



Scour hollows in the lower parts of the river Gaula, Central Norway

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This study analyses scour hollows (deep pools) in the lower part of the river Gaula in the Gauldalen Valley, Central Norway. Gaula is a flood prone river as it has steep catchments with limited self-regulating capacity. The last 70 kilometers of the river are situated below the marine limit. Postglacial isostatic rebound has gradually lowered base level, causing the river to incise into glacimarine and glacifluvial sediments. Several large ice marginal glacifluvial deposits cuts across the valley and has been a major source for bed load material. The investigated lower 30 km has a low gradient (1%,) alluvial channel meandering with low sinuosity across a wide floodplain. Over the last 100 yrs or so, extensive bank protection schemes has stabilized most of the river course. Large-scale gravel mining in the river bed has in places lowered the bed by several meters and exposed marine clays. Gravel mining was halted in late 1980s in the upper parts of the reach but earlier in the lower parts.

This work focuses on the morphology of a number of deep scour hollows found in the bed of the lowest 30 km under the hypothesis that gravel mining and bank protection has caused sediment starvation and reduced bed erodibility. Focus has been on characterizing the topography of selected scour hollows and their relation to planform geometry, channel pattern as well as sites for gravel mining and bank protection.

The bed topography of the 30 km long reach was mapped using a Acoustic Doppler Current Profiler (ADCP). Coordinates for the profile were obtained using GPS and the EGNOS (European Geostationary Navigation Overlay Service) navigation system with sub meter accuracy during good conditions. The profile is taken along the deepest part of the river at low discharge ($45 \text{ m}^3 \text{ s}^{-1}$). Where deep pools were encountered, two to four cross profiles were measured to obtain detailed information on pool geometry along with flow velocity. In January 2008 the scour hollows will be filmed using underwater video camera and bed sediments will be sampled.

The longitudinal profile is characterized by riffle-pool geometry and has an average depth of 1.85 m. A number of pools along the longitudinal profile have a depth in excess of three standard deviations (5.4 m) with the deepest pool being over 9.5 m, and has therefore been given the term scour hollows. The scour hollows are located both in meander bends and in straight reaches and show large variations with respect to width-length relationships. Deeper scour hollows are found in the upper part of the reach where gravel mining ceased last.