

The breakthrough system developed by Leon Ashby for capturing and transferring flood flows in a Bradfield Scheme has a number of advantages over pipelines. The slide above is taken from Leon's presentation and lists 3 benefits over a pipeline system.

The profile of the system can be described as an 'open half-channel' profile. Whereas a typical profile of a river has a single low flow channel and a high flow channel defined by banks at a distance from both sides of the low flow channel. The aqueduct is half of the natural profile as the constructed levee bounds the conveyed water on the downhill side. Up-slope there is a low flow channel and flood flow space as shown in the inserted image.

The system is also more correctly described as a series of connected storages, contained by a levee bank following a contour for more than 100km, before being connected to the next with a short 10m section containing a hydropower unit, and traversing road or rail infrastructure (see insert).

The three advantages of this system over a pipeline for conveying water are:

1. Due to friction, pipelines permit water to be gravitationally transferred in a fall of only 1m per 1-1.5km or 1:150. The open aqueduct described may convey water up to 100km per 10m fall, or 1:10,000. This allows the open-channel to transfer water over very long distances.
2. The open-channel collects water along its length, greatly increasing the catchment area over a closed pipeline. Collecting intermittent falls along the length of the levee bank thus increases the mean volume of flow and decreases the flow variability over the length of the channel.
3. The aqueduct sited along a contour serves a dual purpose as a reservoir, storing up to 1000GL per 100km of water depending on topography and levee height. Pipes inserted through the base of the levee enables the gravitation irrigation of a series of small irrigation schemes down-slope of the levee.

The images shows the increase in catchment area due to the use of an open half-channel between the Burdekin River and Lake Buchanan (red circle) and another potential route for an open half-channel between the Walsh River and Hughenden (purple).

We see that the open half-channel aqueduct can be likened to an artificial river, constructed to divert water across the slope in the desired direction, instead of taking the natural direct downhill path. A lossless artificial river will have the flow characteristics of a natural river, increasing in flow volume and decreasing in flow variability from start to end.

However, the flow would be efficaciously extracted at points along the length so that the mean and variability of flow remains within the optimal operating conditions of the open half-channel design.

