The flows in North Queensland Rivers can vary enormously, up to 1000GL per day on an annual average flow of a few GL per day. The design of an aqueduct to accommodate both regular flows and yet capture significant flood flows presents a challenge.

As the aqueduct constitutes the most costly component of the scheme, simplifications and cost reductions over 1000km or more would be significant. Above is my suggestion for a simple flood flow aqueduct that also accommodates regular flows.

The image shows the transverse cross-section of aqueduct consisting of the channel and levee, and a longitudinal cross-section shows the100km sections with a flat gradient and hydropower and roads in the gaps.

The levee is constructed with a simple cut and fill operation where soils are suitable, transferring the soil from the trench, which is the low flow channel, to the compacted levee bank. A height of about 6m should be sufficient, allowing a peak depth of 10m. The shapes of the channel and levee could be trapezoidal but are shown as triangles for ease.

The low flow cross-section would be around 25m2 and lines with high-density polyethylene liner (HDPE). The slope is very low in most parts, with an extent of 500 to 1000m on a 5m head. The cross-section of the flood flow would, therefore, be around 1250 to 2500m2.

By my calculations, a maximum flow rate of 1m/s or 3.6 km/hr (not too fast as the gradient is very low and avoids scouring) would convey around 2GL per day in the low flow channel and 110 to 220GL per day in the high flow channel. This is more than adequate to capture significant flood flows accounting for variable flow rates as well. The actual detailed design needs to be done to refine these ballpark specifications, including estimates of realistic losses.

An approach favored by Leo Ashby is for the levee to be constructed on the contour for 100km lengths, with each section joined by 10m falls. The levee would act as a combined storage weir while transferring water by hydraulic flow over long distances at gradients as low as 1:10,000.

The gaps between the section could be located at important infrastructure points like major roads, with appropriate low pressure hydropower stations sited on them. This would minimise the disruption of existing infrastructure while providing access to power lines along roads.