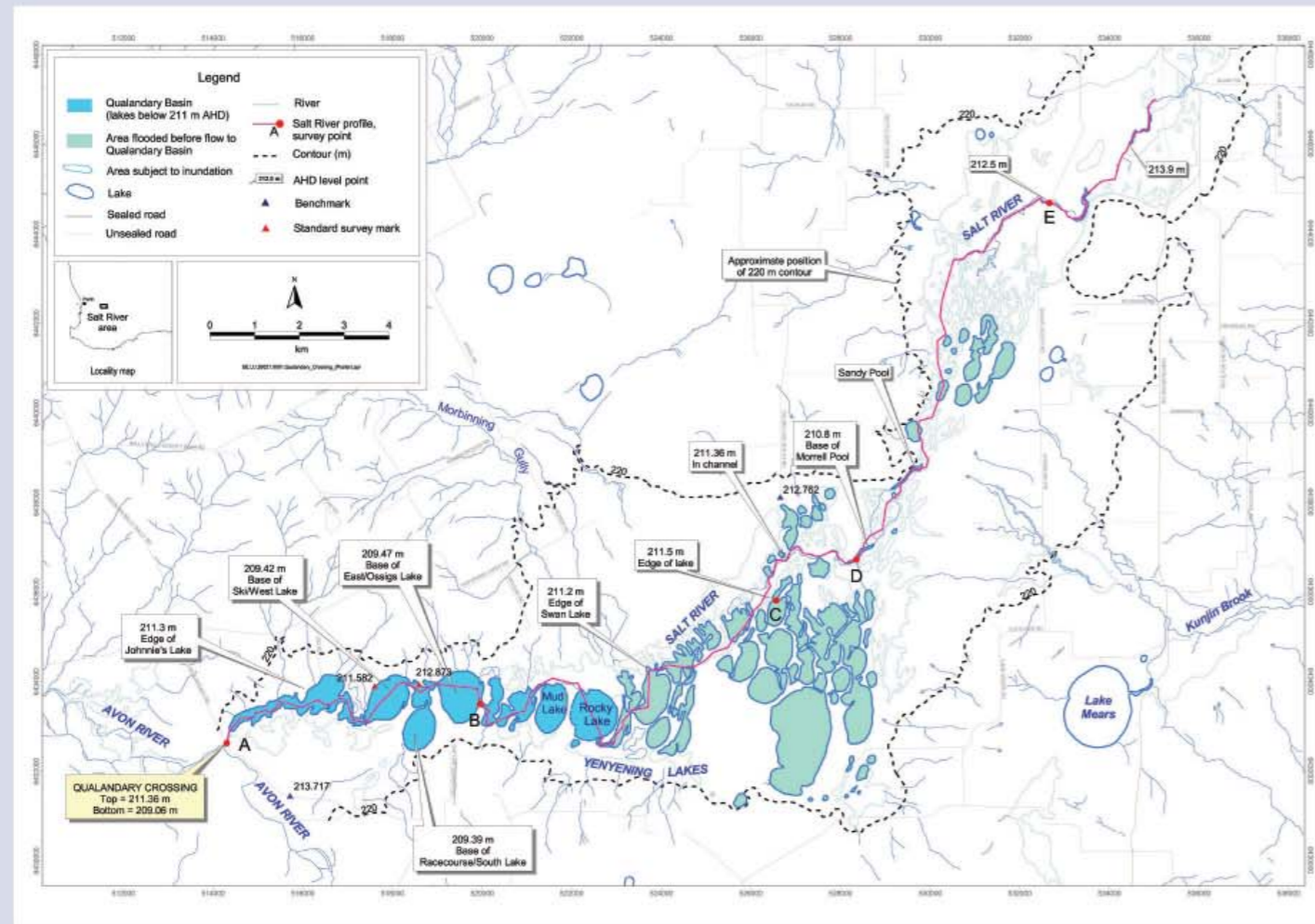
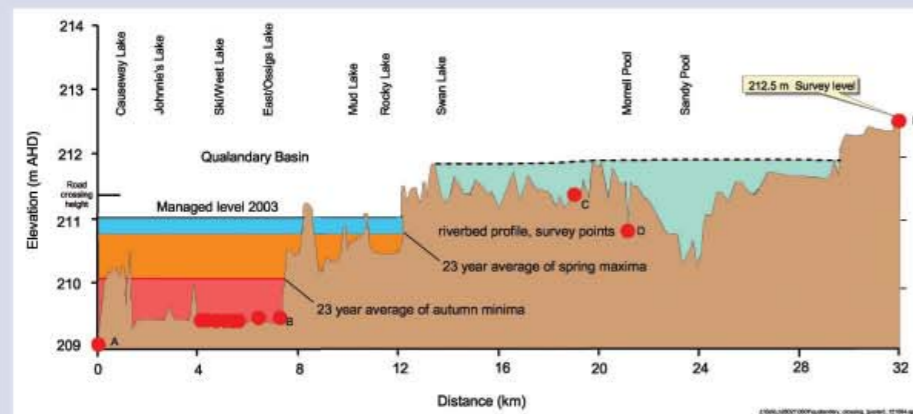


The Qualandary Basin – distinguished from upstream pools in the Salt River

The Salt River bed courses for 32 km through the Yenyening Lakes in traversing the 22 km between Dangin South Road and the Qualandary Crossing. In wet years the Yenyening Lakes are more than 2 m deep and cover 17 km².



The Salt River profile through Yenyening Lakes – separates the Qualandary Basin and upstream pools



The Salt River bed falls from 212.5 to 209.06 m AHD (metres above Australian Height Datum), the level of excavation in the culvert below the crossing and about 1 metre below the natural surface. This is an average decline of about 1 m in 10 km or 0.0001, but importantly the traverse is steepest at the top, flatter in the middle and ends with the Qualandary Basin, mostly flat-bedded lakes at about 209.4 m AHD.

The lowest road crossing height is 211.36 m AHD and water within the Qualandary Basin is now managed to 211.01 m AHD. This water is mostly held in Causeway Lake to East/Ossigs Lake, and some is held as far upstream as Mud Lake and Rocky Lake.

The Salt River only flows beyond Sandy Pool and Morrell Pool into the Qualandary Basin after overtopping 10 km of landscape that is almost 212 m AHD.

Flows from the upstream catchment overtop the crossing about 1 year in 5. The larger inflows were in 1986, 1989, 1990, 1992, 1999 and January 2000, when the passage of a cyclonic low resulted in the highest recorded flood level of 212.21 m AHD. This was 0.85 m over the road.

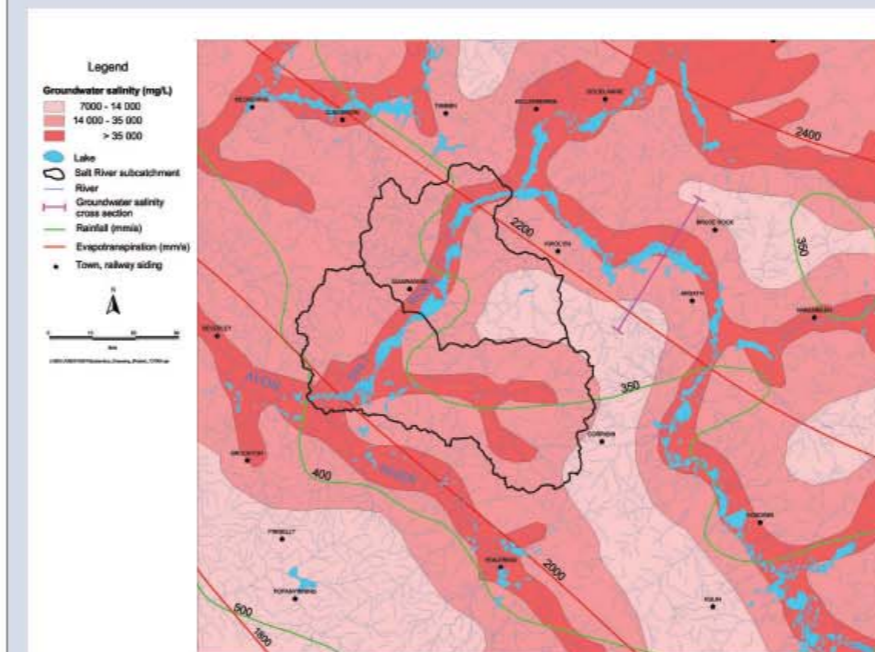
The Qualandary Crossing

The Qualandary Crossing dams the Salt River where it emerges from the broad 30-km long Yenyening Lakes system, just above its junction with the Avon River, 120 km from Perth. The causeway was constructed in the early 1900s and gradually increased in height, mostly to prevent the Avon River flooding back up the Salt River.

Regional groundwater salinity – the pattern reflects saline streamflow and catchment floor evaporation

The regional groundwater salinity pattern that follows the broad, flat river valleys was established long before the Qualandary Crossing. With poor surface drainage and evapotranspiration much greater than rainfall, the accumulation of landscape salt is only rarely reversed.

Low-flows usually come from the relatively small local Salt River subcatchment containing the Yenyening Lakes, but with high flow in the Avon River water has historically backed up into the lakes.



Holding saline water above the crossing is thought by some to affect salinity and agricultural land above the Yenyening Lakes, whereas opening the drain-gates affects the Avon River downstream. Quite small elevation differences along the riverbed profile indicate the crossing retains water only within the Qualandary Basin and does not influence salt-affected land farther upstream.

Conclusions

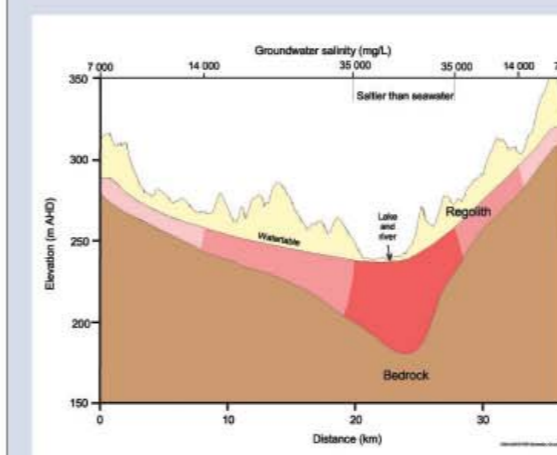
The Salt River profile reveals that the 32km of riverbed descends only 3.44 m but is steepest at the top, undulating in the middle and ends with flat lakebeds in the Qualandary Basin. The elevation differences, though slight, ensure that damming the Salt River will not increase salt-affected land upstream of the Qualandary Basin.

The longitudinal profile of the Salt River clearly shows that managing the water level at the Qualandary Crossing to 211.01 m AHD, just 0.35 m below the road, holds water mostly in the Qualandary Basin. Back flow from an Avon River flood can only extend further by exceeding 212 m AHD and overtopping a 10-km section of higher riverbed upstream of the Qualandary Basin during low flow in the Salt River.

For the Salt River to flow into the Qualandary Basin from upstream pools it must overtop the same section of higher riverbed, after first flooding about 10-16 km of river channels farther upstream.

The regional groundwater salinity pattern follows the major ancient river valleys and is not determined by water retained in the relatively short Qualandary Basin.

Groundwater salinity – increases toward the catchment floor



High evaporation of surface water and groundwater discharge between floods leaves salt near the valley floor. The lower landscape is mostly saturated with saline water and in substantial areas adjoining the rivers the depth to groundwater is only 0.5-1 m. Vertical recharge and slow lateral movement maintain the groundwater gradient toward the flat valley floors.

Waterlogging or flooding of the flat low-lying areas may hinder but not reverse the slow discharge of groundwater from the local catchment. Surface water retained in the lakes and pools does not move laterally up the adjoining slopes.