A detailed study on the impact of longwall-mining induced subsidence in the Waratah Rivulet catchment, New South Wales, Australia has been undertaken to assess changes in the hydrology and hydrochemistry of surface waters and groundwater. Longwall mining beneath the stream has caused substantial fracturing of the streambed, and comparison of hydrological data from upstream and downstream of mining impacted areas has shown that surface water flow is diverted to the subsurface routes. The diverted surface water flows for hundreds of metres through subsurface fractures before re-emerging and discharging at the surface under artesian pressure.

Applied tracer tests (salt and fluorescent dyes) were undertaken in conjunction with radon-222 isotope studies to quantify the surface water loss in mining-impacted areas of the catchment and verify the results of hydrological modelling. The applied tracer tests were undertaken under moderate to high flow conditions, while radon-222 sampling was undertaken under low flow conditions. The results of the applied tracer tests verified that the secondary permeability in the shallow aquifer system has been enhanced by subsidence, with groundwater flowing through subsurface fractures at a velocity of 4,000 – 4,800 m/day. The applied tracer studies also showed that under high flow conditions (>50 ML/day) there was a net loss of surface water in sections of the rivulet, but all lost surface water had returned by the most downstream gauging station within the study area. Radon mass balance calculations have shown that under relatively low flow conditions (<12 ML/day) there is a net surface water loss of up to 20% within the mining-impacted part of Waratah Rivulet.