Dr Stephen Richard Buss MA MSc CGeol

www.hydro-geology.co.uk

An experienced consultant hydrogeologist with nationally-recognised expertise in: sustainable groundwater management, groundwater flooding, groundwater quality and contaminated land risk assessment.

Career Summary

Since Sept 2013: Stephen Buss Environmental Consulting Ltd

An experienced consultant providing cost-effective hydrogeological and groundwater quality assessments and advice. Development of bespoke environmental modelling tools.

Nov 1999 to Aug 2013: ESI Ltd

Technical Director responsible for managing and directing large consultancy projects and business development. I developed the company's catchment management and groundwater flooding capabilities by providing relevant services to water companies and the Environment Agency. I was director of innovation and managed the internal R&D budget. I developed a number of lecture series and regularly presented on internal and external training courses.

1998: Freelance hydrogeologist

Seconded to the Environment Agency in Lichfield, I provided support to the groundwater and contaminated land team.

1997: University of Birmingham

As a postgraduate research assistant I used a GIS system to predict the distribution of groundwater chemistry in an East Anglia Chalk aquifer.

Qualifications

PhD, University of Birmingham 1999

MSc Hydrogeology,
University of Birmingham 1995

BA (Hons) Geological Sciences (2:1),
University of Cambridge 1994

Professional memberships

Chartered Geologist and Fellow of the Geological Society of London

Member of the National Ground Water Association (NGWA)

Member of the International Association of Hydrogeologists (IAH)

Professional standing

Assistant Scientific Editor for the Quarterly Journal of Engineering Geology and Hydrogeology (2012-2018).

Committee member of the Hydrogeological Group of the Geological Society (2005-2009).

Peer reviewer for Environmental Modelling and Software, Applied Geochemistry and Journal of Environmental Quality. Peer Reviewer for DEFRA funded research.

Technical software & tools

ArcGIS, QGIS, Groundwater Vistas, MODFLOW, HYDRUS, PHREEQC, Remedial Targets (P20), RISC, RBCA Toolkit, ConSim, Bioscreen, Excel, Access, Visual Basic, Python and more…

Basement Impacts

Since 2014:

Completion of the screening and scoping groundwater components of basement impact assessments for 24 residential and commercial basement developments in Camden, Kensington and Chelsea, Westminster, Barnet, Surrey and Hertfordshire.

Modelling impact of basement construction on local groundwater levels for 6 residential and commercial basement developments in Camden, Westminster and Surrey.

Modelling inflows to basement dewatering systems, Camden and Hampshire.

Modelling pore water pressure changes adjacent to a multi-storey basement in the London Clay, Westminster.

Prior to 2014:

Completion and management of other consultants for screening and scoping groundwater components of basement impact assessments for 10-15 residential and commercial basement developments in Camden, Kensington and Chelsea, and Tower Hamlets. Several including modelling of groundwater flows around basements.

Planning Advice to Local Authorities

Kingston upon Thames Council (2014): peer review of groundwater flood risk assessment for a basement development.

Wychavon District Council (2014): independent review of development impacts on groundwater flooding.

Mole Valley District Council (2011): peer review of groundwater flood risk assessment.

Torridge District Council (2010): peer review of groundwater flood risk assessment

Groundwater Flooding

Design and implementation of national groundwater flood forecasting service (2015).

Design of a fine-scale groundwater flooding map of Northamptonshire, and development of a county strategy for groundwater flood forecasting (2015).

Mapping groundwater flooding for Bramdean, Hampshire (2014). Advice on return periods of groundwater flooding, Bishops Sutton, Hampshire (2014).

Advice on groundwater flooding in a major retail development purchase in an old Chalk quarry, South East England (2014).

Argyll Environmental (2014): development of an updated methodology for estimating groundwater flood risk.

140 site-specific risk assessments for properties highlighted at risk of groundwater flooding during conveyancing searches (2014-2015).

Design of the first national map of risk from groundwater flooding (2013-ongoing).

Design of a groundwater monitoring system to assess contribution of groundwater to flooding at Hornsea Mere, East Yorkshire (2014 & 2015).

Environment Agency, North West Region (2011): Yorkshire groundwater model. Extraction of extreme baseflows as input to the flood model for Hull.

Argyll Environmental (2010): development of a methodology for estimating groundwater flood risk from susceptibility maps. Review of Argyll's interpretations.

Environment Agency (2009-2010): Groundwater flood warning service policy and forecasting tool development (with Halcrow). Review of existing methods and recommendations for approach to forecasting. Production of the procedures for setting warning thresholds.

Environment Agency, North West Region (2009): mapping groundwater flood hazard on the Corallian aquifer of North Yorkshire. Scoping study using GIS tools to model groundwater levels.

Environment Agency (2009): groundwater inputs to R&D project SC080050 Developing a Prototype Tool for Mapping Flooding from all Sources (with Halcrow and Heriot-Watt University).

Environment Agency, North West Region (2008): use of regional numerical model predictions to assess flooding risk from rebounding groundwater levels.

Private developer, Groundwater flooding risk of the Newbury Park development (2007): Used data from the Kennet Valley model to investigate impacts of installing sheet piling in Newbury.

English Nature: Hydrological Studies at the Stiperstones (2003). Detailed rainfall-runoff modelling was used to assess flood risk downstream of a small rural catchment in Shropshire, during transformation to upland heath.

Private developer (2001): Groundwater flood risk assessment, Compton, Berkshire. Investigated hydrogeological impacts of excavation and re-placing soil within a groundwater flood-prone Chalk catchment.

Soakaways and Drainage

Risk assessments for treated sewage soakaways near Mansfield, Luton and Haslemere (2014-15).

Review of hydrogeological impact of scheme for distributed soakaway disposal of rain water, Port Vila, Vanuatu (2015).

Groundwater Resource Modelling

Birmingham Sherwood Sandstone aquifer model: including data re-analysis and summary of literature on groundwater chemistry. Environment Agency (2013).

London Basin Chalk aquifer model: leading on the interpretation of geology, aquifer properties and groundwater chemistry; plus bringing together the conceptual model and oversight of the reporting and modelling. Environment Agency (2013).

Yorkshire Chalk aquifer. Bringing together the conceptual model, oversight of the reporting and numerical modelling. Development of CAMS water balances, SPZs and extreme baseflows as input to a flood model. Environment Agency (2012).

Lower Mersey/North Merseyside Sherwood Sandstone aquifer. Management of the final stages of the project, including reporting and development of model predictions. Outputs from the model were used to review of existing SPZs, to assess groundwater flooding risk and to define risk zones for saline intrusion. Environment Agency (2009).

Permian Magnesian Limestone aquifer. Data review, conceptualisation and water balances. Particularly including regional interpretation of groundwater chemistry for the aquifer, with specific interest in mine water plume migration, saline intrusion and diffuse nitrate pollution. Environment Agency (2009).

Lichfield Permo-Triassic Sandstone aquifer. Data review, conceptualisation, water balances and numerical modelling of the area between Lichfield and Birmingham. Emphasis is on protecting key low-flow streams and the interaction of a water-transfer tunnel with the aquifer. Environment Agency (2009).

Manchester and East Cheshire Permo-Triassic Sandstone aquifer (2001-2005). Conceptualisation, water balance and numerical model of the public water supply sources around Macclesfield and Wilmslow. Also reviewed the licensing position of Trafford Park, taking into account issues with historic over-abstraction, high iron and manganese concentrations, and saline upconing. Environment Agency (2005).

Dewatering and Quarrying

Risk assessment for potential water quality impacts for a quarry recovery scheme, South Yorkshire (2014).

Identification of source of inflows to a mine using fluorescent dye tracers, North Wales (2014). Using three coloured tracers individual flow routes through the subsurface could be identified.

Sibelco Minerals: Lee Moor china clay pit complex, Dartmoor (2009). Review of old mineral permissions (ROMP), modelling the effects of filling an old pit with water, including leakage via a sealed, old adit. Monitoring hydrological conditions at sites targeted for the translocation of marsh club-moss.

Tarmac: Predicting and mitigating effects of dewatering next to a wetland SAC (2007). Including modelling hydrogeology of the adjacent peat horizons.

RMC Aggregates: Bramshill Quarry Extension (2003). Examined the hydrogeological effect of developing a gravel quarry adjacent to hydrologically sensitive SSSIs in Hampshire.

Tarmac: Hydrogeology of New Cliffe Hill Quarry, Leicestershire (1997). Development of a conceptual model of fracture flow systems within a granite quarry, used to help predict the impact of deepening the quarry.

Groundwater Resource Development

Pumping test analysis for new and recommissioned water supply boreholes, Staffordshire (2015).

Assessment of the need for an abstraction licence from an on-site pool, Lincolnshire (2014).

Water balance modelling study and development of a drought-resilient water supply for a golf course, Staffordshire (2014).

Sustainability assessment of a mineral water spring in Jezzine, Lebanon (2014)

Borehole design for a nursery, Kent (2014). Pumping test for a domestic well supply, Worcestershire (2014).

Pumping test analysis and deployable output assessment for five re-commissioned and new Permo-Triassic sandstone sources. United Utilities (2013).

Optimisation of the placement of potential new groundwater sources using GIS analysis of sensitive receptors and the North Merseyside groundwater model. United Utilities (2008)

Low Flows / Restoring Sustainable Abstraction

Project director for four low flows sites in the West Midlands. Collating ecological, hydrological and hydrogeological inputs and taking an overview of the project outcomes and recommendations. South Staffs Water (2013).

AMP5 NEP low flows desk studies (2010-11). Collating ecological, hydrological and hydrogeological inputs and taking an overview of the project outcomes and recommendations. Severn Trent Water (2011).

Predicting abstraction impacts at Bomere Pool (2008). Use of water balance techniques to understand flows into and out of a SSSI, including scenario analysis to determine sustainable abstraction limits.

Groundwater Quality: diffuse pollution

Co-wrote Environment Agency literature reviews on the sub-surface attenuation of nitrate, ammonium and the herbicide mecoprop (2003-6).

Supported the development of catchment management strategy for Severn Trent Water, focussing on protection of groundwater sources from nitrate (2011-12).

Using a bespoke nitrate concentration trending model, managed the assessment of catchment management options for 29 groundwater sources in the Severn Trent Water area and 13 groundwater sources in the United Utilities area (2011-13). In partnership with ADAS we provided advice on mitigation measures for reduction of diffuse nitrate pollution impacts at these sources. We also advised on managing pesticide inputs to catchments.

Provided advice on N-chemistry in an investigation of the source of nutrients causing excessive macro-algae growth, Portsmouth Harbour.

Groundwater Quality

Technical supervision of modelling observed water quality changes under ASR cycling (Anglian Water, 2015).

Water quality investigations and recommendations for remedial work, Joseph Holt Brewery, Manchester, 2014.

Modelling observed water quality changes under ASR cycling (Thames Water, 2012). I developed a radial flow PhreeqC model to successfully simulate arsenic concentrations during repeated injection – abstraction cycles at an exploratory ASR borehole in the Lower Greensand aquifer, Kent. The model calibrated well to chloride and arsenic concentrations in the abstraction borehole over four cycles. Results were extrapolated to suggest evolution of arsenic concentrations in the wider aquifer.

Modelling expected water quality changes on ASR injection of mains water into the brackish, confined Cotswolds aquifer, Wiltshire (Thames Water, 2012). Oxidation of in-situ pyrite and softening of injected water were considered likely, and the feasible ranges of outcomes were modelled with PhreeqC.

Assessment of regional groundwater quality distributions in major aquifers, to learn more about the hydrogeological conceptual model (see regional models section for areas). There was particular emphasis on chemistry in the Durham Magnesian Limestone aquifer, where dissolution of gypsum-rich marls affected water quality and borehole performance. And the Oxfordshire Corallian aquifer where we successfully modelled the spatial distribution of freshening of saline groundwaters.

Characterising acidic, aluminium-rich slate mine drainage, plus options appraisal and preliminary design of a remediation system to restore local fisheries, Blaenau Ffestiniog. Subsequently supervised three MSc students who have characterised the chemistry and hydrology of the catchment.

Developed national guidance for Water Framework Directive compliant identification and reporting of impacts of diffuse pollution, for both the Environment Agency and Irish EPA.

Used a GIS model, based on water quality correlations with geological setting, to describe the regional hydrochemical distributions in the Suffolk Chalk aquifer (PGRA, University of Birmingham).

Developed a quantitative model for rapid sorption buffering of acid protons and a qualitative model of longer term buffering in the Sherwood Sandstone (PhD, University of Birmingham).

Contaminated Land and Waste Management

Supervision of a PhD student at University of Portsmouth regarding a project to assess human health risk of oil spills in Kuwait (2014).

Independent review of the Environment Agency protocol for use of steel slag waste as road materials. I reviewed the agency's modelling of risk to groundwater, with particular emphasis on chromium VI levels in the slag. (2014)

Confidential client (2010): Peer review of contaminant transport modelling and remedial strategy for a TCE DNAPL contaminated site.

Supervision of a PhD student at University of Birmingham regarding transport of cadmium in Permo-Triassic sandstone aquifers (2008-11).

Thames Water: Controlled Waters risk assessment of retention on-site of sewage grit screenings (2008). Risk assessment for further use of sewage sludge disposal lagoon (2007).

EA Midlands Region (2007): Assessment of risks to Habitats Directive sites from sheep-dip disposals. Collation of sheep dip disposal information, site-based risk assessments and catchment risk assessments for the rivers Dove and Churnet.

Waterman Environmental: Due diligence of former car manufacturing site, Coventry (2007); peer review of risk assessment of tannery site, Somerset (2006); risk assessment of former metal works, Warwickshire (2005).

Scott Doherty Associates: Derivation of custom guideline soil screening values (2007); risk assessment of bus depot, Nottingham (2006); risk assessment of former railway sidings, Hartlepool (2005).

Environment Agency North West Region: Foot and Mouth Disposal Risk Assessments (2001). Advice and support on risk assessments for on-farm disposal of animal carcasses. Development of a probabilistic model of the Great Orton mass burial site as it was being constructed. Plus, further assessment of the long-term cumulative risk from disposals on the groundwater resources of the Eden Valley.

Publications

Peer-reviewed papers

Daily, P.J.J., Shepley, M.G., Riley, J.R. and Buss, S.R., 2012. Simulation of a water transfer tunnel at catchment scale in the Permo-Triassic Sandstone aquifer, UK. Geological Society Special Publication 364: The National Programme of Groundwater Modelling in the United Kingdom, 319-332.

Rivett, M.O., Buss, S.R., Morgan, P., Smith, J.W.N. and Bemment, C.D., 2008. Nitrate attenuation in groundwater: a review of biogeochemical controlling processes. Water Research 42, 4215-4232.

Rivett, M.O., Smith, J.W.N., Buss, S.R. and Morgan, P., 2007. Nitrate occurrence and attenuation in the major aquifers of England and Wales. Quarterly Journal of Engineering Geology and Hydrogeology 40, 335-352.

Buss, S.R., Thrasher, J., Morgan, P. and Smith, J.W.N., 2006. A review of mecoprop attenuation in the subsurface. Quarterly Journal of Engineering Geology and Hydrogeology 39, 283-292.

Buss, S.R., Herbert, A.W., Morgan, P., Thornton, S.F. and Smith, J.W.N., 2004. A review of ammonium attenuation in soil and groundwater. Quarterly Journal of Engineering Geology and Hydrogeology 37, 347-359.

Conference proceedings

Buss, S.R., 2013. Is catchment management feasible for improving quality of public groundwater supplies? Proceedings of the 33rd Annual Groundwater Conference, IAH (Irish Group), Tullamore, April 2013.

Arthur, S.A. and Buss, S.R., 2009. Using a tiered approach to the management of water resources in an aquifer susceptible to saline intrusion. Proc. of the 2nd FEFLOW conf., Potsdam.

Buss, S.R., Tellam, J.H., Lloyd, J.W. and Harris, R.C., 1997. Natural retardation of industrial fluids in the Birmingham urban Triassic Sandstone aquifer, in: Chilton et al. (eds.), 1997. Groundwater in the Urban Environment: Problems, Processes and Management. Balkema, Rotterdam. 97-100.

Published reports

Buss, S.R. and 12 co-authors, 2010. Project SABRE (Source Area BioREmediation) – an overview. CL:AIRE SABRE Bulletin SAB01.

Buss, S.R. and 27 co-authors, 2009. The Hyporheic Handbook. A handbook on the groundwater-surface water interface and hyporheic zone for environment managers. Environment Agency Science report SC/05/0070. [Link]

Horritt, M., Lovell, L., Wicks, J. and Buss, S.R., 2009. Developing a prototype tool for mapping flooding from all sources Phase 1: Scoping and conceptual method development. Environment Agency Science Group R&D Report SC/08/0050/SR1.

Buss, S.R., Rivett, M., Morgan, P. and Bemment, C.D., 2006. Attenuation of Nitrate in the Subsurface Environment. Environment Agency Science Group R&D Report SC/03/0155.

Buss, S.R., Lloyd, J.W., Streetly, M.J., Foley, R. and Shanahan, I., 2005. A Methodology for the Characterisation of Unpolluted Groundwaters (2002-W-DS-7). Environmental Protection Agency, Co. Wexford, Ireland.

Buss, S.R., Herbert, A.W., Green, K.M. and Atkinson, C., 2004. Contaminant Fluxes from Hydraulic Containment Landfills – A Review. Environment Agency Science Group R&D Report NC/03/10.

Thrasher, J., Morgan, P. and Buss, S.R., 2004. Attenuation of Mecoprop in the Subsurface. Environment Agency Science Group R&D Report NC/03/12.

Buss, S.R., Herbert, A.W., Morgan, P. and Thornton, S.F., 2003. Review of Ammonium Attenuation in Soil and Groundwater. Environment Agency NGWCLC Report NC/02/49.

Whittaker, J.J., Buss, S.R., Herbert, A.W. and Fermor, M., 2001. Benchmarking and Guidance on the Comparison of Selected Groundwater Risk-Assessment Models. Environment Agency NGWCLC Report NC/00/14.

Herbert, A.W., Tellam, J.H. and Buss, S.R., 1998. A Methodology for Interpreting Groundwater Quality Data Using GIS.

Environment Agency R&D Technical Report W182.

Published articles

Buss, S.R., 2013. Book Review: An Introduction to Thermogeology: Ground Source Heating and Cooling, by David Banks. Quarterly Journal of Engineering Geology and Hydrogeology 46, 127. [Link]

Buss, S.R., 2010. Book Review: Natural Groundwater Quality edited by Edmunds and Shand, Blackwell Publishing, 2008. Geoscientist 20:12, 18.

Buss, S.R., 2009. Introduction to the Hydrogeology in Heat Engineering papers. Quarterly Journal of Engineering Geology and Hydrogeology 42, 281-282. [Link]

Buss, S.R., 2009. How hydrogeology was born. Rockwatch 50, 30-31.

Buss, S.R., 2006. Book Review: Dynamics and Biogeochemistry of River Corridors and Wetlands edited by Heathwaite et al., IAHS, 2005. Quarterly Journal of Engineering Geology and Hydrogeology 39, 112.