

OVERSEAS WORK

Water Harvesting for Irrigation and Groundwater Recharge through Ponds and Small Dams, Iraq

Sinjar and Baaj Districts are a unique geographical region dominated by Sinjar Mountain in the north, and a vast gently sloping plateau to the south which ends in Badland topography at Wadi Ajeej. Further south, soils are poor and groundwater is brackish descending to playa lakes and Wadi Ajeej salt marshes.

Historically an important cereal farming area of Iraq, the 2014 conflict resulted in damaged infrastructure, social deprivation and an exodus of people. NRC Norwegian Refugee Council implemented a three-year project called Activating Market-based Agricultural Livelihood to help reinstate the vital role that agriculture plays in providing economic security. WRA was contracted to assess the potential role that water harvesting and groundwater recharge might play in increasing availability of water for people, livestock and agriculture. Partners Paul Holmes and Peter Baur were joined by water harvesting specialist, Dr William Critchley, supported by the NRC team based in Erbil.



Flow from Kani Kedri springs, 5 km east of Sinjar town



Access shaft on karez at Wardiya, 12 km west of Sinjar

In addition to analysis of actual crop requirements, technical interventions were suggested, including use of hafirs/pans, roof-top harvesting, micro-catchments, earth bunding and wadi diversions, re-introduction of lattice contour ploughing, combined with improved agronomy and training or assistance for local farmers to maximise early planting, achieve better soil fertility, weed control, seed selectivity and zero-tillage.

Dashgil Terminal 2 Hydrological Study, Azerbaijan

KBR (Kellogg Brown & Root Ltd) was engaged in the design of a new Caspian oil and gas terminal, south of Gobustan at the village of Shikhlar. The low-lying coastal plain is bounded to the west by a railway-highway corridor, to the south by a line of mud volcanoes and separated from the Caspian Sea by a small sand ridge.



Reconnaissance of sand mining operations

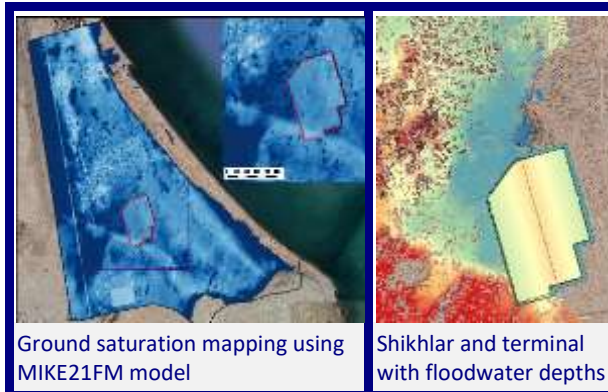
WRA, with the support of CC Hydrodynamics Ltd (CCH), was engaged to design infiltration basins for management of surface water around the new terminal and Shikhlar village, through the use of hydrological and hydrodynamic models of the Caspian coastal plain and associated sand aquifer.

Following a review of site geotechnical investigations, work started with field reconnaissance to examine the hydrogeology and sand mining operations. CHIRPS¹ data were used to extend 1960-2018 rainfall data for the nearby town of Alat, and derive intensity-duration-frequency curves for 100yr design. Permeability tests and borehole lithology were used to characterise spatial variation in infiltration and aquifer thickness.

A pluvial hydrodynamic model was built using MIKE21FM to represent the rainfall-evaporation-infiltration process, surface water movement, and map velocity-scour, floodwater depths and interaction with

¹ Climate Hazards Group InfraRed Precipitation with Station data

shallow groundwater. This demonstrated the viability of the concept of infiltration basins, keeping floodwater levels well below the terminal platform elevations and adjacent urban area.



Team: reconnaissance, Rhys Combs; CHIRPS data, Ron Manley; MIKE21 modelling, Rhys Combs and Mark Cramman; hydrology and project lead, Paul Holmes.

UK WORK

Permeable paving solution for surface water flooding, Hillingdon, London

WRA undertook a flood risk survey for Kaduna Close, a managed housing estate of 24 flats at Eastcote, in the London Borough of Hillingdon. The site had recently experienced surface water flooding and the flats were built in the 1970's before flood risk assessments and surface water management plans were a requirement of the planning process. More recently however, with local government no longer needing to comply with the EU flooding directive, there was a lack of action from the local authority in terms of keeping residents updated on flood risk issues.

Partner Harvey Rodda undertook an assessment of the risk of flooding at the site from all sources and recommended measures for reducing flood risk. The estate had large areas of concrete driveways and turning areas, all of which would contribute to rapid surface runoff following rainfall events. WRA recommended the use of permeable paving, with a depth of permeable sub-base to provide sufficient storage to contain the 100-year return period 6-hour rainfall event, including an allowance for climate change. This pavement would replace large areas of the existing concrete, and provide attenuation of the incident rainfall before it was released into a surface water sewer.



PASSING OF DR JILL CROSSMAN

WRA Associate (2014-2021)

Co-Director of NERC Macronutrients Programme

I'm writing today to share some very sad news. As some of you already have heard, our friend and colleague Dr Jill Crossman passed away suddenly and far too young on Saturday, September 11, 2021.



Jill worked as an associate for WRA for over five years and was involved in several projects including the NERC funded Macronutrients projects, the EU REFRESH Project, Lake Simcoe Project (Canada) plus projects with DEFRA, Thames Water and the Environment Agency.

She was a driving force helping to direct the NERC-funded Macronutrients Programme. This programme involved 12 university groups and 4 NERC Institutes with over 120 Staff involved ranging from senior Professors to Post Docs and PhD Students, plus many Policy People from DEFRA, the UK Environment Agency and the Scottish and Welsh Governments. There was also an international advisory committee and a team from NERC. Jill helped coordinate the programme and organize many fascinating science meetings and policy groups. Despite her young age at the time, nothing fazed her and she was super-efficient and incredibly helpful to all the researchers and staff involved.

Jill was a funny and lovely person and an astute scientist. She was preparing the paperwork for promotion to associate professor at the University of Windsor in Canada and had won some major grants for environmental research in the areas of hydrology, microplastics and eutrophication. Jill published widely (see her last publication <https://www.mdpi.com/2073-4441/13/5/723>, a major intellectual and multi-disciplinary contribution). Many of her colleagues and friends have been shocked at her early passing. Jill was always happiest surrounded by a bunch of scientists, talking non-stop and enjoying the odd glass of wine. The world will not be the same without her.

RIP Jill

Prof Paul Whitehead

WRA Managing Partner, 23rd September 2021.

Next WRA Board Meeting

Thursday 13th January 2022, at 09.30 hrs at Blewbury.

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 Nick Mandeville: nick@watres.com

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