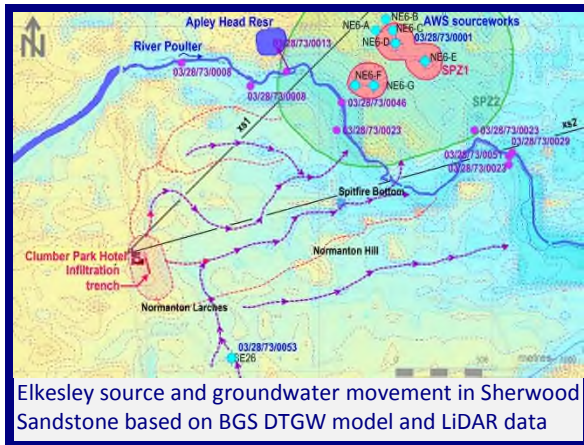


UK WORK

Groundwater Risk Assessment for Environmental Permit at Muthu Clumber Hotel near Worksop

Paul Holmes recently carried out another Tier-1 risk assessment to support the client’s application to renew an environmental permit for the discharge of treated sewage effluent at Muthu Clumber Hotel and Spa, near Worksop, Nottinghamshire. This included a water features survey, conceptual hydrogeological model and groundwater mapping using output from BGS depth-to-groundwater [DTGW] model.



The hotel stands on the site of Normanton Inn which had its own 22.9 m deep water supply well, and replaced by mains water in the 1950s. During inspection it was found that the well received greywater from the kitchen, sealed with fats and other debris, but not connected to the sewage treatment system.

Since 1996, the hotel’s sewage was treated in a package treatment plant, discharging to an infiltration trench or 'sub-surface irrigation system'.



Existing Biodisk and sludge-holding tank

Anglian Water has seven production boreholes with test yields between 30 and 168 l/s, at Elkesley, situated 1.6 km NE of Clumber Park Hotel, exploiting the Sherwood Sandstone aquifer. Observation boreholes in the area

show a small seasonal range of 2 to 3 m for a 53-year record, but with a steady decline in peak groundwater levels, which are 21 to 24.5 m below ground level.

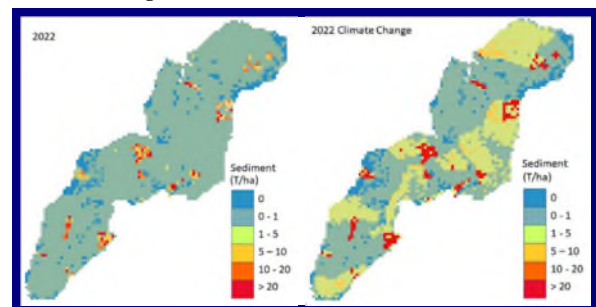
The effluent discharge was found to be acceptable:

- The main effluent characteristic of concern was oxidised nitrogen which did not exceed the natural background level in groundwater.
- Concentrations of non-hazardous pollutants were less than the environmental standard or natural background level applicable to the aquifer.
- Risk to the groundwater-fed receptor at Spitfire Bottom [River Poulter wetland and open stream] was very low.
- Hydraulic loading of the discharge was small [1.8% of groundwater flow and 0.6% of nitrogen load].

The main conclusion of the screening was that a formal maintenance programme should be established with regular cleaning of the bio-disc, de-sludging and effluent monitoring, to avoid failures which had occasionally occurred in the past.

Stickenbridge Catchment Assessment

In Mar-May 2022, Dr Harvey Rodda and Paul Holmes collaborated with H Fraser Consulting Ltd on a study of stream discharge and sediment yield in the catchment affecting Perran Foundry Leat, at the tidal limit of Restronguet Creek in Cornwall. Historically, power was provided by construction of a 2 km long leat diverting water from River Kennall weir. Two earth embankment dams with sluices were built across a tributary valley to control elevation and siltation. Dams were modified to capture all incoming flow behind a boarded flume, and the upstream leat channel abandoned. The downstream leat suffers from leakage despite repair works, and silt was removed in 2022. The A39 improvement works in 2017 required a new stream layout and culvert with orifice to maintain flow into the leat siltation pond.

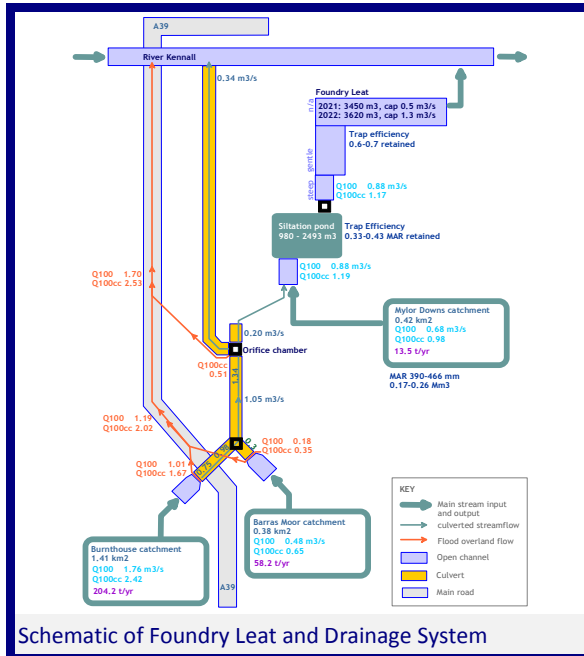


Predicted Mean Annual Sediment Losses for Current and Future Conditions in the Tributary Catchments

WINFAP5 and ReFH2 software were used to estimate peak flow and hydrographs for the tributary catchments

for a range of conditions, indicating that the T100 flood for the combined area is 2.89 m³/s.

Mean total sediment yield from QSWAT simulations for the tributary catchments covering an area of 2.22 km² was 124.0 t/km²/yr for 2017 increasing to 1711 t/km²/yr with climate change in tis high rainfall area of Cornwall



Schematic of Foundry Leat and Drainage System

Leat capacity had been reduced by channel obstacles to half full capacity of 1.1 m³/s] but recent silt removal in increased capacity to 1.3 m³/s. Removal of flume stop boards will result in lack of attenuation and rapid flow through the siltation pond, allowing up to 4000 m³ of sediment to accumulate in the pond-leat system. available volume in the pond is 980 m³ which could be increased to 2493 m³. As a result, the flow capacity of the leat would be reduced by 84% if the siltation pond is left as it is, or reduced by 42% if improved.

The recommended course of action was to focus attention on the siltation pond and reinstate its function to trap sediment and attenuate floods. Floods exceeding 2 to 10 year risk will now occur on the A39 as a result of the low capacity of the culverts.

OVERSEAS WORK

Miya River Weir, Guinée

SRK recently completed ground investigations at the proposed Miya River flat-V weir site to determine the depth and quality of bedrock and overburden. A mixture of excavator and manual augering were used to identify rock-head at depths of 1 to 1.5m, but with the weathered mantle increasing in depth on the western abutment. The weir will exploit the hard-rock bar across the river channel and narrowing of the floodplain. The eastern valley-side has a uniformly-steep slope, whereas the

slope of the western valley-side is broken by a small river terrace in places.



View of the Miya River valley

In parallel, WRA completed outline design of the weir, which drains a catchment area of 40.8 km² and it has been sited at a point along the river corridor where the topography confines peak flood discharge to a valley width of about 50 m.

Flow records downstream at Nionsonmoridou bridge, were transposed to the weir site to give a bank full discharge of 15.9 m³/s and Q100 range of 22.7 to 32.5 m³/s for the weir design.

The weir has been sited half-way along a straight 50 m reach of the river. The width of the weir matches the natural channel which is on average 6.5 m at bank-full discharge and 5.4 m at low flows. The mean bank-full depth is 1.34 m and mean low flow depth 0.5 m.

The outline design shows a weir crest width of 6 m raised 0.5 m above upstream bed level, with concrete crest-slopes of 1:20, vertical side-walls up to 2.4 m above minimum crest level. The flow gauging range will be 0.03 to 40 m³/s.



Miya River at the site of proposed weir

Training News

WRA and Oxford Molecular Biosensors have been running a new water quality modelling & management course: <https://www.omb.co.uk/courses>

Next WRA Board Meeting

6th July 2023, at 09.30 hrs.

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

Water Resource Associates LLP, PO Box 838, Wallingford, Oxon OX10 9XA. Tel: +44[0] 1491 838 190, www.watres.com