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**Title:** Graphical User Environment to Support Multi-Dimensional Sediment Models

**Topic Area:** Work Unit D3: Informatics Tools for System-Wide Numerical Simulation

**Objective:** Implement multi-dimensional sediment modeling capability within the Corps of Engineers Surface Water Modeling System (SMS), Watershed Modeling System (WMS), and Groundwater Modeling System (GMS). Informatic modeling tools developed herein and implemented in SMS, WMS, and GMS will support all local and global multi-dimensional sediment models produced by the RSM Research Program, the SMART research program, and some first generation models already in existence.

**Problem:** The Corps' SMS, WMS, and GMS modeling systems are widely distributed and used within the Corps and throughout the private sector. They are an integral part of the planning, engineering, and operations activities of the Corps of Engineers. As yet, they do not have sediment transport modeling capabilities.

**Benefits:** Fielding sediment transport modeling capabilities in these fielded and successful systems would immediately improve regional sediment management capabilities of the Corps. The hydroinformatic implementation of multi-dimensional sediment models developed by RSM will form the modeling framework with which complex sediment management simulations will be made. Many RSM decisions can only be based on accurate simulations of multiple sediment management decisions. Therefore, this informatic modeling capability is essential to Corps business practices. Technology transfer of products from this unit will be supported by the E4.2 work unit "Sedimentation Modeling Technical Support Center".

This work produces new tools and methods for the USACE and nation. It is an integral part of the Regional Sediment Management Research Program, and thus contributes primarily to support of the USACE's navigation, flood/storm damage reduction, and environmental protection and quality missions. It supports all 8 Civil Works strategic goals and 7 of 9 Listening Session objectives identified by HQUSACE as R&D priorities. With companion work units, it employs active technology transfer and insertion.

**Work Description:** There are a variety of sedimentation modeling tools that must be produced to support the models developed in the Modeling and Assessment Task area. The developed RSM models will provide 1-, 2-, and/or 3-dimensional depiction of sedimentation processes and sediment management

practices for the entire watershed from the uplands to the sea. A modification of the conceptual modeling approach used in the SMS, WMS, and GMS (Groundwater Modeling System) modeling systems will form the basis from which all input and output files for multi-dimensional models will be constructed and analyzed. A complete set of visualization and analysis tools will be produced to handle interpretations of model results. These will include such things as color shaded contours of erosion, deposition, suspended and bedload sediment concentrations, particle tracking, and statistical parameterization tools for different sediment classes. Impacts of sediment management operations such as Confined Disposal Facilities (CDFs) and dredged channels on groundwater resources will be addressed in detail. This is important since the groundwater impacts of sediment decisions can and will impact the viability of navigation channel operations.

The substantial investment already made in the Corps' SMS, WMS, and GMS systems will make possible a level of richness and productivity in the tools not possible if connections were made to more primitive or newly evolving informatic systems. In addition, the Corps is already trained to a large degree in the use of these systems so it will be an easy task to train the Corps on the use of new sedimentation improvements.

The first year of the effort will concentrate on generic analysis tools that all multi-dimensional models can use whether they are watershed, groundwater, riverine, estuarine, or coastal in nature. Then, first generation sedimentation models that already exist and are widely accepted will be supported with initial versions of model specific interfaces. As the RSM program proceeds, second generation models will be completed and will require model specific interfaces. A follow-on work unit will be required to produce the graphical user interface tools for these new models. There will be sufficient development time in the early years to allow builders of new models to understand the formats with which they need to write their codes to ensure productive graphical user interfaces and rapid technology transfer.

The construction and release of informatic products will depend on when sediment models are completed. The design document can be easily accomplished in the initial year. Generic visualization routines can be started quickly and will be used by all models in some fashion. The first generation sediment model GUIs (models that are currently in use) will be implemented first. A follow-on work unit will continue the work of this unit in producing GUI's for the second-generation models (new technology models developed in RSM).

### **Products:**

The primary products of this work will be improved graphical user environments to support RSM.

<u>Product</u>	<u>Schedule</u>
1. TN: Design Document for Implementing Generic Sedimentation Model GUIs	Q3/02
2. TN: Generic Visualization Routines for SMS, WMS, and GMS	Q4/02
3. Workshop for Prototype of First Generation Sedimentation Model GUI	Q4/03
4. TN: Complete Graphical User Interfaces for First Generation Models	Q4/04