WRA Bulletin 63

January 2022

OVERSEAS WORK

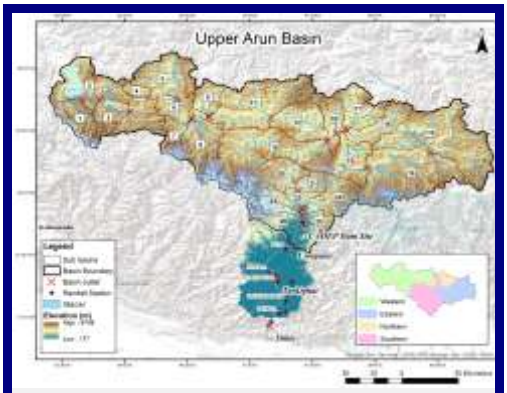
Upper Arun Hydro-electric Project, Nepal

There is a long term plan to develop hydropower on the Arun River in north-east Nepal, by developing a cascade of 5 major schemes. Construction by an Indian developer of the 4th scheme downstream, called Arun-3 HEP, has already commenced in May 2018, with completion anticipated in 2023. A World Bank funded feasibility study of the 2nd scheme downstream in the cascade, called Upper Arun HEP, has just been completed by a Chinese consultant. Associate Nick Mandeville, with back-stopping support from Partner Frank Farquharson, is the hydrology member of the Dam Safety Panel of Experts.

Proposed location for the Upper Arun HEP dam site

Although there is a rudimentary road permitting all-weather access to the location of the proposed powerhouse, the dam site itself is located in a remote location close to the Nepal-China border. The only way in at present is a 2 day walk or a 15 minute helicopter ride from the powerhouse area. The present proposal is for a 91m high concrete gravity dam diverting flow into an 8.4 km headrace tunnel. From the far end the water drops 483m to an underground power house with capacity 1,040 MW. Due to the narrow valley and steep gradient of the river bed at the dam site, only a reservoir with modest volume can be developed, which allows for 6 hour daily peaking capacity during the low flow season..

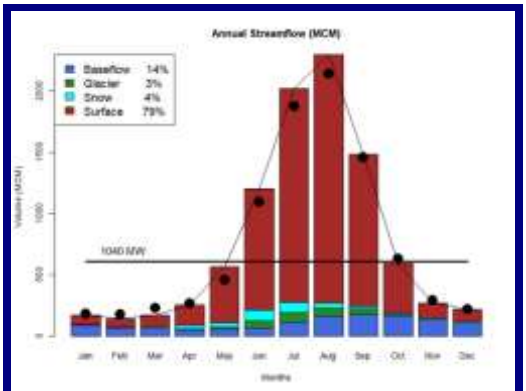
The most interesting aspect of the study is that the Arun River basin has its headwaters in Tibet, covering a huge area of 25,300 km^2, in an approximate T shape. The altitude of this portion lies mainly in the range 3,500 – 4,500m with isolated peaks of more than 6,000m dotted around, up to the highest peak Chomolungma (8,849m). The lowest point of the basin has altitude 127m, at the confluence of the Arun River with the Sun Koshi River. This gives an altitude difference of 8,722m for the complete basin, one of the highest values in the world. The Tibetan portion has a semi-arid cold climate in direct contrast with the moist warm climate on the Nepalese side of the border. For example, the mean annual rainfall at Tingri in Tibet is 318 mm, while at Num, close to the proposed power house on the Nepalese side, it is 4,565 mm, a ratio of more than 1:14.



Arun River basin

There is little ground-based hydro-meteorological information available on the Tibetan portion of the basin. Only one climate station is known to exist within the basin at Tingri at altitude 4,300m, which also contain a raingauge, and there are no streamflow gauging stations at all. Therefore estimation of suitable hydro-meteorological data on the Tibetan side is mainly dependent on satellite derived variables.

Streamflow estimates at the proposed Upper Arun dam site were prepared during the feasibility study from gauging stations located slightly further downstream in Nepal. The flows follow a monthly variation which is typical of a monsoonal climate in the high Himalayas.



Estimated monthly flows at the Upper Arun dam site

UK WORK

Design of Remedial Measures to resolve Water Ingress at Terence House, Holton, Oxon

Construction of a new residential building started during winter 2020-21, and in excavating foundations, excessive amounts of water entered the building area. WRA was commissioned by Select Homes (mk) Ltd to resolve the problem and design remedial measures.

Water flooding the underfloor space of Terence House

Although it was confirmed that the Beckley Sand at Holton is capable of yielding small amounts of groundwater, used historically for water supply, trial pits showed no groundwater circulation in the Arngrove Spiculite which outcrops across the northern part of the Terence House property.

Dewatering of trial pit | Trial pit logging

The water ingress is derived primarily from rainfall and runoff moving off the clay-bound soils and recharging voids behind a tall retaining wall. As a result, during construction, rainwater accumulated in the patio and underfloor space which consists of a levelled clay platform formed by stripping and removing soil.

The solution, devised by Partner Paul Holmes, focused on installing two sub-horizontal well-screens, one under the rear patio and another adjacent to the garage, connected to a single discharge pipe down the driveway to the sewer connection.

Plan: horizontal well-screens, and remedial drainage system

In addition to the well-screens, perforated land-drains were placed by drilling at 120mm diameter through the concrete foundation of building walls at key locations to connect the under-floor drainage.

New Associate

Gaye McKay has been appointed as an Associate of Water Resource Associates LLP from July 2021.

She is an Environmental Scientist, with 25 years' experience working for both regulatory authorities and the private sector. She has extensive experience in flood risk management, catchment management, and sustainable drainage. She was formerly the coordinator of the UK SuDS monitoring project and assisted in the development of several SEPA guidance documents on SuDS.

Change of Bulletin editor

Associate Nick Mandeville is stepping down as WRA Bulletin editor after a 5 year stint. Partner Paul Whitehead will take over the reins, starting with the April 2022 issue, so please send any potential contributions to him.

Next WRA Board Meeting

Thursday 5th May 2022, at 09.30 hrs at Oxford.

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Partners, 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 Paul Whitehead: paul.whitehead@watres.com

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