WRA Bulletin 43

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Upper Karnali Hydropower Scheme, Nepal

The proposed 900 MW Upper Karnali hydropower scheme is located on a 180 degree bend in the Karnali river in the far west of Nepal, a location first identified as a promising site for a large run-of-river scheme as far back as the 1960s. If constructed during the 5-year period 2017-2021 it will become the largest scheme built to date in Nepal. GMR Ltd of India was licensed in 2008 by the Government of Nepal to develop the scheme, and they prepared a Detailed Project Report in July 2011.

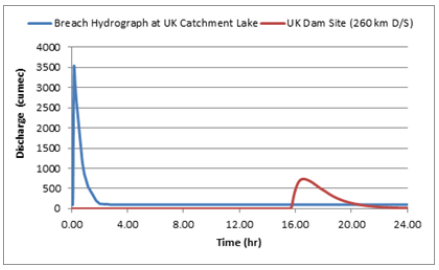
Nick Mandeville joined a number of other grey-haired elderly gentlemen on the Project Review Panel; the eldest of these was 86 years old, so there is still hope for all those intending to prolong their careers! A site visit was conducted by helicopter from Kathmandu in December 2014, and four meetings of the Panel were held, two of which were attended in person, and the others by Internet group discussion. As the Hydrology member, Nick's job was to review this GMR report, in particular the water availability, flood estimation, and potential risk from glacier lake outburst floods.

A 90-minute helicopter flight saved a 4-day round trip by road

A reliable 45 year continuous daily flow record was luckily available at the site, which showed good consistency over this period, although the flows themselves were only of medium accuracy, as too few discharge measurements had been made over the years by visiting field teams, a feature common to most gauging stations in Nepal. The design features of the scheme based on this record were judged to be sound.

Improvements to the flood estimates were suggested by introducing the regional flood frequency technique based on annual maxima records from three other neighbouring long-term stations. The foothills of the Himalayas are occasionally prone to the effects from the tail end of large cyclones tracking in across India from the Bay of Bengal, and use of previous studies of such phenomena were used to estimate a revised value of Probable Maximum Flood at the dam site.

Proposed headrace inlet location

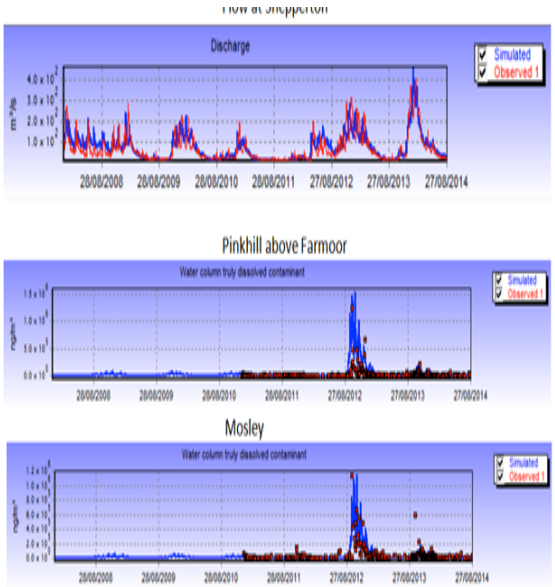


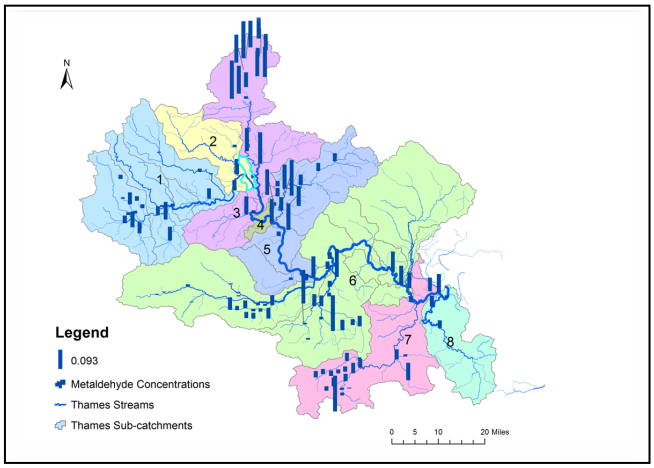
Unlike central and eastern parts of Nepal, previous inventories indicated no potentially dangerous glacial lakes in the upstream catchment of the Karnali River within Nepal itself. However 11 such lakes were identified in the Majiacangbu basin in the Tibet Autonomous Region of China, which flows into the upper reaches of the Karnali river. Dam breach analysis of the largest of these lakes, combined with Muskingum routing of the resulting breach hydrograph, showed that sufficient attenuation of the peak flows, over the 260 km length of the downstream river channel, such that there was minimal risk to the proposed dam structure.

Attenuation of breach hydrograph from upstream glacial lake

Modelling Metaldehyde in the River Thames

This project was undertaken to assess the impacts of pollution in the River Thames from applications of slug pellets (Metaldehyde), used on agricultural land to kill slugs and snails. This is becoming an increasing problem as warmer, wetter winters increase slug populations and farmers are applying increasing quantities of metaldehyde. The figures below show the high concentrations of metaldehyde in the River Thames System across the catchment spatially and as a time series at Farmoor and at Datchet, both key water abstraction sites.

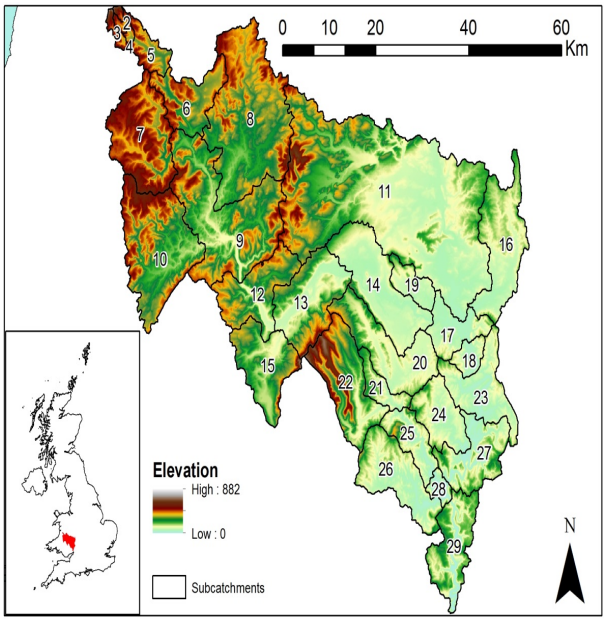


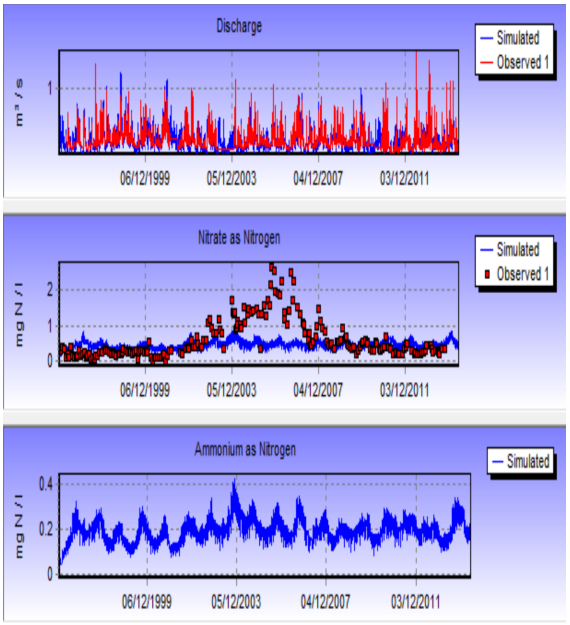


The INCA Organics model was applied to the Thames to simulate the pollution dynamics and a set of scenarios of application rates completed. From the summary scenario data a simple decision support system was produced so that Thames Water could calculate the application rates required to meet the EU/WHO water abstraction standards. Alternatively they can calculate the area of land that needs to be treated with the a higher cost slug repellent, Ferric Phosphate, with Thames providing suitable compensation to farmers to encourage them to use this alternative.

Impacts of land use and climate changes on Freshwaters and Ecology across Europe

This EU funded project assessed the impacts of land use and climate changes on hydrology, water quality and ecology in Northern European Rivers. Sites in Wales at Llyn Brianne were selected as well as a full modelling study of the River Wye. The INCA model was set up for the Wye and Brianne catchments driven by future climate data from the climate models, namely IPSL and GFDL, both run with two different climate forcings, RCP4.5 and RCP8.5. The socio-economic scenarios were implemented by changing some of the INCA model parameters in order to reproduce the impact of alternative storylines, including changing land use, fertiliser additions, extended growing seasons and changed population levels. Impacts of these changes on flow, water quality and ecology were assessed and it was shown that climate will alter the hydrological balance and therefore change nutrient fluxes and ecology.





Next WRA Board Meeting

13th January 2017, Blewbury

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Directors, Associates and Consultants. The document is circulated by email, and published on the WRA web-site, aiming to keep the WRA network, up-to-date with respect to current activities. Please email contributions for future issues to Frank Farquharson: frank@watres.com
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