**Dr HEATHER C. KERR**

**consultant**

kerr.whanau2020@gmail.com

(+64) 0223590960

**Profile**

Heather is an environmental engineer with 9 years of experience in research & academia and 2 years in consultancy for the water sector. She is a passionate environmentalist and elite sportsperson, having represented England and the Barbarians F.C in rugby union. She has worked for Isle Utilities since 2021, initially in the UK office as a Technical Consultant, and more recently in the Asia Pacific office as a Consultant. Heather’s technical expertise is in research, potable water sludges, circular economy, project design and management, stakeholder engagement and technical due diligence. She has contributed to the delivery of a range of projects in her time at Isle, including horizon scans, due diligence reports, literature reviews and technical reports. In Australia, she now leads Isle’s Bulk Water Innovation Program (BWIP) and runs W-Lab's webinar series (run on behalf of WSAA).

Before joining Isle, Heather was a researcher (PhD and PDRA), which both focused on the use of water treatment residuals from potable water treatment as soil amendments for a range of applications. The research investigated the use of water treatment residuals from the clean water industry to amend soils to improve their physical characteristics such as water retention, strength properties and CO2 emissions. Her PDRA work now contributes to a multi-disciplinary project that is developing climate adaptation control technologies for urban spaces, using novel composite barrier systems in subsurface soils with high water capacity plant species. This technology is to be used as part of newly developed infrastructure.

During her time at university, Heather picked up playing rugby and captained the 1st XV. She competed professionally in the Allianz Premier 15s competition for Wasps FC (2020-2022) and DMP Sharks (2012-2020). She has earned 23 caps for England (2015-2020) including competing at the 2017 Word Cup and numerous Six Nations and has two caps for Barbarians FC.

**Qualifications**

**PhD Civil Engineering,** University of Durham, UK, 2019

**MSc Risk and Environmental Hazard,** University of Durham, UK, 2013

**BSc (Hons) Geography,** University of Durham, UK, 2012

**Experience**

**Isle Utilities Ltd (UK) –**Technology Consultant 2021-date

**University of Durham (UK)** Post-doctoral Research Associate on the CACTUS Project 2019-2022

**University of Durham (UK)** Research Assistant: Weetslade field trial 2016-2017

**England RFU (UK)** Professional Rugby Player 2015-date

**Employment History**

**Technology Consultant, Isle Utilities** (Dec 2021 to present)

My role involves the discovery, understanding and delivery of innovative technologies in the water sector, to clients and external partners. My job involves working with range of clients across the world from mining companies, companies holding research grants, the EA and water utilities. The focus of our consulting at Isle Utilities is to accelerate the uptake of emerging technologies.

**Postdoctoral Research Associate, Durham University, Durham** (March 2019-March 2022)

I investigated the use of novel composite barrier systems that enhance the subsurface soil function in a sustainable way to both provide enhanced water holding capacity and act as a barrier to water ingress and egress, while supporting vegetation growth. My responsibilities and achievements during the post include;

* Planning and managing my own research activity under guidance of the principal investigator, and continuing to develop hard working self-discipline and creative thinking.
* Undertaking specialist geotechnical laboratory testing.
* Understand and convey material of a specialist or highly technical nature to the rest of my research team through presentations and discussions that led to the presentation of research papers in conferences and publications,
* Prepared and delivered presentations on research outputs/activities to both academic and non-academic partners, research collaborators and research sponsors (AECOM, Geosynthetics, CIRIA, NHBS, Welsh Gov, Royal Haskoning),
* Found solutions to problems that may affect the achievement of research objectives and deadlines, offering creative or innovative solutions.
* Developed key working relationships with research colleagues and external contacts to support the overall aims of the CACTUS programme.
* Managed the interaction and collaboration of the 10 person CACTUS team to ensure that our common goals are being met, including coordination of project meetings and dissemination of events.

**Rugby Player, England RFU, London** (January 2017-September 2017)

For a short period in the lead up to the Women's Rugby World Cup, I earned a professional contract with England RFU. During the period 2015-2020 I have been part of the elite playing squad for England and fulfilled this role semi-professionally with the exception of my full time contract.

**Research Assistant, Durham University, Durham** (September 2016- March 2017)

The role as a research assistant involved the establishment of a large scale living laboratory/field trial using data from my PhD research, which showed that soil amendments increase the flood resilience of agricultural soils in laboratory experiments. This project involved working with many external parties including construction partners (Northumbrian Water, Enderby Ltd), local authorities (Environment Agency, Northumberland Council) and funding bodies. This role provided invaluable experience for improving my project management skills from inception to completion.

**Lab Demonstrator (Civil Engineering, Level 3)** 2015-2016

Final year BSc Civil Engineering students are required to take a number of lab based practical modules. I was the lead demonstrator for the Water Quality module during Term 1, taken by 30 students over two weeks. I was required to teach, demonstrate and evaluate student’s work.

**Relevant Projects**

**Project: Empowering Rural Communities with Smart Technology: Next Generation Flood Resilience (Environment Agency, UK)**

**Role: Technical researcher and final report co-author**

**Description:** The Next Generation Flood Resilience project aims to use novel AI techniques and smart sensors in flashy flood catchments to help improve the resilience of the communities living within six rapid response catchments (RRC) in the NE of the UK. There are currently no early warning systems in place for a number of reasons (forecasting capabilities, telemetry issues and operational systems of flood warning). Isle’s role in the project was to complete technical and operational discovery phases of the project, to identify innovative technologies and best practise in early flood warning. This included the identification of any previous or ongoing relevant work packages based in flashy catchments, the identification of technologies and concepts relevant to the inputs or outputs of early warning systems, a SWOT analysis of innovation potential for flood forecasting, AI/ML, smart sensor and analytical deployment platforms, generated from Isle’s Horizon Scanning methodology. Finally, Isle produced a proposed draft end-to-end system capable of meeting the programme objectives as set out in the User Focused Design Synthesis Report and the Operational Discovery Synthesis Report.

**Project: Innovation Partnership for Water Treatment Optimisation (USA & France)**

**Role: Technical researcher and report co-author**

**Description:** The client’s objective with mine closure was to minimise the financial, environmental, and social risks and liabilities associated with permanently ceasing operations, and some closure sites require water risk mitigation in perpetuity. Water management and treatment is a key aspect of site rehabilitation, and the client was interested in best practices, adjusted operating philosophies, and new technologies that can achieve a step-change reduction in the cost of treatment and to reduce HSE risks without compromising environmental performance. The client has initiated a Water Treatment Development Plan (WTDP). Phase 1 of the plan included a collation and assessment of a water treatment fact base across their assets. They collaborated with Isle to support Phase 2 and assess the current water management / treatment practices on 13 individual sites, to gather water qualities and to review discharge or reuse limits. At sites where water treatment plants (WTPs) exist, Isle was required to determine what operational improvements and/or alternative technologies could be implemented to reduce operational costs, meet compliance requirements, streamline procurement and have a lower environmental impact (chemicals, energy, etc.). At sites with no WTP in place, Isle was required to propose suitable acid rock drainage (ARD) prevention methods, and/or water management methods and/or water treatment process trains on a site-by-site basis. *Heather was responsible for the delivery of potential water treatment approaches (as described above in Phase 2) on two of the client's sites in France. One required the removal of excessive Fluoride at an active water treatment plant, and the other a complete redesign of the treatment system to move towards passive treatment rather than active water treatment. This project required detailed understanding and knowledge of water treatment, with specific reference to removal methods for particular contaminants of concern.*

**Project: Community SuDS Accelerator (Environment Agency, UK)**

**Role: Technical researcher**

**Description:** The Stanley South SuDS+ project is interested in monitoring the impact of future implemented SuDS solutions within the project area. The data collected from the monitoring will be used to define the efficacy of the solutions in terms of water quantity, water quality, amenity and biodiversity, as appropriate. The purpose of this horizon scan is to collate technologies (sensors, loggers and services) available to monitor the performance of the SuDS installations and to monitor the community’s physical interaction with the features. It is expected that this list will serve as a catalogue of solutions that the project team can readily and quickly select and install as SuDS solutions are implemented. The horizon scan will also detail technical details of the solutions that could be used for the design and construction of the project data repository. *Heather was responsible for attending weekly meetings to provide input to the project team, and completing a horizon scan of appropriate and innovative technologies to monitor SUDS.*

**Project: Hydrogen in UK Water Sector (RWE, UK)**

**Role: Input and review of final report**

**Description:** The UK water sector has all the right attributes to be an attractive market for Hydrogen. RWE, a noted electrical engineering and power generation company was keen to understand the market drivers and barriers in order to create a value proposition to sell hydrogen solutions to the UK water sector. Isle’s role was to produce an assessment of the UK water market for hydrogen which helps RWE understand; what solutions water companies are looking at and what interests them, the level of activity / interest by water company, challenges they face and benefits they seek, additional ‘side benefits’ such as using the oxygen for aeration of waste heat for sludge drying, typical NPV, IRR and ROI required of projects, and an assessment of the best way to engage water companies, i.e. education and long sales process, assessment of possible segments, prospects and timescales. *Heather was responsible for reviewing and editing the draft report written for RWE, to ensure that the output of the project matched the proposed work and delivered RWE with understanding of the hydrogen market in the UK.*

**Project: Utilities of the Future Program (World Bank, Global)**

**Role: Resource collection**

**Description:** The objective of work was to identify and/or develop additional resources that can add value to the current content of the World Bank’s Utility of the future program, so that it fulfils its function as a knowledge tool and is always at the forefront of industry trends; these resources were selected based on their content, aimed to provide guidance to users on how to materialise and implement actions and practices prioritised as part of the UoF program. The assignment also entails the development of Terms of Reference and Technical Specifications to contract out support to implement activities and recommendations proposed by the UoF program. *Heather was responsible for sourcing and vetting useful resources according to a number of different categories, to be used as resources for water utilities.*

**Project: Interruption to Service Best in Class (Anglian Water, UK)**

**Role: Technical researcher**

**Description:** Anglian Water were putting together their business plan as part of the PR24 process for the next AMP. This plan included activities required to meet estimated ODI targets for challenges such as Interruptions to Supply (I2S) which they were planning to reduce from their current position of 9 minutes 48 seconds to 1 minute. Anglian Water required external insight that provided confidence or challenges their proposed investment. For interruptions to supply this could have include a mix of asset investment or investment in incident response. Anglian Water aimed to understand the areas in which innovation exists, the type of benefit the activity can drive and an estimation of the cost per unit. *Heather’s role in this project was to research and assess all relevant technologies that could reduce interruption to service in different ways, e.g. maintaining asset uptime or increasing emergency response time, and produce a detailed document detailing these technologies.*

**Project: Mobile Water Treatment (United Utilities, UK)**

**Role: Technical researcher**

**Description:**

**Project: Designer Liner (Yorkshire Water, UK)**

**Role: Technical report writing**

**Description:**

**Project: Binnies dealflow (Binnies, UK)**

**Role: Project manager**

**Description:** Isle Utilities and Binnies (formerly Black & Veatch) have an ongoing relationship, in which Isle provides an extended dealflow service (finding and assessing innovative technologies from across the world) to present technologies of interest in quarterly workshops to the innovation team at Binnies. *Heather is responsible for the day to day project management, which includes keeping up to date with invoicing, client communications, managing the delivery of the project in a timely manner and ensuring all project team members complete assigned tasks.*

**Project: REDUCED Project (MOSL, UK)**

**Role: Project manager**

**Description:**

**Project: Ofwat Discovery Challenge Support (United Utilities, UK)**

**Role: Funding submission and reporting**

**Description:** United Utilities (UU) were looking to participate in the 2022 round of the Ofwat Breakthrough Challenge and  coordinated internally to gather suitable ideas. Following a series of ideation workshops across Customer, Networks, Digital Construction and Biosolids, four potential projects were submitted to the Ofwat Discovery Fund, two of which were entered into the Transform Fund and two into the Catalyst Fund. United Utilities required support in writing the funding application to Ofwat. The support entailed; developing the concept with an internal project team at UU, approaching and securing project partners and funding, developing a detailed design and cost of the delivery program, and working with all partners to write a succinct and impactful submission. The development and delivery of the submission was an intense process requiring communication and coordination of multiple stakeholders over a short period of time. Regular meetings were held to provide steering, guidance and assess delivery risks. Heather was responsible for the delivery of two of the submissions, which required significant time management and coordination skills across nearly 20 different parties.

**Project: Pilot Survey of Water Utilities forIBNET and Enumeration Training (World Bank, Global)**

**Role: Enumeration of Water Utilities**

**Description:** The World Bank is developing the new iteration of the International Benchmarking Network (IBNET) tool. This tool will help utilities improve their performance by establishing a database that would offer, amongst other things, a functional benchmarking tool in multiple languages, utility-specific reports, and a tariff database toolkit. IBNET is a global information system and partnership, specifically designed for water and sanitation service providers, which has been around for over 24 years and is one of the most trusted sources of global water and sanitation data available online. The aim of the project delivered by Isle was to (i) collate a sampling frame and contribute to the outreach approach to utilities and (ii) conduct the full survey pilot with 200 utilities. Heather’s role was to complete training to become an enumerator, through a series of online classes, and conduct surveys with numerous water utilities and score them according to a strict set of guidelines.

**Prior to joining Isle**

**Project: CACTUS (Climate Adaptation Control Technologies for Urban Spaces), Durham University**

**Role: Post-Doctoral Research Associate**

**Description:** The aim of the project was to develop climate adaptation control technologies for urban spaces (towns and cities). Novel composite barrier systems were developed to limit the impacts of climate change on urban geo-infrastructure. The potential barrier system can be incorporated into a variety of geo-infrastructure components for mitigating the environmental impacts. The barrier prevents movement of water into the soil below foundation level or into zones of backfill behind retaining walls. Such a barrier could also be used alongside roads and railways to prevent water movement into the subgrade or formation. However, the focus within this investigation is shallow foundations and retaining structures.  *Heather was responsible for the design and delivery of two research work packages in the CACTUS project. The objectives of these work packages were [1] to identify a range of potential soil types (homogenous and composite) that will meet the desired requirements of climate adaptation engineered barriers (hydraulic conductivity and water holding capacity), and [2] to address the independent and combined impacts of wet-dry and freeze-thaw cycles on the stress-deformation characteristics of the soil systems through physical modelling. Heather worked in conjunction with five other universities during the project, and collaborated to publish the early findings in IGSCME’s conference proceedings.*

**Education**

**PhD, University of Durham, Durham** (September 2013 – November 2018)

Originally entitled Engineering Soil Carbon for Flood Mitigation, during the PhD study Heather investigated the potential benefits of using water treatment residual (WTR), a waste from the treatment of clean drinking water, to beneficially amend soil. Owing to the relative novelty of this area of research, the PhD study quickly focused on the investigation of physical soil properties as a result of amendment using WTR. During this period of study I completed work as an RA to plan and implement a large scale field study with external partners, including construction engineers, local council and the Environment Agency legal teams. In addition, I spent a total of 3 months at Stellenbosch University as a Research Affiliate to complete investigations using x-ray computed tomography with the expertise of the CT Scanner Facility Staff. My thesis was entitled; 'Using a water treatment residual and compost co-amendment as a sustainable soil improvement technology to enhance flood holding capacity'.

**MSc Risk and Environmental Hazards, University of Durham** (Sept 2012 – Sept 2013)

Achieved Distinction. My modules included Spatial and Temporal Dimensions of Hazard, Hydrological Hazards, Mountain Hazards, Understanding Risk, Risk Frontiers, In my dissertation, I worked with local stakeholders and the Wears Rivers Trust, using SCIMAP (diffuse pollution risk mapping) to model floodplains in Lanchester.

**BSc Geography, University of Durham, Durham** (September 2009- December 2012)

2:1 Hons

**Further learning and experience**

* Cultural Significance of Wai, Water New Zealand (2023)
* Enumerator Training (World Bank) 2022
* Nature-based Solutions for Disaster and Climate Resilience (SDGAcademyX) *completed 2021*
* Collaboration research placement at Stellenbosch University (Dr Cathy Clarke & Stephan Le Roux) 2016 and 2018
* Poster presentation at Geo-Chicago Conference & publication in proceedings (August 2016)
* Department of Hazard, Risk and Resilience, Durham University: Thinking about hazards; a cross disciplinary study – Presentation (July- March 2016)
* Durham University Research Mechanics: Engineering Day Presentation (October 2015)
* XVI European Conference on Soil Mechanics and Geotechnical Engineering (September 2015)
* ‘A nation that destroys its soils destroys itself’ Workshop, Westminster London (October 2014)
* COST Action TU1202 Meeting, Lisbon: Early stage researcher workshop (October 2014)
* LiCOR Soil Flux Workshop, CEH (October 2014)
* Environment Agency Flash Flooding Finals ; Presentation of 1st PhD year research September (March 2014).
* Placement with Wear Rivers Trust for MSc Dissertation research (2013).

**Other skills**

Research, project management, leadership, teamwork, innovative and critical thinking, problem solving, data analysis, attention to detail, fast learner. Proficiency in Excel, ARCGIS, SCIMAP, Volume Graphics, Avizo, LiCOR, ECH20 Utility.

**Publications**

* **Kerr, H. C., Johnson, K. L., & Toll, D. G. (2022).** Reusing Fe water treatment residual as a soil amendment to improve physical function and flood resilience. *Soil*, 8(1), 283-295.
* **Toll, D. G., Kerr, H., et al . (2022).** Investigating Water Holding Barriers for Climate Adaptation. *In 20th International Conference on Soil Mechanics and Geotechnical Engineering*. Newcastle University.
* **Kerr, H.C. (2018)** PhD Thesis; Using a water treatment residual and compost co-amendment as a sustainable soil improvement technology to enhance flood holding capacity
* **Kerr, H.C., Johnson, K.L., Toll, D.G., Mansfield, F. (2016)** Flood holding capacity: a novel concept to evaluate the resilience of amended soils. G*eotechnical Special Publication; Geo-Chicago* Conference Proceedings.
* **Kerr, H.C. (2013)** An assessment of runoff generation on Greencroft Farming Estate in the Smallhope Burn Catchment, Lanchester. *MSc Thesis,* Durham University