



Evaluation of Real-Time Bedload Transport Measurement Technique During High Flows

Description

MVP has contracted with the USGS for real-time monitoring of suspended-sediment concentrations, suspended sand load and bedload sediment on the lower Chippewa River, a major source and contributor of sand-sized sediment to the Upper Mississippi River (UMR). In this RSM effort, bedload measurements will be obtained using the ISSDOTv2 method to provide a comparison to the proposed USGS real-time bedload transport monitoring effort.



Issue/Challenge To Address

Sediment on the lower Chippewa River is a major source and contributor of sand-sized sediment to the Upper Mississippi River. In 2014, sediment deposition in the Upper Mississippi River navigation channel caused channel closures between Winona and Wabasha, Minnesota, delaying commercial navigation for a period of 3 weeks. This event was costly (millions of dollars per day) to both private industry and the federal government. Real-time monitoring of bed material (sand) loads can facilitate channel maintenance by reducing the uncertainty associated with the timing and magnitude of sediment transport. The St. Paul District has contracted with the USGS for real-time monitoring of suspended-sediment concentrations, suspended sand load and bedload sediment on the lower Chippewa River. The proposed methodology for bedload transport measurement is unique and has been used on gravel bed streams, but is not well validated for sand bed rivers. Concurrently with the USGS proposed approach, USACE-ERDC-CHL will conduct a series of multi-beam surveys over a range of medium to high flows in the vicinity of the USGS bed-load monitoring site. These data will be used with the ISSDOTv2 method to compute bedload transport across the channel that can be compared with the USGS values. The ISSDOTv2 method has been shown to provide consistent and reliable bedload measurements in riverine environments in which the predominant bedload transport mode is bed forms.



US Army Corps
of Engineers
Engineer Research and
Development Center

National Regional Sediment Management Program St. Paul District (MVP):



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Successes Lessons Learned

Lessons learned will be compiled during the duration of this study.

Expected Products

- Collected data and processed files from multi-beam survey data.
- Computed bed-load results from the ISSDOTv2 method.
- Final Report and Presentation.

Stakeholders/Users

Stakeholders include the St Paul District, US Geological Survey, and the Coastal and Hydraulics Lab at USACE-ERDC-WES, Vicksburg, MS.

Projected Benefits Value Added

The results of this study will validate an approach for real-time bedload transport monitoring being conducted by the USGS for MVP. This will provide MVP with significantly improved estimates of sediment loads on the lower Chippewa River, needed for UMR channel maintenance, including early warning of large sediment fluxes into the UMR from the Chippewa River. This study will provide benchmark data and state-of-the-science methods for monitoring bedload on small rivers. This proposal adds vital validation data for a lower cost real-time monitoring system that could be applied at other locations nationwide.

Leveraging Opportunities

The proposed project directly leverages an MVP project with the USGS. The USGS scope of work provides a real-time monitoring system for suspended and bedload transport. The USGS proposal recognizes the uncertainty associated with the bedload measurements and includes comparison to traditional quantification methods, including physical sediment samples. Physical sediment samples, however, are often difficult to obtain and inaccurate during higher flows when greater amounts of bedload transport are occurring. Under this proposal, this will be addressed by conducting multi-beam surveys and computing bedload measurements with the ISSDOTv2 method. ISSDOTv2 method has been validated with flume data and shown to provide consistent and repeatable bedload measurements. It has been successfully applied under high flow conditions on 6 major rivers in the United States at over 30 different sites.

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Participating Partners

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