2025 Ineson Lecture

Wednesday 19th November at the Geological Society, Burlington House, London.

Sustainable Groundwater: Old and New

The International Association of Hydrogeologists British National Chapter, together with the Hydrogeological Group, are pleased to announce the 2025 Ineson Lecture on the theme of Sustainable Groundwater: Old and New. The Ineson Lecture this year will also host the 2025 Darcy Lecture NGWA Darcy Lecture 2025.

Programme

09:30 am Registration & coffee in the Lower Library

10:30 am Welcome, Harriet Carlyle (Chair of IAH GB Chapter)

10:40 am Keynote Speaker Introduction

10:45 am Keynote speaker: 2025 Darcy Lecture – Dr. Grant Ferguson (University of Saskatchewan) Living Fossils: Ancient Groundwater in the Anthropocene

11:45 am Rob Soley (WSP) - Groundwater is great! Large cuts to abstraction are unwise

12:10 pm Alastair Black (Groundwater Science) - What is the definition of 'Sustainable' in our management decisions?

12:35 pm John Day Bursary

12:40 pm Lunch & Hydro Group AGM 1 hr

13:40 pm Bentje Brauns (British Geological Survey) - What can standardised indices reveal about hydrogeological connectivity and drought dynamics across scales?

14:05 pm Mark Grout (Environment Agency) - The use of groundwater to buffer droughts and the quest for sustainable abstraction across the East Anglian region of the UK

14:30 pm Hydrogeological Group Medal Awards

14:40 pm Tea

15:10 pm Ineson Lecture Introduction

15:15 pm Ineson Lecture: Dr. Bridget Scanlon (The University of Texas at Austin) Conjunctive Management of Surface Water and Groundwater to Increase the Sustainability of Global Water Resources

16:15 pm Panel discussion

17:00 pm Drinks reception in the library

Speaker Abstracts

Dr. Grant Ferguson (University of Saskatchewan) Living Fossils: Ancient Groundwater in the Anthropocene. The bulk of groundwater on Earth is fossil, having been recharged more than 12,000 years ago. Past definitions classified these waters as non-renewable because the aquifer systems containing them are not replenished on human timescales. Scrutiny of this definition suggests that it is overly simplistic and may result in preventing access to groundwater to improve water security in some cases or while failing to prevent excessive depletion in others. In many aquifers, groundwater residence times are long because of their large storage volumes; there is no reason to believe that using groundwater from large aquifers is less sustainable than using groundwater from smaller aquifers if recharge rates have not varied appreciably over time. In cases where past climates were much wetter, there has been concern that groundwater will not be replenished under current conditions. Examination of groundwater age distributions suggests that this situation is relatively uncommon. Substantial groundwater storage anomalies are unlikely to persist in areas containing fossil groundwater due to the differences between the rates of transport and hydraulic diffusion, except in very large regional aquifers. This difference in behaviour between storage and transport has been confirmed by recent studies using stable isotopes of noble gases to reconstruct past water table depths. Changes in storage associated with past climates appear to be smaller than those associated with anthropogenic depletion of groundwater, including cases where modern and fossil groundwaters have been extracted. The long response times of many groundwater systems allow them to mediate water and solute fluxes within the Earth system over long time periods. Their lack of sensitivity to current climate changes will make them a strategic resource, if used at appropriate rates.

Rob Soley (WSP) *Groundwater is great! Large cuts to abstraction are unwise.* Our need to access and manage groundwater storage is becoming more acute to sustain public supplies, agriculture, industry, wetlands and river flows through droughts as the climate shifts. Water bills are already stretching affordability levels for many to fund reductions in sewage pollution, the government wants to get growth going and build more houses, and the effectiveness of measures to reduce water consumption and mains leakage is uncertain. At this critical time, our regulators have set an Environmental Destination challenge of reducing groundwater abstraction in England by ~2,600Ml/d – over one third of current pumping - with the aim of complying with naturally-referenced river flow targets. Most of these cuts would fall in headwater catchments where seasonal storage and flow mechanisms are most active in reducing low flow impacts below summer groundwater abstraction rates. Given the uncertainty of realising demand reductions, replacing these drought-resilient sources will put additional stress on strategic new surface reservoirs, desalination plants and effluent recycling schemes which are mostly needed to build more supply security for the future. The hydro-ecological evidence underpinning the default river flow targets is also poor, so we risk wasting a lot of money for limited biodiversity gains.

This presentation will focus on the technical reasons why groundwater is such a great resource in many different settings, using the Wessex Basin chalk as an example, and argues that we would be unwise to lose our access to manage it more smartly for the future for both supplies and environmental support.

Alastair Black (Groundwater Science) *What is the definition of 'Sustainable' in our management decisions?* Much of the UK water management decisions are based on low flow metrics; commonly involving flow naturalisation, nationally scalable estimates of ecological sensitivity to flow reductions and percentile methods. We also use EU-WFD derived classifications, GIS based catchment water balances and in some instances, restrictive, wetland specific metrics.

But do these constitute a defensible definition of sustainability? Can the present methods be augmented to reflect uncertainty in cases where there are not bespoke hydroecological or related surveys to link sustainability to pressure? How can present precise but inaccurate models be used to defensibly imply no-harm on receptors.

This study meets a need where sustainability decisions are required, but the definition of what is the ecological need is uncertain.

In this talk we also raise that models and other forms of decision-making tools should be without bias, but the optioneering can be undertaken in a Precautionary manner. This is counter to tools being built to be Precautionary and further applied in a Precautionary manner.

This talk is intended as a proactive discussion on why and how we can move away from this emerging direction of cessation of groundwater use.

Bentje Brauns (British Geological Survey) - What can standardised indices reveal about hydrogeological connectivity and drought dynamics across scales? Groundwater systems respond to droughts in diverse and often delayed ways, shaped by multiple factors such as aquifer properties, recharge processes, and land use. This talk explores how standardised indices, such as the Standardised Groundwater Index (SGI), can support the interpretation of groundwater drought dynamics across scales—particularly when working with large, heterogeneous datasets. While such indices offer a useful lens for identifying broad patterns, they also simplify site-specific behaviour. Cluster analysis of groundwater hydrographs reveals spatially coherent response types, reflecting differences in system memory and connectivity. These findings highlight both the potential and the limitations of using standardised approaches to understand groundwater droughts. Within this talk and example of an SGI analysis of a large a large (~3000 sites) set of groundwater time series from 1986 to 2015 is presented and shows large-scale patterns in groundwater droughts.

Mark Grout (Environment Agency) - The use of groundwater to buffer droughts and the quest for sustainable abstraction across the East Anglian region of the UK. This talk will describe the water resources supply system that has been developed across East Anglia to show the extent to which groundwater augmentation has been developed in order to buffer the spatial variations in demand, and to mitigate for low streamflows in dry weather. The last 25 years has seen a changing emphasis from the development of groundwater for water supply to an ambition to restore a more natural hydrological regime. The implications and challenges of this change for water supply and groundwater augmentation are highlighted.

The East Anglian region, in common with other regions of the UK, shows spatial variations in demand; there are significant centres of demand around Cambridge and South Essex. East Anglia is also one of the driest areas of the UK and is susceptible to periods of prolonged dry weather. Fortunately, the region is underlain by the Chalk aquifer and its adjoining aquifers. Over time, the Chalk aquifer system has been developed for public water supply, but also to augment river flows to buffer the effects of the spatial variation in demand and seasonal changes in water availability. This talk will describe the water resources supply system that has been developed across East Anglia to show the extent to which groundwater augmentation has been developed.

Over the last 25 years, a framework of groundwater models has been developed for East Anglia to support water resources and water quality management. The models are allowing the Environment Agency to investigate the effectiveness and potential future operation of groundwater augmentation schemes. Many of the augmentation schemes were developed without the benefit of groundwater models or at best, much simpler groundwater models. The current framework of groundwater models is providing the opportunity to review these important groundwater augmentation assets.

The last 25 years has also seen a concerted downward pressure on groundwater abstraction. This downward pressure has been exerted through the Restoring Sustainable Abstraction Programme initiated in 1997, the Habitats Directive and the Water Framework Directive. Many of the watercourses across East Anglia are also now identified as Chalk Streams under the initiative to restore Chalk Stream flows. Not least, the Environment Agency has recently launched its National Framework, including the Environmental Destination, a programme that is working towards an ambition of significantly lower groundwater abstraction across the Chalk of South East England, particularly in view of potential climate change scenarios. The implications and challenges of this ambition for water abstractors and groundwater augmentation are highlighted.

Dr. Bridget Scanlon (The University of Texas at Austin) Conjunctive Management of Surface Water and Groundwater to Increase the Sustainability of Global Water Resources. Managing global water resources is becoming increasingly challenging with increasing irrigation water demand and intensifying climate extremes. Our analysis of global water storage trends benefits from advances in remote sensing, especially GRACE satellite data, global and regional modelling, and expanding monitoring networks.

GRACE satellite data show declining, stable, and rising trends in total water storage over the past two decades in various regions globally. The causes of water storage variability are primarily linked to human drivers, particularly irrigation, and climate extremes, especially droughts and floods. GRACE satellites show large-scale water storage

depletion over the past two decades in NW India, Middle East, N Africa, and SW US. Groundwater monitoring and regional modelling provide longer-term context over the past century, showing rising water storage in NW India, central Pakistan and the NW US, and declining water storage in parts of the US High Plains and US Central Valley. Areas of stable or rising water storage show potential for irrigation expansion, including many parts of Africa and humid E US. Water resource resilience can be increased by conjunctively managing surface water and groundwater and storing water in surface and subsurface reservoirs from wet climate cycles for use during droughts. Examples of conjunctive surface water and groundwater management include combining canal irrigation and groundwater irrigation in NW India and SW US. Inefficient surface water irrigation during wet periods can be used to recharge depleted aquifers for use during droughts, as in the SW US and using managed aquifer recharge.

A diverse portfolio of water management solutions, in tandem with managing groundwater and surface water as a single resource, can help address human and ecosystem needs while building a resilient water system. The visual power of GRACE satellite data has helped communicate water storage variability to the public and influence water policy in many regions, including India and the US.

Speaker Biographies

Dr Grant Ferguson is a professor of hydrogeology in the Department of Civil, Geological and Environmental Engineering at the University of Saskatchewan. He also holds a joint appointment in the School of Environment and Sustainability at the University of Saskatchewan and is an adjunct professor at the University of Arizona and University of Waterloo. Ferguson holds a B.Sc. from the University of Waterloo and a Ph.D. from the University of Manitoba. His research focuses on the hydrogeology of deep groundwater systems, paleohydrogeology, the hydrogeology of the Canadian Prairies and sustainable development of groundwater resources. Ferguson is currently vice president, North America for the International Association of Hydrogeologists and has served as President of their Canadian National Chapter. He is also an associate editor for the journal Groundwater.

Rob Soley is a hydrogeologist who has focused on water resources work overseas and in the UK for the last 36 years. He helped the Environment Agency design many of its spreadsheet, GIS and coding tools to assess the acceptability of abstraction and discharge impacts on rivers, wetland and estuarine/coastal receptors. Most of the examples in the talk are drawn from the regional groundwater, river flow and wetland models which Rob has led the development and use of across the Sandstone, Chalk, Limestone and gravel aquifers of England. He is half way through releasing a series of 'Groundwater is Great!' videos on LinkedIn exploring the hydrogeological processes and regulatory issues summarised in this presentation

Alastair Black is a hydrogeologist and software developer with over twenty years of experience in water-resources modelling, mining hydrogeology, and sustainable groundwater management. As Director of Groundwater Science Ltd, he has been part of the team in more than sixty groundwater and surface-water modelling projects for regulators, water companies, and industry. His interests focus on improving conceptual accuracy and predictive reliability in water-resource assessments through innovative use of numerical modelling and software development. Alastair aims to continue to promote sustainable abstraction and evidence-based decision-making across the sector.

Dr. Bentje Brauns is a Senior Hydrogeologist at the British Geological Survey (BGS). Her academic journey began with a PhD focused on groundwater–surface water interactions and nutrient exchange in Asia. Since then, she has built a diverse portfolio of work addressing groundwater contamination, recharge dynamics—including drought-related challenges—and field-based hydrogeological investigations across Europe, Africa, and Asia. At BGS, Bentje has been contributing to international research since 2018, leading and supporting projects that tackle complex groundwater issues with an emphasis on collaborative solutions and interdisciplinary work.

Mark Grout. My career in groundwater started just over 40 years ago when I was awarded a Ph.D. on the numerical modelling of radial flow to a pumping well. The Ph.D. led on to a research fellowship, working on a contract to review the reliable outputs of the groundwater sources of the then Lee Valley Water Company, now part of Affinity Water. Lee Valley Water Company supplied water to most of Hertfordshire and the eastern part of Essex. At the end of the research fellowship, I joined Anglian Water Authority as a groundwater modeller. Following the privatisation of the water industry, I transferred to the National Rivers Authority and then the Environment Agency, still based within the former Anglian Region, covering Lincolnshire and East Anglia. Throughout the 1990s, the focus of groundwater modelling within the Environment Agency was delineating groundwater protection zones for the purposes of the new national Groundwater Protection Policy. At the end of the 1990s, I wrote a Strategy aimed at the development of a framework of groundwater models covering all the main aquifers of the Anglian Region that could form the basis for decision-support with regard to groundwater resources and groundwater quality management. Since the year 2000, I have led a programme to deliver this framework. I also led the application of the groundwater models in support of the Restoring Sustainable Abstraction Programme, the Habitats Directive Review of Consents, the Water Framework Directive and then to a complete review of the original groundwater protection zones. My current work continues to focus on the maintenance and refinement of the Anglian groundwater models, and their operation in support of a range of water resources business drivers

Dr. Bridget Scanlon is a Research Professor at the Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin. Her current research focuses on various aspects of water resources, including global assessments using satellites and modelling, management related to climate extremes, and water energy interdependence. She has authored ~ or co-authored ~200 publications. Dr. Scanlon is an AAAS, AGU and GSA Fellow and a member of the National Academy of Engineering.

Posters

John Day Bursary Award – Winner

A review and update of an existing model for sustainable water supply in Cox's Bazar Mega Camp.

Hasan Kadodia
University of Birmingham

This project addresses groundwater resources for a mega refugee camp, Cox's Bazar, in south-east Bangladesh for Rohingya people who have fled Myanmar. Since 2017, the rapid expansion of the Mega Camp, which accommodates over 1 million refugees, had caused the substantial increase in demand for drinking and sanitation water, resulting in intensified groundwater abstractions. Additionally, accommodating the camp's expansion has meant further destruction of existing natural forests, causing a change in local hydrological conditions, affecting the average annual rainfall and the groundwater recharge. Consequently, groundwater levels in wells across the Mega Camp has been steadily declining as abstraction continues to meet growing demand. To clarify current conditions, an expanded database was collated: observation well hydrographs, rainfall and PET records, updated production-well, population datasets, and published pumping test summaries from earlier work. Datasets were processed, but a time series was not reconstructed given project time constraints. The inputs were used to refresh the existing numerical model and to suggest a more efficient groundwater management rather than detailed forecasts. The study suggests practical measures to ease aquifer stress, selective use of deeper formations such as the Tipam Sandstone, capture and storage of monsoon runoff on elevated ground, encouragement of deeper drilling north of the Mega Camp where transmissivity values are usually higher. The work provides a coherent data foundation and clear actions for integrated groundwater management and adaptive planning. Key limitations are the absence of transient target series in calibration, and the lack of a newly reconstructed time series. Conclusions therefore emphasise observed records and operational recommendations rather than precise predictions.

John Day Bursary Award – Runner-up

Ground Source Heat Potential for the University of Birmingham

Mateusz Pandzierski
University of Birmingham

This project further develops an existing FEFLOW heat transport model of the sandstone aquifer beneath the university campus, in the context of assessment of potential for open loop ground source heating and cooling. A refined conceptual model of groundwater and heat movement is developed, including interaction between the aquifer and surface water boundaries, and anisotropy of the sandstone. The role of these factors in the viability and long-term performance of the proposed geothermal scheme is analysed using the updated model.

Ecosystem Hydrological Monitoring – Implications for Groundwater Management

Regan, S.[1,2], Cushnan, H.[3], O'Connor, M.[3], and Mackin, F.[3]
[1] Scientific Advice and Research Directorate. National Parks and Wildlife Service. Dublin; [2] School of Earth Science. University College Dublin. Dublin; [3] RPS Consulting Engineers. Belfast.

The National Parks and Wildlife Service is the State Agency responsible for nature conservation of national and international protected areas in Ireland. Associated with this, is a scientific monitoring programme that has been developed for ecosystems of particular significance (peatlands, coastal wetlands, grasslands and rivers). A primary purpose of the monitoring network is to collect long-term scientific observations on ecological, hydrological and carbon dynamics in order to better understand ecosystem dynamics and its response to environmental pressures (e.g. land-use, pollution and climate change). Groundwater monitoring is an integral part of the monitoring scheme, informing conservation management, but also as information for regional hydrology, with many observation sites being located in important municipal water supply and recharge areas.

This poster will present the monitoring network, preliminary results and insights into thresholds for sustainable groundwater abstraction in areas with important ecological receptors.

Assessing the resilience of public water supply boreholes to future drought

Kirsty Upton, Matthew Arran, Chris Jackson, Ben Marchant, Setareh Nagheli
British Geological Survey

Water companies must be able to assess the amount of water they are able to supply -Deployable Output (DO) - and how this might change under future drought conditions, which are predicted to be more frequent and severe. Water companies currently lack adequate tools for assessing future changes in groundwater DO, instead relying on historical data to make a 'best guess'. We present the development of a modelling framework – combining detailed source scale groundwater models, simulation of regional groundwater level hydrographs using AquiMod, and machine learning-based model emulation – that can be used to produce seasonal to multi-decadal forecasts of groundwater source performance.

Linking SAR Backscatter Intensity to Ecohydrological Dynamics of Temperate Bogs

Mahdi Khoshlahjeh Azar[1,2], Alexis Hrysiewicz[1,2], Shane Donohue[2,3], Shane Regan[4], Raymond Flynn[5], Florence Renou-Wilson[6], Eoghan P. Holohan[1,2]
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[6] School of Biology and Environmental Science, University College Dublin, Dublin, Ireland

Peatlands play a crucial role in regulating water flow, maintaining groundwater recharge, and preserving water quality. However, climate variability and human disturbance increasingly threaten their function, potentially leading to carbon emissions, biodiversity loss, and poor water quality. Understanding groundwater dynamics within peatland systems is therefore essential for sustainable water resource management. The widespread distribution of damaged peatlands makes these processes challenging. Synthetic Aperture Radar (SAR) satellites provide consistent, large-scale observations at high resolution, even under cloudy conditions. Yet, the links between SAR backscatter and peatland ecohydrology remain only partly understood. Our study examined how cross-polarized C-band SAR backscatter, VV (vertical transmit/vertical receive) and VH (vertical transmit/horizontal receive), relates to temperate bogs. Time series of SAR backscatter intensity showed annual oscillations: maxima in winter-spring and minima in summer-autumn, mainly reflecting soil moisture changes controlled by groundwater and meteorological condition. We found that industrial cutaway peatlands exhibit stronger seasonal VV intensity swings than near-intact bogs, reflecting more extreme drying-wetting cycles that can influence local groundwater dynamics. VH intensity was highest in shrub-dominated areas and lowest in cutaway and moss-dominated bogs, indicating vegetation-driven differences in water retention and infiltration. Importantly, shifts in SAR backscatter reveal the hydrological effects of human disturbance and early restoration, highlighting SAR's potential as a tool for monitoring peatland management practices that support sustainable groundwater resources.

Restoring Sustainable Abstraction in Nottinghamshire

Phil Hubbard[1], Matilda Beatty[2], Ben Harvey-Galliers[1], Andrew Davey[3], Alberto Scotti[3]
[1]Stantec; [2]Severn Trent; [3]APEM

The East Midlands Permo-Triassic sandstone aquifer is a vital source of water for large parts of Nottinghamshire and South Yorkshire, with abstraction by Severn Trent, Anglian Water and Yorkshire Water. Since 2010, Stantec and APEM have been investigating abstraction-induced low flows for Severn Trent in tributaries of the River Idle and the River Trent. As a result of these investigations, Severn Trent committed in 2020 to reduce abstraction across the wellfield by 23.5 Ml/d by 2030, alongside river restoration measures in four waterbodies.

Such an abstraction reduction posed a significant challenge for the local water supply, and has required investment in alternative supplies and substantial reconfiguration of the network. Stantec has supported Severn Trent in the development of a sustainable abstraction strategy for the area, using the EA's East Midlands Yorkshire groundwater model to target reductions at the most environmentally beneficial sources, while also respecting operational constraints and avoiding potential disbenefits. The project highlights the importance of conjunctive use for effective management of water resources, as well as the need to integrate licence changes with catchment measures to improve environmental outcomes.

Lough Fea Sand and Gravel Aquifer - Dual approach to estimating recharge to a shallow superficial aquifer

Paul Wilson and Rebecca Ní Chonchubhair
Geological Survey of Northern Ireland

The Lough Fea Sand and Gravel Aquifer is a productive superficial aquifer which is currently of interest to Northern Ireland Water due to its potentially high yields (>1 ML from shallow boreholes) and potential financial savings as its high elevation allows water to be gravity fed to users. Due to its strong connection to surface water flows, a robust understanding of the groundwater resource is required to ensure it is managed sustainably. This study estimates groundwater recharge through the FAO method which utilises Met Office weather data and superficial mapping and through the Water Table Fluctuation Method which utilises actual groundwater level data from a borehole located adjacent to the weather station. The proximity of the observation well to the weather station allows for a comparison to be made between both methods.

Dynamics of Groundwater Recharge and Land Subsidence in the Kathmandu Valley

Anoj Khanal[1], Hayley Saul[1], Prakash Pokhrel[2,3]
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In recent years, Kathmandu Valley has witnessed massive land subsidence with rate of subsidence exceeding 20 cm/yr in certain locations and groundwater withdrawal is believed to be a major driver behind this subsidence. This research examines the relationship between groundwater age, recharge process, groundwater subsidence and existing land use practices, exploring the drivers of ongoing subsidence. Recent data shows Kathmandu Valley has a mixed groundwater recharge environment where modern water is mixing well with pre-modern water, suggesting a complex heterogeneous recharge environment. The existing multi-aquifer pumping system, combined with a mixed recharge environment, creates favourable conditions for land subsidence. Current subsidence data reveal a strong correlation between zones characterized by intensive groundwater extraction and the presence of older groundwater, both of which exhibit higher subsidence rates. This suggests that the recharge environment of the valley plays a critical role in driving the subsidence. With increasing water demand and the lack of sustainable water alternatives, the magnitude and spatial extent of subsidence are likely to intensify in the coming years, posing a substantial challenge for nearly four million inhabitants of Nepal's capital city.

Revisiting groundwater for future resilience.

Stuart Allen, Natalie Kieboom, Sian Loveless, Amy Wilcox
Environment Agency

The Environment Agency (EA) plays a key role in managing water resources in England. With a changing climate and new demands on water sources (for example, economic growth, net zero and AI) we need a better understanding of the potential role groundwater can play in managing these challenges.

This poster will share findings from previous EA work in this area (including droughts, brackish water sources) and where we see evidence gaps and opportunities for future research into groundwater resources (for example, improving models of surface water-groundwater interactions and water management units).

Sand dams as year-round groundwater supply in water scarce regions.

Alison Parker
Cranfield University

Sand dams are a way of increasing groundwater availability in water scarce regions with long dry seasons. To measure how far into the dry season they provide water 30 handpumps next to sand dams were fitted with data transmitters which measured when the pump was being used. At 21 wells, abstraction was still being recorded at the end of at least one long dry season; however, high spatial and temporal heterogeneity between pumps and seasons means that not all sand dams deliver reliable water supply year-round.

Building strategic groundwater monitoring capacity into natural capital assessments

Elena Armenise, Mario Manganaro, Sharon Thomas
Environment Agency, Horizon House, Deanery Road, Bristol, BS1 5AH, UK

The Natural Capital and Ecosystem Assessment (NCEA) programme is Defra's largest research and development programme, designed to build strategic capacity for monitoring and assessing natural capital and ecosystems across England. It will improve the quantity, quality, and relevance of environmental data and system-level insights, which will ultimately help government, businesses, and the public make more informed decisions and environmental policies.

As part of this initiative, the Environment Agency is establishing five new monitoring networks focused on groundwater ecology, groundwater quality, groundwater level, groundwater temperature, and groundwater dependent wetlands. These networks will deliver unbiased and statistically robust assessment of the groundwater condition across the country, filling critical evidence gaps, providing a more holistic view of environmental health and resilience, and informing long-term policy and investment decisions for sustainable groundwater management.

Sustainable groundwater in Scotland: the environmental tracer baseline

George Darling[1], Laura Holliday[1], Alan MacDonald[1], Leo Peskett[2], Daren Gooddy[1,3], Brighid Ó Dochartaigh[1]
[1]British Geological Survey; [2]Heriot Watt University; [3]currently UKCEH

The growing contribution of groundwater to Scotland's water supply makes it important to establish 'baseline' aquifer conditions against which to evaluate future changes due to abstraction, pollution and climate change, all factors that determine resource sustainability. The SEPA/BGS Baseline report series (https://nora.nerc.ac.uk/id/eprint/519084) laid a firm foundation, but prioritised water quality over factors like provenance and age. This poster outlines progress regarding the latter across Scotland, in the form of improved maps of stable isotopes in groundwater, and age-tracer information from a range of aquifers. These will allow better evaluation of any future changes in individual aquifers as they are developed.

Groundwater Relief Poster

Oliver Wale
Groundwater Relief

Since 2021, Groundwater Relief and Acted have been supporting the Northeast Syrian water authorities with a hydrogeological study of the Upper Khabour River Basin in Al-Hasakah Governorate. This work is in response to prolonged water insecurity and the drying of Ras-al-Ein spring and the Khabour River.

Key activities to date include a desk-based hydrogeological study, establishment of groundwater and rainfall monitoring systems, and pumping test investigations of major wellfields near Hasakah and Qamishli cities.

Initial findings indicate that water scarcity in Al-Hasakah is driven by a complex mix of climatic, anthropogenic, political, and geological factors. In particular, the reliance on non-renewable deep aquifers and the prevalence of anhydrite in the upper aquifers contribute to a high prevalence of elevated groundwater salinity. However, limited zones of relatively fresh groundwater are found beneath local volcanic basalt formations, which are increasingly exploited to supply drinking water to Hasakah city via water trucking.

Next steps in the programme include downhole geophysical surveys, continued data collection, refinement of the existing Leapfrog 3D geological model, and development of a numerical groundwater flow model to support informed, scenario-based decision-making by local authorities.

Assessing and Mitigating Impacts of Quarry Dewatering: A Hydrogeological Approach with a Case Study from Scotland

Chris Woodhouse and Hannah Muir
Envireau Water

Dewatering from quarries can impact abstractors, river flow and the environment and a robust hydrogeological conceptual model is essential to enable impacts to be predicted and appropriately mitigated. A case study from a hard rock quarry in Scotland shows how, through targeted data collection and conceptualisation, impacts can be assessed and mitigation designed to protect neighbouring private water supplies and an ecological SSSI.

A Wee Dram of Resilience: Water Supply Boreholes Supporting the Distilling Industry in Scotland.

Chris Allman
Envireau Water

To increase climate resilience and support business growth, two new production boreholes were installed to supplement old spring sources at an existing distillery on Speyside. A series of ground investigations were initially completed to support the development of the new groundwater sources, ensuring that the final scheme was developed prioritising source efficiency and sustainability, and ensuring protection to the nearby designated sites. Two boreholes were successfully drilled and tested, securing a more robust and drought-resistant water supply and enabling increased operational capacity and long-term sustainability.