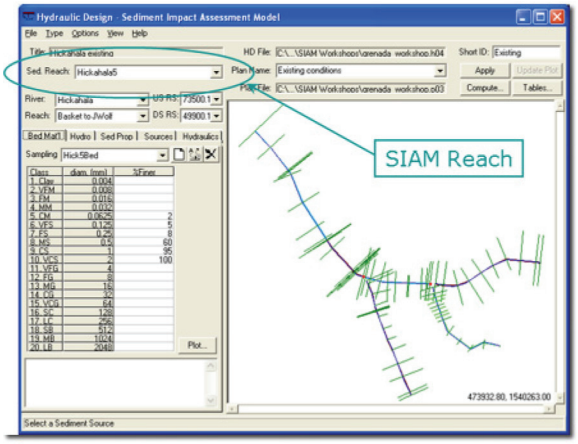
System-Wide Water SWWRP Resources Program

Sediment Impact Analysis Methods (SIAM)



Description: The Sediment Impact Analysis Methods (SIAM) is being developed as a one-dimensional (1-D) sediment continuity model that will provide the field with a useable tool for conducting rapid assessments and design of water resources projects. SIAM will provide a framework to combine channel morphological, hydrologic, and hydraulic information for a series of reaches representing a network of channels. The algorithms will use sediment continuity and the connectivity between reaches to evaluate the impact from local changes in flow and/or sediment inputs on the system. SIAM will develop a map of potential imbalances in a channel network to provide the first step in identifying design or remediation needs. A key component of SIAM will be its ability to track sediment through the system by grain size and to account for the spatial variations in the wash load/bed-material load thresholds. This will allow SIAM to not only quantify the bed material-driven morphologic impacts, but also to route the wash load through the system.

Application: Currently in beta release (HEC-RAS 4.0). Current test applications of SIAM include Yalobusha River (USACE, Vicksburg District), Arkansas River (USACE, Little Rock and Tulsa Districts), Toutle and Cowlitz Rivers (USACE, Portland District), and Hawkcombe Stream (University of Nottingham, UK).

Benefits: The current version of SIAM has been embedded in the Hydraulic Design Module of HEC-RAS. Currently six sediment transport functions are available for SIAM computations. SIAM can distinguish between wash load and bed-material load based on user-defined threshold diameter. Bed-material local balance is computed as the difference between bed-material supply and sediment transport capacity. Wash load is routed. Computations are performed by grain size class on a reach average basis. SIAM uses steady state hydraulic computations from HEC-RAS seamlessly. SIAM has the ability to rapidly assess impacts of changes in sediment supply, hydrology and hydraulics. SIAM aims to integrate watershed-scale sediment continuity concepts into stream rehabilitation and management. The model provides an intermediate step between qualitative evaluations and comprehensive mobile boundary numerical models. It also provides a framework to combine hydrology, hydraulics, and sediment supply into a geomorphic assessment and rehabilitation design. With sediment as the number one ranking pollutant in streams and a contributing agent in many others, the addition of SIAM into the river-engineering toolkit will empower designers and planners to more easily consider sediment supply and transport in management and rehabilitation of channel systems.

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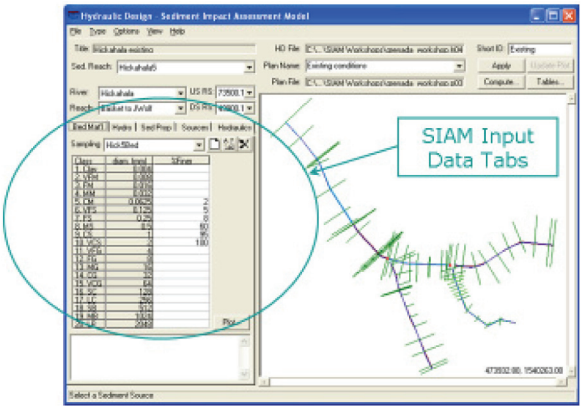

Future Capabilities:

- **FY07** - Sediment budget capabilities as a module in HEC-RAS.
- **FY08** - Addition of armoring and cohesive bed functionality.
- **FY09** - Incorporation of habitat impact assessment (with Environmental Laboratory).
- **FY10** - Addition of optimization routines.

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