

# 2D Surface Water Modeling in the Colville River Delta, Alaska

Presented by Garrett Yager

**Abstract:** A two-dimensional finite element model was developed to simulate surface water flow through the Colville River Delta on the North Slope of Alaska in support of future oil and gas development in the region. Detailed upland topography, acquired by LiDAR, in the form of a high resolution digital terrain model (DTM), was integrated with bathymetric survey data of the deltaic channels to form a cohesive basemap for assigning elevations to the finite element mesh. Bathymetric survey data was collected in the form of cross sections where the location, alignment, and density was dependent on hydraulic considerations including channel uniformity, width, sinuosity, branching, and braiding. Interpolation between cross sections is required to form a continuous surface for assigning bathymetric elevations to the finite element mesh. Traditional interpolation methods, such as Triangulated Irregular Networks (TINs) or GIS raster interpolation schemes, can introduce artificial barriers to flow when interpolating between cross sections. A channel fitted grid was used to interpolate channel bathymetry along grid lines between surveyed cross sections. This technique honors flow direction in the interpolation process, preventing artificial cross-channel obstructions. After model simulations were complete, flood inundation maps were developed. Direct model output was constrained by the finite element mesh and provided a coarse representation of flood inundation limits. The modeled water surface was overlaid on the DTM and allowed to conform to the detailed topography, resulting in a more refined flood inundation map.

**Biography:** Garrett Yager works as a water resources engineer for Michael Baker International specializing in 1D and 2D surface water models for a variety of applications including bridge and culvert design, bridge scour, sediment transport analysis, and developing infrastructure in flood prone areas. His industry experience spans across a broad range of projects. He began his career working as a hydrographic surveyor conducting bathymetric surveys for coastal engineering projects, offshore oil and gas developments, nautical charting, and dredging contracts. He holds a Bachelor of Arts degree in Natural Resource Management and Bachelor of Science and Master of Science degrees in Civil Engineering. Currently he is a project manager leading water resources projects for oil and gas clients in the Arctic.

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