dist	Avail and/or Special
A-1	

19951101 014

DTIC QUALITY INSPECTED 8

## **MISSOURI RIVER FLOOD MODELLING PROJECT**

**Report no. 4: 1/10/95**

Professor Malcolm G. Anderson

*Department of Geography, University of Bristol, University Road, Bristol, BS8 1SS, UK.  
Tel: +44-117-929-7875 Fax: +44-117-928-7878*

---

### **SUMMARY**

This document reports results derived from dynamic simulations computed with a two dimensional finite element model of a 60 km reach of the Missouri River.

---

### **BACKGROUND**

The aim of this project is to undertake a feasibility study into the potential utility of integrating high resolution two dimensional finite element flow models and Geographical Information System technology.

The initial phase of this research concerns the construction of an operational high resolution flow model for a 60 km reach of the Missouri River between Gavins Point Dam and Maskell gauging station.

This report contains a brief review of progress on this work unit during months 8-12 of the research contract.

## **CURRENT POSITION**

A dynamic computation has been established for the two dimensional finite element model developed in the first 8 months of this project. From this simulation the following conclusions can be drawn.

- (i) The numerical model is computationally stable under dynamic flow conditions. This has not previously been demonstrated for river channel simulations over such long reach lengths and as such represents a significant achievement. This was anticipated in Report no. 3 (1/7/95) as if stable steady state conditions can be achieved it is likely that dynamic simulations will be relatively problem free. This is the case with the Missouri River model. We are thus in a position to move to validation of the hydraulic model, however a question arises concerning the current topographic representation (see Report no. 2: 1/5/95 and Report no. 3: 1/7/95). This has been developed using data from 37 surveyed cross sections and incorporates a number of interpolation uncertainties. For this reason a dynamic simulation using this topography may not establish realistic flow patterns in the developed model. This is particularly so if a validation of the developed model is attempted. We are therefore dependent on the supply of the LiDAR data set for model topographic parameterization if validation studies are to be meaningful.
- (ii) The scheme appears to function in a stable, mass conservative manner during dynamic simulations.
- (iii) The model is fully capable of simulating dry banks, tributary inflows and zones of recirculation.
- (iv) Computational requirements for the model will be high. This is a consequence of the large number of computational points used in the model and the length of the reach. This latter consideration is relevant if one wishes to simulate a complete flood wave passing through the reach.

During this period of research two other tasks have been completed. Firstly, USACE Missouri River District has been approached concerning gauge zero data and, secondly, USACE CRREL has been approached concerning the availability for use of the LIDAR high resolution topographic data set collected in late 1994.

## **FUTURE WORK**

Future work will consist of four main tasks:

1. Refinement and testing of the numerical model.
2. Development of validated dynamic simulations using available flow data once LIDAR topographic data becomes available.
3. Selection and development of a simple hydraulic model for the James River (see Report no. 2: 1/5/95).
4. Development of a numerical model/ ARC INFO GIS interface.