

# Integration of Geomorphology and Advanced Hydraulic Modeling

## Geomorphic and River Channel Stability Assessment Merced River Mariposa County, California

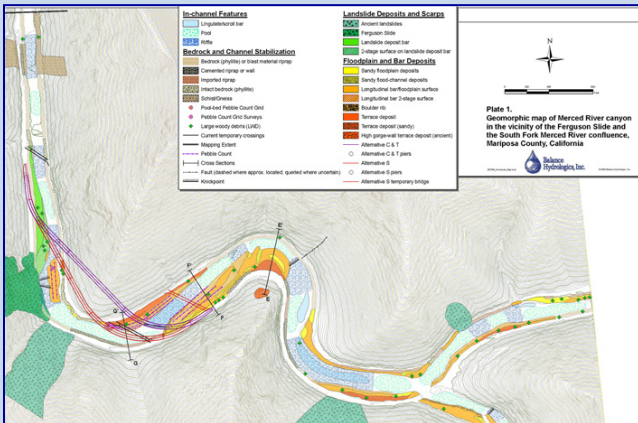
### Background:

Under a subcontract to Parsons Transportation Group for the California Department of Transportation, Balance evaluated the hydraulic and geomorphic behavior of the Merced River at a large landslide approximately 16 miles downstream of Yosemite National Park. Temporary bridges across the Merced are currently in place to reroute Hwy 140 around the slide. Now several permanent bridge designs are being considered. The objective of the study was to analyze the potential effects of the proposed bridge alternatives on river stability, hydraulics, scour and fill, and recreational rafting use of the river reach. The project integrated field geomorphology and hydrology, detailed geomorphic mapping, advanced hydraulic modeling, quantitative geomorphic analyses, GIS applications and engineering.

### Geomorphic Assessments:

A full spectrum of geomorphic assessments were made and summarized. Field observations were summarized on a geomorphic map.

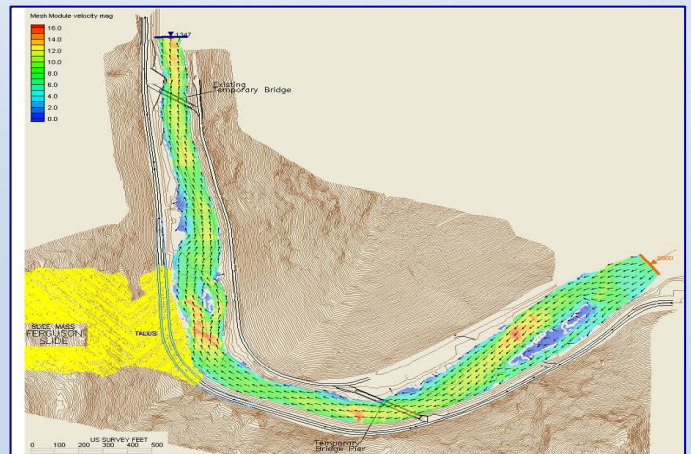
- Bed material size and composition
- Marking and dating high water marks
- Geologic features
- Aerial photo analysis of bed feature evolution
- Fluvial geomorphic features



Geomorphic map of project reach of the Merced River.

### Advanced Hydraulic and Geomorphic Modeling Applications:

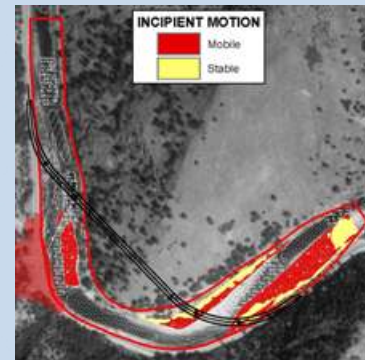
- Hydrologic analysis of gage records.
- 1- and 2-dimensional hydraulic modeling using FESWMS and HEC-RAS modeling platforms
- Model calibration to field observations
- Application of results to bridge selection



Two-dimensional model result for velocity and flow direction

### Quantitative Geomorphic Analyses:

- Change in critical shear stress and diameter
- Incipient motion calculations based on model results and substrate data



Incipient motion and mobile versus immobile regions