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# Old River Control Complex Sedimentation Investigation

## Mississippi River Geomorphology and Potamology Report No. 6

An investigation of the Old River Control Complex (ORCC) was conducted to determine current rates of sediment diversion, evaluate potential impacts on the stability of the Mississippi River, and identify options to increase sediment diversion rates. The investigation was conducted via a combination of field data collection and laboratory analysis, geomorphic assessments, and numerical modeling.

The fraction of Mississippi River sediment diverted through the ORCC is a function of several factors, including the river discharge, the state of the river bed (i.e., bathymetry and bed material gradation), the shape of the hydrograph, and the distribution of flow allocated to each diversion structure: the Hydroelectric Station, the Low Sill Structure, and the Auxiliary Structure. This flow allocation among structures is of particular importance since each structure passes a different amount of sediment for the same diverted flow. Hence, changes in operations at the ORCC can have a significant impact on the amount of sediment diverted for a given water diversion.

## Sediment diversion efficiency

Differences in the sediment diversion efficiency of each structure are due primarily to their relative locations in river bends. The Hydroelectric Station diverts water from the outside of a river bend, where the sediment concentration is at a minimum (bed material load tends to be higher toward the inside of a bend). The Low Sill Structure is located at the transition between bends, and the Auxiliary Structure is located at the inside of the next downstream bend.

## AdH/SEDLIB numerical model

Bed material sediments, primarily sand in the Mississippi River, strongly influence the morphology of the channel; therefore, the diversion of bed material is the primary focus of this study. For a numerical simulation of January through September of 2010, the total mass of bed material diverted at the ORCC was 9.1 million tons. Based on an analytical estimate, the amount of bed material that must be diverted to maintain downstream equilibrium is 16.6 million tons. Hence, the excess bed material passed downstream for this simulation period is 16.6 – 9.1 = 7.5 million tons.

## Screening tool

To allow water control personnel to apply the results of this study to practical operational decisions, a spreadsheet application that estimates the sediment diversion efficiency of the complex has been developed whereby the results of the numerical model analysis can be used to experiment with changes in the ORCC operations.

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Report prepared for the Mississippi River Commission

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## Limited geomorphic assessment

Analysis of the comparative cross sections indicates a generally shallower river channel in 2010 than existed in 1975 for the reach just upstream of the Hydroelectric Station to just downstream of the Auxiliary Structure.

## Recommendations

To divert more sediment through the complex within current operational constraints, the recommended operation of the ORCC is to divert as much flow as possible through the Low Sill Structure during the rising limb of the hydrograph. During the peak and falling limb of the hydrograph, full flow capacity can be restored to the hydropower structure with remaining flow passing through the Auxiliary Structure.

### Summary of Significant Findings

- In order to have any significant impact on sediment diversion at the Old River Control Complex (ORCC), it is necessary to alter the operation of the Hydroelectric Station.
- As currently operated, the Low Sill Structure is the most efficient at transporting sediment to the Atchafalaya River side of the ORCC.
- The Auxiliary Structure is the most efficient at diverting sediment from the Mississippi River but tends to shoal as currently operated and therefore is less efficient at delivering sediment through the complex.
- The modeling analysis indicates that excess sediment is being passed downriver, and therefore, any mitigation of this excess sediment should either have a neutral or positive effect on flood stages.

## For More Information

To access the full version of *Old River Control Complex Sedimentation Investigation* report, click the following link: http://acwc.sdp.sirsi.net/client/en_US/search/asset/1045347.

Additional MRG&P reports, historic reports, and MRG&P information can be accessed from the MRG&P Publications and Technology Transfer website: http://www.mvd.usace.army.mil/Missions/MississippiRiverScienceTechnology/MSRiverGeomorphologyPotamology/PublicationsTechTransfer.aspx.

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