

A project profile from geoengineers.com

Monte Cristo Bridge Hydraulic Design

GeoEngineers' river team and engineers help design an award-winning rural bridge



The new Monte Cristo bridge occupies an abandoned railroad grade.

Overview

In 2003, record fall rainstorms washed out a 650-foot section of the Monte Cristo Grade Road adjacent to the South Fork Stillaguamish River near Verlot, Washington. This unpaved gravel road had provided the only vehicle access to U.S. Forest Service lands and recreational properties in the area until it was closed to traffic after the washout. Subsequent storms and landslides altered the course of the river, leaving a section of the grade road submerged.

Snohomish County Public Works (SCPW) proposed to build a new bridge, called the Monte Cristo Grade Road Bridge #660, to restore vehicle access to the area while limiting environmental disruption. SCPW proposed building the bridge on the site of an abandoned railroad bridge with existing abutments that could potentially be reused.

GeoEngineers' river team members worked closely with SCPW and WHPacific's structural engineers to provide hydraulic design and geomorphic evaluation for the proposed bridge and to advise the engineers on a final bridge design that would best stand up to the long-term impacts of river movement and hydraulics.

Monte Cristo Grade Road Bridge #660 was completed ahead of schedule and opened to traffic in fall 2009.

EXPERTISE

- River & Stream Management

MARKET

- Water & Natural Resources

LOCATION

- Near Verlot, Washington

Approach

GeoEngineers' river team performed:

- **A detailed scour analysis** that helped the project team select the geometry for a mid-channel bridge pier and informed required embedment depths for the pile-supported structures.
- **A channel migration hazard assessment** to characterize past and future river behavior through this reach of river to better understand how channel movement could influence the long-term stability of the bridge.
- **A wood-loading analysis** to estimate the likely shear forces that would be applied to the bridge pier if a channel-spanning log jam were to develop on the pier. The South Fork Stillaguamish is a wood-rich river system, and wood accumulations would likely influence hydraulics around the bridge supports.

Results

- GeoEngineers' analysis resulted in modifications to the pile depth, pile cap design, and pier geometry and orientation that will make the bridge substructure more suitable to long-term impacts from potential high flows or shift in channel alignment.
- The wood-loading analysis that GeoEngineers completed was an innovative approach developed specifically for this project to determine whether the structural design could support the forces predicted to act on the pier from a large log jam.
- The Monte Cristo Grade Road Bridge #660 received a 2011 Engineering Excellence Awards Best in State Gold Award from the American Council of Engineering Companies of Washington for designs that address social, economic and sustainability considerations.



Severe river bank erosion and channel migration upstream required consideration during bridge design.



The soils in the area were weakened by lenses of fine sand that erode easily.



Site of the abandoned railroad bridge before construction



The bridge was designed to account for long-term hazards associated with river scour and channel migration.



The new bridge restored vehicle access to the area with limited environmental disruption.

Find this page online at:
<http://www.geoengineers.com/project/monte-cristo-bridge-hydraulic-design>



California
Sacramento 916-444-5825

Idaho
Boise 208-433-8098

Louisiana
Baton Rouge 225-293-2460

Missouri
Springfield 417-831-9700

Oregon
Bend 541-550-0745
Portland 503-624-9274

Utah
Salt Lake City 801-307-0217

Washington
Bellingham 360-647-1510
Redmond 425-861-6000
Seattle (HQ) 206-728-2674
Spokane 509-363-3125
Tacoma 253-383-4940

Contact us online at:
<http://www.geoengineers.com/contact>