# Flood Modeller Pro

2D modeling for the Resilient Saint Vrain Creek Project, Longmont, Colorado, USA

A complex riverine system exists in Longmont, Colorado along Saint Vrain Creek, which is a tributary to the South Platte River. The drainage basin for the creek is several hundred square miles and contributes to significant peak flows during spring runoff and summer storm events.

A major storm occurred in 2013, when rain over a 10-day period produced flows equivalent to 100-year flow rates across several streams along Colorado's Front Range. St. Vrain Creek was one of the streams that overtopped its banks creating flood damage to bridges, utilities, trails, and public and private lands. Damage also included significant erosion of the channel and gravel mining ponds that line the river.
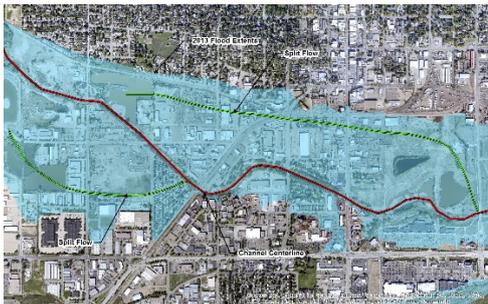
CH2M was tasked with analyzing the existing conditions for 10 miles of the Saint Vrain Creek to better understand the channel capacity and locations where flood waters could be contained instead of overtopping which would create future damage. This required the CH2M team to become more familiar with the previous floodplain mapping efforts, work that had previously identified a puzzle of split flows formed by flood waters CH2M was tasked with analyzing the existing conditions riverine hydraulics and floodplain for approximately 8 miles of St. Vrain Creek to determine the channel capacity and identify locations where flood waters could be better contained through future channel improvement projects. The CH2M team reviewed the 2013 flooding limits and previous floodplain mapping efforts by the Federal Emergency Management Agency (FEMA) and others. Due to the lack of channel capacity, a complex system of split flows occurs and flood waters overtop the channel banks in multiple locations, causing extensive flooding of urbanized areas along St. Vrain Creek.

To create a more accurate hydraulic model, CH2M's Flood Modeller Pro's 2D Alternating Direction Implicit (ADI) solver was chosen as the method to identify and analyze the split flows and support the one-dimensional modeling effort. Data collection was performed to gather topographic, hydrologic, and land use data. Boundary conditions, project limits, roughness coefficients, and topographic data were input into the model using GIS polylines and ASCII grids. The model results identified the existing conditions split flows and determined where changes to the floodplain mapping were required. The information from Flood Modeller 2D was incorporated into a one-dimensional model to create the Existing Conditions model for the Conditional Letter of Map Revision (CLO MR) application required by FEMA for work performed within a river's floodplain and in order to update the regulatory Flood Insurance Rate Maps (FIRMs).

Flood Modeller Pro's 2D ADI solver was able to identify these critical split flow paths and ultimately assisted in establishing the hydraulic baseline for the one-dimensional model. Flood Modeller Pro has also been used to support one-dimensional riprap revetment sizing for channel stabilization.

With a successful application of Flood Modeller Pro on the Resilient St. Vrain Creek Project, Flood Modeller Pro was proven to be an efficient and valuable tool for analyzing complex riverine hydraulics in urbanized areas.

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With a legacy stretching back 40 years, Flood Modeller allows users to model rivers, floodplains and urban areas, using our powerful 1D and 2D solvers.