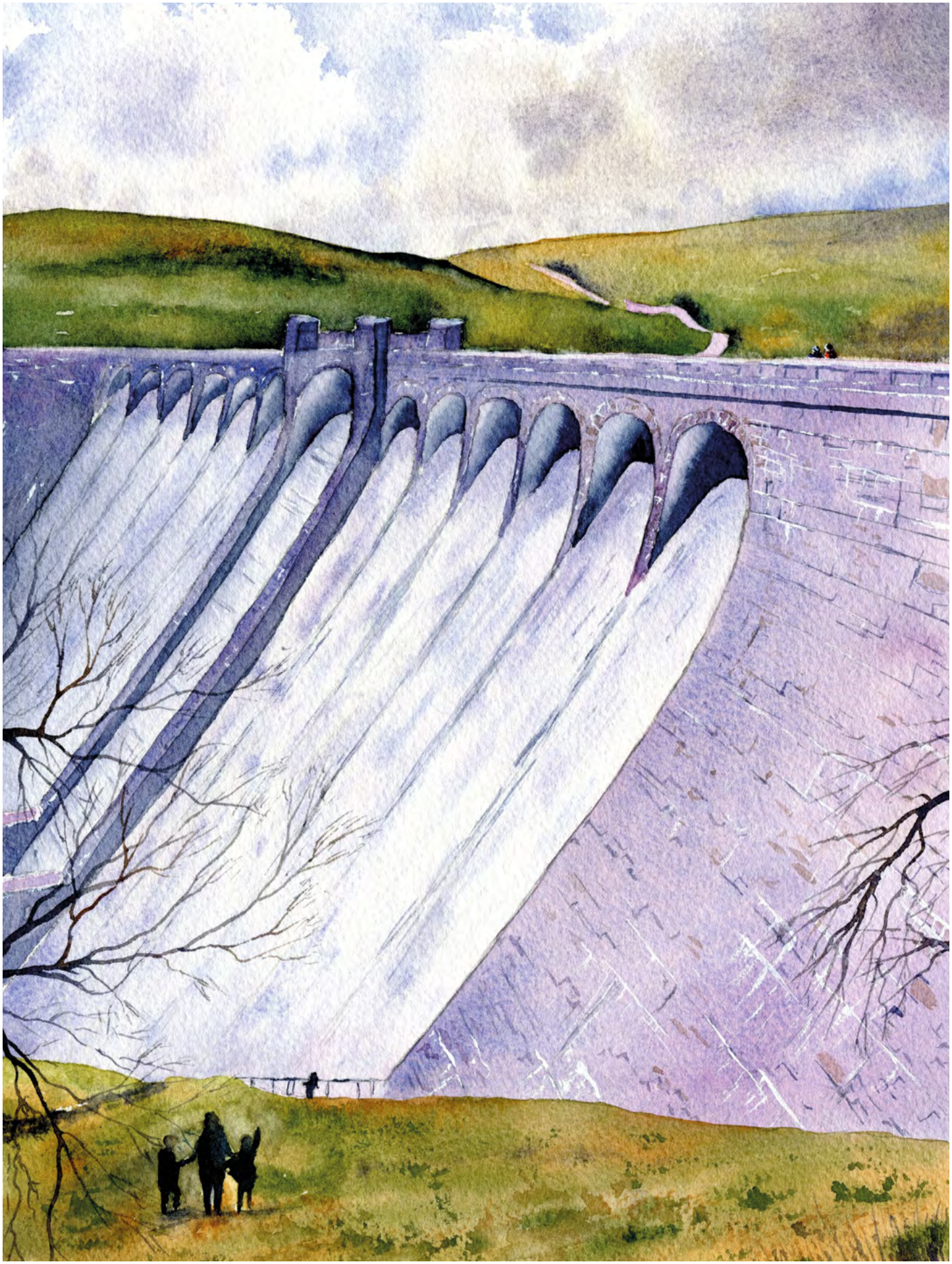
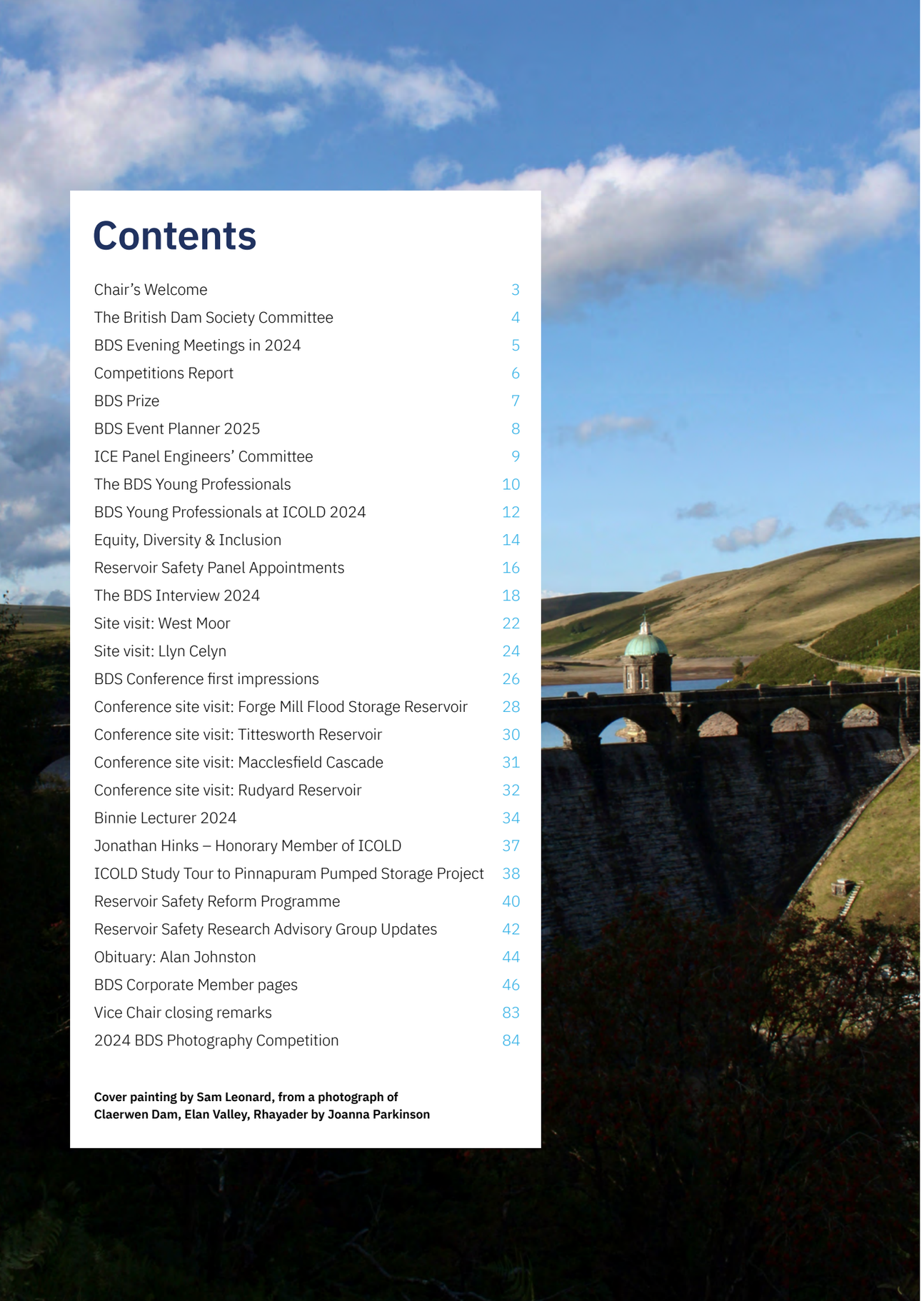
The British Dam Society

Yearbook 2024





Contents

Cover painting by Sam Leonard, from a photograph of Claerwen Dam, Elan Valley, Rhayader by Joanna Parkinson

Chair’s Welcome

Welcome to the 2024 British Dam Society (BDS) Yearbook. This year marks our 4th year of this annual publication and I am pleased to say that it has become an integral part of our programme, going from strength to strength providing an insight into some of the activities and achievements from our members over the last year.

As I look back over the last 12 months as Chair of the BDS, we have had a very busy year ensuring that we have provided many opportunities to meet face to face, as well as online, to network, share and learn from each other and most importantly to discuss the current and future states of our industry.

1st Young Professional (YP) Forum

In April, the BDS held its 1st Young Professional (YP) Forum at the Institution of Civil Engineers in London. This event provided an opportunity for BDS YPs to build on their networks, expand their knowledge, learn from others, and most importantly have a voice in showing how the BDS can support their future growth. We were honoured to have Michael Rogers (Past ICOLD President) attend, contribute and to share his knowledge with our YPs, as well as enabling the YPs to discuss with him their experiences in the industry to date and their future ambitions.

The event was a great success, and my thanks goes to the YP team who ensured that the YP group continues to grow, as it is vital that we keep the next generation of professionals within our industry engaged and passionate for their future development.

22nd Biennial Conference

The main event of our calendar this year was the opportunity for a significant number of our members to all come together at our 22nd Biennial Conference at Keele University. Our largest conference attendance to date, with 319 delegates and 18 exhibitors attending a programme of technical presentations, workshops, site visits and social activities. Everywhere I turned people were engaged, smiling, listening, networking with old/new friends and colleagues.

Feedback from the conference has been extremely positive and will now be used to shape the format and location of our conference in 2026. Once again, these large events would not be possible without the individuals in the organising committee, who I cannot thank enough for all their hard work ensuring the event was a success.

BDS on the international scene

BDS has continued to build its relationships internationally. It is vital that we maintain and build on relationships within the international community to ensure that advances in technology are shared, any lessons learned from incidents are communicated, changes in legislation and guidance are cascaded and new methods of design and construction are discussed.

In May, we participated in the inaugural European Dam Day, an initiative created by ICOLD European Club (EurCOLD) to promote the awareness, understanding and role of dams historically and in our current/future climate. The BDS joined fellow national committees over a week via a social media campaign celebrating our industry, the people who work within it, historical incidents, changes in legislation and significant UK investment projects that are currently ongoing. This was a great way to raise the profile of the BDS internationally and we will be looking at building on this during 2025 for the next European Dam Day, asking members to join in by possibly hosting site tours, sharing projects, papers and presentations during the period.

ICOLD 92nd Annual General Meeting and symposium

The ICOLD 92nd Annual General Meeting and symposium was held in New Delhi, in September/October, with nearly 2000 people attending from all over the globe, including 19 delegates from the UK. Several BDS members gave presentations, poster sessions, contributed to panel discussions and attended their technical committee meetings. I was delighted to see our members fully committing to the week, ensuring they took every opportunity to share their knowledge, learn and network. All three of our successful YP bursary applicants represented the BDS and themselves in such a professional manner and the interaction between them and the global YP community is growing each year. These face to face to meetings within the community have also enabled our YPs to host several joint lunchtime/evening sessions with their equivalent peers/groups internationally.

I represented the UK at the ICOLD General Assembly, where I joined 57 other member countries to vote on and discuss a variety of topics, including new members, location of future meetings and hearing the progress across all technical committee and regional clubs. It is vital that the BDS plays a role in these discussions and over the next few years this will become part of the BDS strategy of growth.

Looking back – and looking forward

My time as Chair will finish in April 2025, after over 10 years for me as member of the BDS committee. I would like to thank all the committee members, past Chairs and my current executive team, Darren Shaw, Andrew Thompson and Rachael Lavery, for their continued efforts to ensure our society continues to grow. Since April 2023, I have been extremely proud to represent the society as Chair and there have been many occasions where it has been fantastic to see the uniqueness of our industry and the individuals within it come together to ensure that we positively contribute, raise awareness, celebrate success, and overcome any challenges ahead, with the same passion and aligned vision. Thank you for all your support to our society as individual or corporate members.

Rachel Davies, BDS Chair

The British Dam Society Committee

The BDS committee comprises elected and nominated members, who together run all BDS activities and initiatives. You can see their roles below, under their names, so if you have a particular matter relating to BDS please contact the appropriate committee member via bds@ice.org.uk.

The committee structure comprises:

- A Chair and a Vice Chair (each for a two-year term, with the current term ending in April 2025)
- Three Honorary Officers who carry out key administrative tasks: Technical Secretary; Website Manager and Dams and Reservoirs Editor (these are open-ended appointments)
- The Chair of the Young Professionals (YPs)
- Up to twelve elected members (each for a three-year term)
- Up to three members nominated by the BDS Chair for specific tasks (each a two-year term)
- The YP Chair is supported by three elected YP members who make up the YP Committee.

If you are a BDS member who is interested in joining the BDS committee and contributing to the running of the BDS there will be an opportunity to be elected to the committee at the AGM on 28 April 2025.

If you would like to know more about what is involved as a committee member please contact any existing committee member before the call for nominations is sent out in January 2025.

Rachel Davies
BDS Chair

Darren Shaw
BDS Vice Chair & ReSRAG Chair

Andrew Thompson
BDS Technical Secretary

Rhys Coombs
Webmaster

Andrew Pepper
Editor - Dams and Reservoirs Journal & Yearbook

Amy Carter
Equality, Diversity and Inclusion champion

Stephen Cavanagh
Technical Site Visits & Regional Hubs

Matt Coombs
Evening Meetings

John Foster
Supervising Engineers' Forum

Rob King
BDS Newsletter

Rachael Lavery
YP Chair

Sam Leonard
University liaison & student research

Stephen Lockett
Professional institution & corporate member liaison

Drummond Modley
University liaison & student research

Anthea Peters
Reservoir Committee & ICOLD Technical Committees

Geralt Richards
Competitions

Richard Williams
University liaison & student research

Niall Allen
YP - Social Media

Rachel Dawes
YP - Mentoring Champion

Henry Foster-Roberts
YP - Events

Moira Doherty
BDS Secretary (ICE)

BDS Evening Meetings in 2024

In 2024 the BDS held six evening meetings at ICE, One Great George Street, all of which were streamed live and recorded. If you missed a meeting or would like to hear one again all can be found on britishdams.org/meetings-and-events/listen-again/

8 January 2024 – Historic Structures and Dams

Dr Mark Roberts (National Trust), Richard Terrell (Binnies), Dr Jonathan Berry (Cadw), Craig Goff (HR Wallingford) and David Littlemore (Stillwater Associates)

The presentations outlined some of the issues and challenges of working alongside and on historic structures whilst meeting the requirements of the Reservoirs Act, and the sometimes-conflicting priorities this can generate. Many dams in the UK were built in the 1800s and 1900s and as such, many of the features which make up the dams are now considered key heritage structures with listed status, or have other significant designations.

4 March 2024 – The Victorian Approach to the sustainability of British Dams

Pam Rigby and Andrew Thompson (United Utilities)

The Victorians are often cited to be one of the most sustainable generations in UK history, driven by the necessity to reduce, reuse, and recycle. Studying the Victorian period may provoke new ways of thinking about contemporary issues, including the problem of environmental degradation and climate change. The presentation looked at two examples of recent remedial works on dams and compared them to original Victorian construction practices to evaluate whether we are being more or less sustainable in our current approach to construction.

22 April 2024 – International Lecture – Reflections on a Career in the International Dams Profession

Michael F Rogers, Honorary President, International Commission on Large Dams

The presentation followed Mike through his career with reflections on many professional and personal lessons learned, taken from successes and failures. These career experiences included growing up through the early days of RCC applications for dams, from developing small 2000m³ earthen dam overtopping protection schemes to chairing the international joint venture assigned as construction manager of the largest RCC dam in the world – the 272m high, 17 Mm³ Diamer Basha Hydroelectric Development (Pakistan). Nowadays, as a senior consultant approaching retirement (slowly), Mike shared his grand experiences and lessons as part of his capacity building dialogue with the young professionals and commiseration of like-experiences with his fellow seasoned colleagues.

8 July 2024 – The Service Reservoir – More than just a concrete box

Jon Green and Bryn Philpott (Thames Water)

The storage of treated potable water in service reservoirs forms a key part of the water supply infrastructure. These reservoirs are often located close to built-up areas and therefore pose a potential risk to communities. The forthcoming change to the Reservoirs Act to reduce the volumetric threshold is likely to result in a greater number of these service reservoirs being encompassed within the Reservoirs Act.

The presentation gave an overview of the significant variety of Thames Water's service reservoirs, which showed their historical development along with some of their key features, issues, strengths and potential vulnerabilities. It concluded with a case history of Barrow Hill service reservoir, located near Regents Park. It was reconstructed as a large raised reservoir in 2019, making it London's newest service reservoir.

14 October 2024 – Natural Resources Wales – Our 10-year reservoir journey

Andrew Basford, Jack Lewis-Roberts and Geralt Richards (Natural Resources Wales) and Matt Coombs (Binnies)

The presentations told the story of the challenges of forming a new organisation running in parallel with legislative changes to the Reservoir Act. They covered from the initial investigation of numerous potential large raised reservoirs and registration, to investigative work, outcome workshops, and final scheme delivery. Natural Resources Wales (NRW) has delivered multiple construction schemes over the past 10 years to uphold reservoir safety standards, which have included several discontinuance projects.

18 November 2024 – Discussion papers: exploring reservoir safety and evolving engineering roles

Chris Scott, (Independent), Julian Welbank (Independent) and Dominic Molyneux (Binnies)

The presentations examined critical aspects of reservoir safety, construction, and oversight roles in the UK. These included how 'quality' could be applied to reservoir safety, the evolving role of the Construction Engineer in the light of modern procurement practices, and the expanded responsibilities of Supervising Engineers.

BDS Competitions Report

The Bateman Award

The Bateman Award is named after the illustrious Victorian dam engineer John Frederic La Trobe Bateman (1810–1889) who was involved in the construction of reservoirs and waterworks through much of the 19th century, and is awarded to the authors of a paper published in the previous two years which has made a significant contribution to dam engineering or reservoir safety.

For this competition there were 78 eligible papers, 28 from the Dams & Reservoirs Journal, and 50 from the Conference proceedings. There was a wide range of topics covered within the papers, which was reflected in the final shortlist selected by the judging panel.

Thank you to the judging panel of Andrew Pepper, Joao Santa-Clara, Matthew Atyeo, David Bell, David Prisk, Stephen Lockett, Jon Troke, Johnny Lyttle and David Rebollo, who took the time to read the papers and scored them on technical content, originality and readability.

The award was presented to **Dr Andrew Charles** for his paper *From Chingford to Carsington: impact of soil mechanics on dam construction, 1937–1987*. This paper can be read via the BDS website – *Dams & Reservoirs* (Volume 34, Issue 1, March 2024).

Dr Andrew Charles was unable to attend the conference in Keele in September 2024, but was presented with his award by Andrew Pepper subsequently.

The other papers shortlisted for the Bateman Award were:

M. Biesta, R. Mann & T. Judge
Ice loading at Scottish Water's reservoirs (Dams and Reservoirs Vol. 32, No 4)

D. Parkinson & J. A. Charles
Recollections and reflections on the construction of Scammonden dam (1966–1970) (Dams and Reservoirs Vol. 33, No 3)

A. Brown & N. McCullough
Risk-based reservoir safety management: experience from the United States of America (Dams and Reservoirs Vol. 33, No 3)

G. Mason
Risk-Informed Decision-Making for Dinas Dam (BDS Conference 2024 paper, Session 1)

Dr Andrew Charles with the Bateman Award 2024

Annual Photography Competition

The 2024 British Dam Society Photography Competition had 44 entries from all over the UK and overseas, featuring construction, maintenance, operations, inspections, incidents and decommissioning – a full range of reservoir activities. The competition was judged by the conference delegates through the conference app.

The results were:

1st Phoebe Erskine
Glenhove No 1 Service Reservoir, Cumbernauld, Scotland

2nd Nick Prytherch
Blackbrook Reservoir, Leicestershire

3rd Alan Warren
Beacons discharge culvert

The winning photographs are featured on the back page of this Yearbook. Thanks to all who have entered the competition – your photographs may feature on the BDS website, the cover of the BDS Journal *Dams & Reservoirs*, and in BDS Yearbooks.

Upcoming events

In 2025, there will be two competitions for BDS members. The November evening meeting is scheduled to be the presentations for the BDS Prize, awarded for the Young Professionals Paper Competition. The annual BDS Photography Competition will open again in late Spring 2025 – so remember to take some photographs while visiting reservoirs over the next few months.

BDS PRIZE 2025

Young Professionals Competition

An opportunity to present at a BDS evening meeting and to have your paper published in the BDS Journal *Dams & Reservoirs*

CASH PRIZES FOR THE TOP THREE PAPERS

RULES

1. This competition is open to BDS members aged 35 and under.
2. Participants are invited to submit papers on dam engineering relating to their experience in reservoir research, design, construction, operation, maintenance or supervision. Participants must be able to demonstrate that they have undertaken a significant role, re lative to their level of experience, in the project or topic.
3. There must be only one author per paper.
4. Candidates must email synopses of their proposed papers to the Secretary, BDS (bds@ice.org.uk) by Friday 12 September 2025. Synopses should be 250 words in length and should be accompanied by brief biographical details of the author (maximum 250 words).
5. Authors of synopses assessed as being relevant to the competition will be invited to submit their completed papers by Friday 10 October 2025.
6. Papers should be approximately 2,500 words in length.
7. Five finalists will be invited to present their papers at the BDS Evening meeting on Monday 17 November 2025 at the Institution of Civil Engineers, One Great George Street, London. Presentations should last 10 minutes with a further five minutes for questions.
8. The oral and visual presentation, as well as the content of papers, will be judged by a panel of three judges. The judges will have no connection with the author and will comprise members of the BDS Committee or other BDS members.
9. The organisers reserve the right to substitute another prize of equivalent value.

EVENTS

BDS Event Planner 2025

Throughout the year we host a number of evening talks, competitions, site visits and other networking activities for our members. For 2025 the main events will be the BDS Supervising Engineers' Forum in September and an opportunity for Young Professionals to showcase their experience at the BDS Prize in November.

We also offer Regional Hubs across the country to allow members to join our evening talks virtually and to meet face-to-face with fellow members from your region. Our Young Professionals Group also offers networking and CPD opportunities throughout the year.

DATES FOR YOUR DIARY	
January	• London evening meeting (6th January) with Regional Hubs available • Applications are open for Committee nominations – this year there are four positions available on the main BDS committee.
February	• Synopses invitation opens for Supervising Engineers' Forum.
March	• London evening meeting (3rd March) with Regional Hubs available • DEADLINE for the Committee nominations.
April	• Annual General Meeting followed by evening meeting (28th April) with Regional Hubs available.
May	• ICOLD Event:- 28th ICOLD Congress and 93rd Annual Meeting in Chendu, China (16-23rd May).
June	• Site Visits are to be held at various sites across the country throughout the year • EWG-IE and EWG-OOE annual meetings at Brno University, Czech Republic (25-28th June).
July	• London evening meeting (7th July) with Regional Hubs available.
August	• Registration for the BDS Supervising Engineers' Forum opens – book early to avoid disappointment!
September	• EurCOLD 2025 – date TBC • BDS Supervising Engineers' Forum (13th September).
October	• London evening meeting (6th October) with Regional Hubs available • DEADLINE for the BDS Prize submissions • DEADLINE for the BDS Photo Competition submissions.
November	• Inspecting Engineers' Forum (20th November) • London evening meeting (20th November) with Regional Hubs available. **This evening meeting is for the BDS Prize and includes the results of the BDS Photo Competition.**
December	• Invitation opens for Synopses and Workshop Proposals for 2026 Conference.

For updated information go to britishdams.org/meetings-and-events/events-calendar/

ICE Panel Engineers' Committee

This note summarises the ongoing activities of the ICE Panel Engineers' Committee, or PEC. The committee aims to continue to represent all panels of reservoir engineers and provide a link for communication between reservoir engineers and the government departments and their regulators across the United Kingdom.

The committee aims to provide a voice for reservoir engineers working within the current reservoir safety regulatory framework, but also to provide guidance and direction for planned future amendments and potentially even completely new reservoir safety legislation. The Committee works with agencies in all four jurisdictions. However, a particular focus is to provide feedback, comment and advice on the implementation in England of the recommendations of the Independent Reservoir Safety Review Report published in March 2021 (the Balmforth Report).

The committee is composed of representatives of both the Supervising and All Reservoirs Panel. The committee comprises seven members: with representation from the BDS committee, the ICE Reservoirs Committee, Scotland, small and large undertakers. The Chair is appointed by the Chair of the Reservoirs Committee from amongst the members of the committee. Current members of the committee are: -

Chris Scott – *Chair (ARPE, ICE Reservoirs Committee and consultancy)*

Alan Brown *(ARPE, consultancy and small undertakers)*

Siobhan Butler *(SE, large undertakers)*

Paul Farnell *(SE, large undertakers)*

John Foster *(ARPE, consultancy and small undertakers)*

Mark Hayward *(SE, consultancy and small undertakers),*

Tony Judge *(SE, Scotland and large undertakers)*

To improve engagement between the PEC and the community it serves, a basic means of sharing thoughts and concerns has been set up. Panel engineers can use the adjacent QR code to share thoughts and recommendations for future committee discussions, or to bring to the committee's attention topics to be raised with the regulators and responsible government offices.

The PEC is currently working through several workstreams which are focused on responding to recommendations of the Balmforth report for England, involving discussions primarily with Defra, the Environment Agency, and Natural Resources Wales. These include: -

- Hazard reclassification – participating in the working steering group towards a system with the potential to focus resources to effective risk management and ongoing safety improvements.
- Panel engineer supply and capacity – with review of initial proposals associated with potential new hazard classification and legislation changes.
- Reservoir safety management plans providing direction as required to ensure effectiveness.
- All of the above coordinating with legislation changes.

The committee has also reviewed and raised concerns voiced by panel engineers with the relevant regulator, including: -

- Purpose of quality assessments of panel engineers' reports.
- Enforcement authority communication with regards to application of guidance to panel engineers as if enforceable rather than advisable.

During 2025 updates will be provided on the detail of such matters including the proposed changes of hazard reclassification, panel restructure.

← Pen-y-Cae Reservoir, Wales – Chloe Fisher

The BDS Young Professionals

The British Dam Society Young Professionals (YP) section is for members who are 35 years old and under, which include both those working in industry and students. The YP group was formed to promote the dams and reservoirs industry to students and early career professionals, as well as provide support to existing YP members. This is especially important with the ongoing work with dams and reservoirs within the UK.

The YP committee

The current YP committee members who have continued their work are:

Rachael Lavery
Chair

Henry Foster-Roberts
Events

Rachel Dawes
Mentoring

Niall Allen
Social Media

The objectives of the YP group

The YP committee works to support and create opportunities for young professionals within the industry to develop their knowledge, provide professional development and expand their network. This is done with the support of the main British Dam Society Committee.

The seven main objectives of the YP committee are:

1. **Increase the BDS membership base of under 35s.**
2. **Increase networking opportunities for young professionals within the BDS.**
3. **Provide workshops for professional development.**
4. **Provide a mentoring scheme and professional development advice.**
5. **Assist BDS initiatives in schools, colleges, and universities.**
6. **Organise social evenings and events.**
7. **Liaise with other Young Professionals Forums in the ICOLD community to share ideas.**

Benefits and opportunities for BDS YP members

There are various benefits of being a young professionals member of the British Dam Society which include:

- The opportunity to attend the Young Professionals Forum – the 1st BDS YP Forum took place in 2024
- The BDS mentoring scheme that is managed by the YP committee. This provides support for young professionals who are looking to become Supervising Engineers or develop their knowledge of dams and reservoirs.
- The opportunity to attend monthly Continuing Professional Development (CPD) events that cover a variety of topics presented by both senior professionals and young professionals
- Access to *Dams and Reservoirs* journal
- The opportunity to attend the ICOLD conference through the YP bursary. This allows YPs to learn about international work and connect with YPs from other countries.

Continuing Professional Development events

The YP committee has continued to organise the monthly CPD webinars. These are open to all BDS members to develop their learning, with invitations sent to all YPs and the links for the talks available on the events page of the BDS website.

There has been a range of presentations on a variety of topics in 2024, with one CPD presenter being the current ICOLD YP Forum Chair who presented on the ICOLD Young Professionals and how BDS YPs can get involved.

The YP committee is organising special webinar sessions with our YP counterparts in other countries. A webinar on 20th November was titled 'International Insights: Dam Performance Monitoring in Canada and the UK' was arranged between the BDS YP Committee and the Canadian Dam Association Young Professionals. Rachael Lavery, as the YP Chair. acted as the BDS YP moderator. This session was recorded and can be found on 'Listen Again' on the BDS website.

The YP Committee would like to thank the 2024 presenters for their time. The events champion has arranged for presentations into 2025, but would always appreciate offers from BDS members to present at one of these sessions. So please do get in touch with Henry Foster-Roberts at youngprofessionals@britishdams.org

Mentoring programme

The mentoring programme has continued with the BDS providing support to the YP members who want to apply to join the Supervising Engineer Panel.

Social Media

BDS YP activities are posted on the BDS LinkedIn page which is maintained by the BDS YP Committee. Over the last year, there has been a 50% increase in the number of followers on the BDS LinkedIn page.

We would encourage BDS members to follow the BDS LinkedIn page for updates on events.

BDS YP Forum

The 1st British Dam Society Young Professionals Forum took place on 22nd April 2024 at the Institution of Civil Engineers in London. This was organised by the YP committee.

The YP Forum was an afternoon filled with four sessions on the following topics:

- Reservoir incidents, with one speaker being former ICOLD President Michael Rogers
- The route to becoming a Supervising Engineer
- Spillway design
- Sustainability.

There was also an Equality, Diversity and Inclusion (EDI) session, see page 14.

Around 50 YP members attended this event, which provided an opportunity for young professionals to develop their learning and expand their network. This was a successful event with active participation from the delegates. The BDS YP committee will continue to organise this biennial event.

The YP committee would like to thank the speakers for giving their time to present, the delegates for their participation and the main BDS committee for their support with this event.

The YP committee with some of the delegates and past ICOLD President Michael Rogers at the first YP Forum

Rachael Lavery, Amy Carter, Niall Allen, Merlin Davis and Sam Tudor at ICOLD 2024

BDS Young Professionals at ICOLD 2024

The 2024 International Commission on Large Dams (ICOLD) Annual Meeting took place in New Delhi, India during 29 September – 3 October 2024.

ICOLD Young Professionals (YPs) organised a number of events, including a YP workshop, YP Forum and ICOLD YP evening meal.

Rachael Lavery, as the BDS Young Professionals' Chair, attended ICOLD 2024 with four other Young Professionals (Amy Carter, Niall Allen, Merlin Davis and Sam Tudor), three of whom were recipients of the British Dam Society Young Professionals bursary.

The majority of the ICOLD YP events took place on 29th September, with an informative workshop on 'Advancements In Dam Engineering', followed by the ICOLD YP meeting in the late afternoon. Rachael Lavery supported the ICOLD YP Forum during the late afternoon meeting by providing a topic of discussion and, with the support of Merlin Davis, hosting a group during the breakout session while the votes for the election of two new members of the ICOLD YP Forum board were counted. The ICOLD YP meal took place on the evening of 2nd October.

These events provided the BDS YPs many opportunities to network with young professionals from other international organisations, with connections formed that will allow the BDS YPs to exchange knowledge and experiences internationally.

Papers, Posters and Presentations

The BDS Young Professionals (YPs) were involved with the submission of papers, presentations and the poster session.

Merlin Davis (Canal and River Trust) presented her paper titled "Review of Risk-Based Dam Safety Management for a Multiple Dam Portfolio in the United Kingdom," authored by M Davis, S Butler, C A Gilman, D Windsor, and D Prisk from the Canal and River Trust. The paper highlighted the Trust's management of 71 regulated large raised reservoirs, emphasizing the importance of risk-informed dam safety management in addressing ageing infrastructure and climate change. Merlin also produced a poster for the conference, where she fielded questions from international colleagues.

Merlin Davis with the poster of her paper

Rachael Lavery (Environment Agency) presented her paper, alongside co-author Mikaela Bitner, titled "International Collaboration to advance levee management", authored by R Lavery from the Environment Agency, M Bitner from the US Army Corps of Engineers and N J A Verdijck from Rijkswaterstaat. The Environment Agency, US Army Corps of Engineers and Rijkswaterstaat work together as the Levee Safety Partnership. The paper focused on the similarities and differences between the organisations, including their roles and responsibilities, methods of risk assessment, risk tolerance, and organisational challenges.

Amy Carter delivering her presentation on gender diversity and inclusion

Amy Carter (Arcadis) spoke at the inaugural committee meeting on gender diversity and inclusion, representing the BDS main committee in her role as equity, diversity and inclusion (EDI) champion. For more about this initiative see the EDI update on page 14.

Sam Tudor (Dŵr Cymru Welsh Water) gave a thought-provoking speech on dam stewardship as part of the World Declaration on the role of dams in energy transition and climate change. As the leading international authority on dams, ICOLD decided to establish an ad-hoc technical committee to produce this World Declaration, of which there have been only three in its history. It was hoped that the Declaration would form a part of the discussion at COP 29 in Azerbaijan. Sam's speech invited YPs to consider their moral responsibility to maintain dams in a safe and operable manner so that they may provide a societal benefit for future generations.

Rachael Lavery presenting her paper on levee management

All papers and presentations are available to download at www.icold2024.org

Sam Tudor's presentation was on dam stewardship

Merlin Davis speaking in the Technical Committee working group

Technical committees

Participating in an ICOLD technical committee is an excellent way to fully leverage the expertise of the global community. **Merlin Davis** was appointed as a member of Technical Committee I - Public Safety around Dams, representing the UK. As part of the committee, she contributed to the working group preparing the 'State of Practice Report' on emergency management for dams. She facilitated a workshop on the 'Scope of Emergency Management for Dam Owners and Operators,' where she shared and exchanged technical expertise with the global community. Through these interactions, she brought back valuable insights and shared best practices from the UK. Merlin also participated in the committee meeting, providing updates from the UK and offering input on other public safety bulletins set to be published in 2025.

UPDATE

Equity, Diversity & Inclusion

Gender diversity and inclusion committee at ICOLD 2024

AMY CARTER
amy.carter@arcadis.com

Amy has been a member of the BDS main committee since 2022, where she holds the position of Equity, Diversity & Inclusion (EDI) Champion. As a Specialist Knowledge Society of the Institution of Civil Engineers (ICE), the BDS is committed to operating in accordance with the ICE's diversity and inclusion policy, and with the Fairness, Inclusion and Respect Committee's Diversity and Inclusion Action Plan 2021–2025. For more information, please refer to ice.org.uk/about-us/who-we-are/diversity-and-inclusion

This year has been an exciting one for EDI in the BDS – we held our first speed networking event, carried out our first qualitative survey, started planning the launch of a new EDI working group, and built international connections with like-minded colleagues at ICOLD 2024. *Read on to find out more…*

ICOLD ad-hoc committee on gender diversity and inclusion

Last year's ICOLD event in Gothenburg saw the launch of a new ad-hoc committee on gender diversity and inclusion (GDI) in the international dams community. One of their early actions was to ask all National Committees (NCs) to complete a survey, looking at gender diversity in their leadership, membership, events and publications, and how this has changed over the past five years.

The survey was a mixture of qualitative and quantitative questions – quantitative results showed an increase in gender diversity within BDS committee members and *Dams & Reservoirs* paper authors; results for speakers at BDS events were mixed. The BDS response to a question on diversity in leadership is shown in Figure 1. Formal diversity monitoring of BDS membership is something I am still working to address with the ICE, but in the interim we have been able to quantify gender diversity data for 2023, as seen in Figure 2.

Of the 106 NCs, 37 responded to the survey, and were invited to present their results at the inaugural meeting of the GDI committee at ICOLD 2024 in New Delhi. I was glad to be able to represent the BDS at this event, in large part due to the generous Young Professionals' bursary. Each NC was invited to give a short presentation on their survey results and other GDI initiatives in their country, followed by a group discussion on the challenges faced by women in the industry and ideas on how ICOLD can improve (including broadening their diversity and inclusion goals to characteristics beyond gender). I came away with a lot of new ideas which I aim to integrate into the upcoming 2025 BDS strategy.

Figure 1
Representation of women in BDS leadership

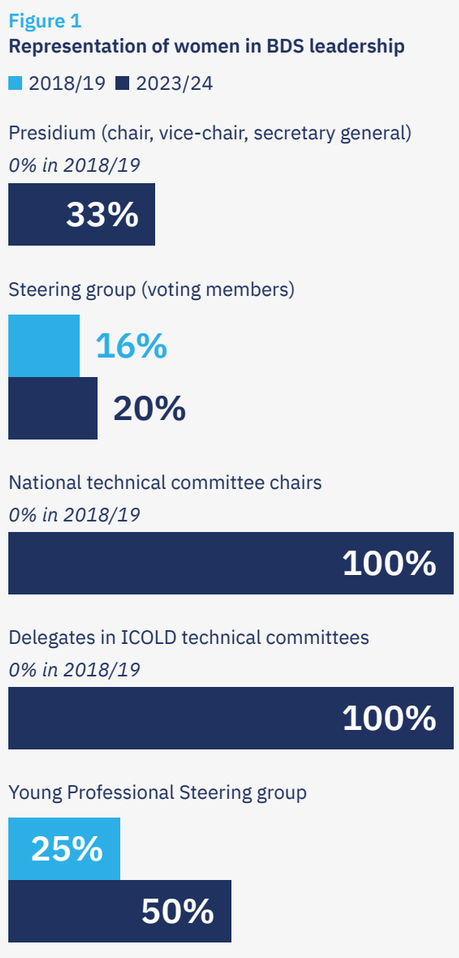
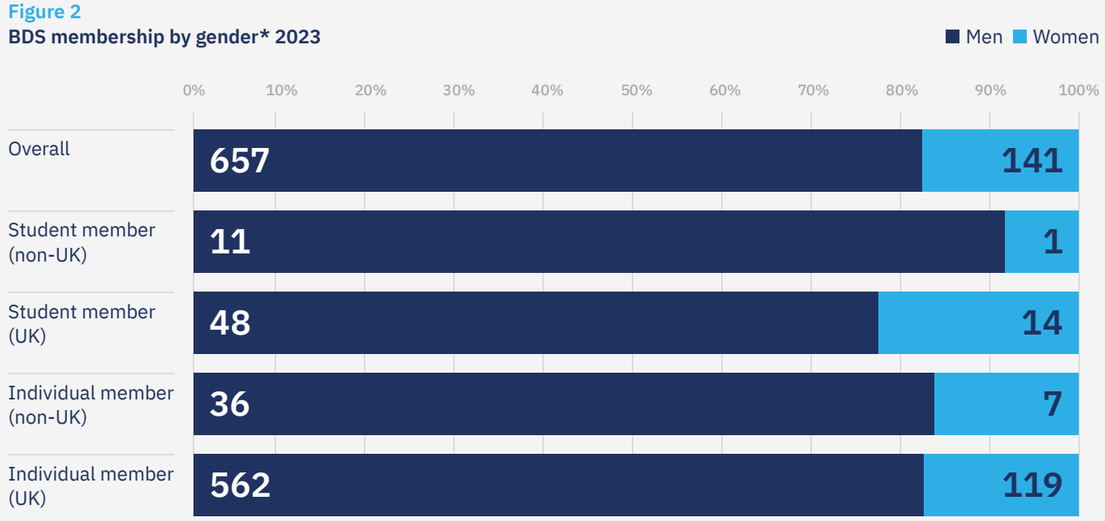


Figure 2
BDS membership by gender* 2023



Young Professionals' Forum

Closer to home, it was great to take the opening slot at the first ever Young Professionals' Forum event, held at One Great George Street in April. Attendees were invited to take a seat at one of five tables, hosted by each of the YP Committee members and me. As well as networking with peers, the intention was to shed light on some of the specific focus areas of the two committees and encourage greater engagement with those from the YP membership. It was also an opportunity for me to gather some feedback from the membership, which was really encouraging.

"As a YP woman, I've found the BDS welcoming and actively promoting my engagement (e.g. through events like the YP forum). It's nice to have female role-models on the committee and at the front of the organisation too. Generally the organisation isn't very diverse but I can see that changing in the future as it reaches out and engages more people/membership."

Anonymous

As always, if you have any ideas or would like to offer some support, feel free to reach out. I wish you all a happy new year and look forward to seeing you in 2025.

* The BDS acknowledges that the use of cis-gendered language may perpetuate exclusion towards individuals whose gender identities do not conform to traditional norms, and whilst we cannot change the data that has already been gathered, we are committed to addressing this going forward.

Reservoir Safety Panel Appointments

The British Dam Society would like to congratulate the following engineers who have been appointed or reappointed to a Reservoir Safety Panel under the Reservoirs Act since the last issue of the BDS Yearbook.

Reappointed as All Reservoirs Panel Engineers:

John Foster
Technical Principal, Mott MacDonald

Martin Hewitt
Technical Director (Dams), Mott MacDonald

Reappointed as Service Reservoir Panel Engineer:

Stephen Cavanagh
Civil Technical Director, Binnies

Appointed as Supervising Engineers:

Andrew Davie
Associate Director, AECOM

Johnny Lyttle
Senior Engineer, Environment Agency

Tom Dutton
Principal Engineer, Jacobs

Abi Morgan
Associate (Dams & Reservoirs), Arup

Oliver White
Reservoir Engineer, Thames Water

Guy Hitchins
Reservoir Supervising Engineer, Severn Trent Water

Jineesha Mehta
Senior Dam Engineer, Stantec

João Correia
Project Development Engineer, Bechtel

Michael Calder
Principal Civil Engineer, Binnies

Michael Jack
Lead Civil Engineer, RWE Generation

Reappointed as Supervising Engineers

Christopher Parks
Principal Geotechnical Engineer, United Utilities

David Rebollo
Senior Associate Engineer, Mott MacDonald

David Scopes
Associate Civil Engineer, Mott MacDonald

David Steven
Associate Civil Engineer, Mott MacDonald

Laura Mansito
Statutory Reservoir Safety Manager, Southern Water

Neil Harding
Director, Reservoir and Water Services

Simon Golds
Senior Civil Engineer, Mott MacDonald Bentley

Siobhan Butler
Principal Reservoir Engineer, Canal and River Trust

Stephen Lockett
Principal Dams Engineer, Mott MacDonald

Andrew Constantine
Reservoir Supervising Engineer, Yorkshire Water

Christopher Smith
Senior Reservoir Engineer, Thames Water

Jon Troke
Principal Dam Engineer, Stantec

Kevin Murray
Principal Engineer, Scottish Water

Christopher Raistrick
Reservoir Supervising Engineer, Yorkshire Water

Clifford Harrison
Independent Consultant

Duncan Scott
Senior Civil Engineer, SSE Renewables

Jordan Langbridge
Senior Project Manager, Arcadis

Mark Mackenzie
Principal Engineer Scottish Water

Nathan Walding
Principal Engineer Edwards Diving Services

Russell Stead
Reservoir Supervising Engineer, United Utilities

Loch Chliostair (Martin Deane)

The BDS Interview 2024

Last year we spoke to four brand new supervising engineers, we asked how they discovered the role, how they found the panel process, who inspired them and we talked to them about their experience since they came on the panel. This year we found two of the most recently appointed ARPEs, **Kenneth Barr** (Technical Director at Fairhurst) and **Martin Deane** (Senior Associate – Dams & Reservoirs at Mott MacDonald) and thought we could look at an ARPE's point of view.

Welcome to you both. Starting with Ken first, where did it start for you to lead into reservoir engineering?

Ken – I've been involved with reservoirs throughout my career which is quite a long time now. I joined Fairhurst in 1981 and I joined a team that was led by David Campbell who was the equivalent of an All Reservoirs Panel Engineer under the 1930 Act. So, I was working immediately on dams and reservoirs. I felt really lucky because at that time the industry was in a bit of a recession and it was quite difficult to get consultancy jobs, and I'd not only got a job but got into something that I was really interested in. That is where it officially started for me.

I was always interested in dams. My father was also a civil engineer but he went into academia and he was a professor of civil engineering hydraulics at Strathclyde University so I think the thing that first got me interested was going to visit the hydraulics lab at Strathclyde University when I was still a schoolboy and just the idea of playing with water was fascinating.

Whilst at university as a summer student I worked for James Williamson & Partners which later became the Glasgow office of Motts and I was involved in doing surveys for a pumped storage scheme which never got built. It's funny how, more than 40 years later, we're now talking about big pumped storage schemes again.

Martin – When I was in school I had dreams of getting far away from Enniskillen. I had figured that with skills in water engineering I would go to many countries and work abroad but I didn't think about dams at all. As with Ken I was very lucky, in my case, to get sponsored at university by a Northern Irish contractor called Farrans. They arranged for me to have a year out working for them on the construction of a water treatment works for Belfast. It was really formative and developed me as a person. I started as a graduate with Jacobs Babtie, in 2005 in Glasgow, initially doing water and wastewater projects but quite quickly I got involved in the design of a spillway for a dam in Nigeria. In 2008 I also worked up in the Highlands on the construction of the Glendoe Hydropower Scheme. During the six years I had with Jacobs I was doing a mixture of work, not all dams, but I did like dams.

In 2011 I moved down to Mott MacDonald in Cambridge and since then I have been entirely working on dams and big hydraulic structures like barrages.

Was there a first dam that you were aware of that sparked your interest?

Martin – Well, my home town of Enniskillen is on an island (the name of the town means *Island of Kathleen* in Gaelic) and the loughs upstream and downstream of the town now actually form a reservoir. There are two dams in cascade downstream the lower one is just across the Irish border in Donegal and looks pretty impressive (at Cathaleen's Fall Hydropower station operated by ESB). I'd get a quick look at it on the way past whilst heading to day trips at the beach as a child, but I never really paid that much heed until I got into the industry.

Ken – There certainly were reservoirs near where I lived in Glasgow when I was growing up. Mugdock and Craigmaddie reservoirs are just on the edge of Milngavie which was not that far away from where I lived and occasionally, we would go for walks there. They were reasonably sized earth embankment dams, part of the Glasgow water supply.

With your early careers, did you both have a role model and someone who helped guide you through those early years to help with your early development?

Ken – I worked for David Campbell for quite a number of years and he certainly was a role model. He had a very broad expertise which covered hydraulics and hydrology, geotechnics and structures.

Martin – I think in my early years in that Jacobs office I was pretty lucky. I was working with Jim Findlay, Stuart King, Martin Hewitt, and an engineer who is retired now called Bill Davidson, who was in the Babtie dams team for a very long time but was not a panel engineer.

As part of your early development, you both spent time as Supervising Engineers before becoming ARPE. During your time as an SE, was there always an ambition to then take the next step?

Ken – I was appointed to the supervising panel in 1991 so I was a Supervising Engineer for over thirty years, well I still am a Supervising Engineer, but I was on the SupE panel for over 30 years. I wasn't planning on a progression towards ARPE; but for most of that time I was doing the Supervising Engineer role I was involved in reservoir remedial works, a few new dam projects, not dams of any great size but new construction projects. I've worked with a large number of ARPE engineers over the years and have really enjoyed that.

I find it really rewarding interacting with these people who'd come from different organisations and had different experiences and involvement in projects that were certainly quite different to what we were doing in Fairhurst. I was able to learn from them and just benefit from interacting with them but becoming ARPE wasn't something that I was planning for.

What changed your mind?

There were panel engineers we'd been using for many years who were all either retiring or talking about retiring, such as John Ackers, Martin Airey, and earlier on John Cowie. It seemed to be getting more difficult to use external people, so several different things came together at once.

I got the agreement of the business to transition to working full time on reservoirs and I made that transition in 2021. I'd been on the reservoirs committee between 2018-2022 which gave me a better understanding of what was expected, and finally there was the Balmforth Report talking about the supply of engineers. I felt that they were talking about me.

Martin – I got on the Supervising Engineer panel in 2013. I had realised in my time at Jacobs that I wanted to do it, largely due to seeing the likes of Stuart King disappear out of the office on a sunny day to walk around a dam. I thought, I want to do that. The project that I was working on at the time didn't involve many site visits, and I was stuck in the office day after day - I wanted to get out and see some dams!

I didn't really make it happen while I was at Jacobs but upon moving to Mott MacDonald I decided I really wanted to get on the Supervising Engineer Panel. Martin Airey and Tim Hill supported me to get my application in. Much like Ken I didn't think for a long time that I would be suitable to be an All Reservoir Panel Engineer. I couldn't see how I was going to get the skills, until 2013 when the first of several big opportunities came out of the blue. After my first child was born I went into the office to ask for reduced hours to enable me to help with childcare and so that my wife could go back to work. In the same meeting it was suggested I go to Albania to work on a dam there. My wife and daughter could also come, so it would be a big adventure and it would also solve our childcare issues. We had a year and a half out there and it was a very useful experience working on an 80m high clay core dam. When I came back I became involved in the design of the Boston Barrier in Lincolnshire which was a big tidal flood defence scheme and was a very important experience for me as a major detailed design project. I found myself learning a lot of technical knowledge again. Subsequent to that I worked on the SESRO project; a proposed reservoir to be located outside Abingdon in Oxfordshire, which has required lots of finite element and slope stability modelling. Since I returned to Glasgow in 2019, I've also had the opportunity to do work on concrete dams and service reservoirs. I feel I have been on a very steep learning curve since going to Albania. I was finding that when it came to all these different dam types and different types of analyses I was covering all the bases. I've got a certain set of skills now and it's a good way to use them within an ARPE role.

Ken, I guess over a 30 year career you felt you'd covered all bases and was ready to apply for ARPE?

Ken – In the early part of my career, when I was working with David Campbell, we did all the different aspects of dam reservoir engineering within the same team so I got geotechnical experience at that time and structural experience. It's not the way we work now. People are far more specialised and I think it would be far more difficult for people to get the sort of experience that I got in the early part of my career but when I look back at it, when it came to preparing the application, some of my experience was quite long ago but it covered all the areas.

Moving into the process of applying for ARPE, was it just another interview, how did it compare to applying for the SE role?

Ken – My application for SupE was a long time ago, so I wouldn't really compare it. At that time there was no formal application form, there were no attributes you had to meet, it was all far less well-defined.

I ended up being a subcommittee chair during my time on the reservoirs committee and interviewing people for the ARPE panel so I was very familiar with the process. I found the whole business of being on the Reservoirs Committee very rewarding, I learnt a lot. Every application you review you learn something new about some of the experiences people have had.

For the ARPE interview you've still got to sit in front of the panel engineers and be asked about anything and everything.

Martin – I think the Supervising Engineer application was definitely less intimidating, I'd attended the ES1 course, I recognised there was a need to know the legislation and there were a couple of key guidance documents that I really should know, but the role of the Supervising Engineer is quite prescribed and I went into the interview knowing that I should be able to answer pretty much any question they would throw at me given how defined the role was.

With the All Reservoir Panel Engineer interview, to be the Construction Engineer for any type of new dam, there seemed a pretty infinite number of questions that can be asked, given the number of dam types and the various things that could happen on site so I did an awful lot of preparation and reading. It was akin to the ICE Chartership application in a way. With chartership I remember going back over my projects and experiences and then asking myself questions about the projects that I worked on that I didn't ask at the time, like '*how much was this budget*' or, '*why did we do it that way?*' and with ARPE you go back over these dams that you've worked at and you ask, '*why did we do this', 'why was that detailed like that*'?.

So what was the first appointment as an ARPE?

Ken – I think my first inspection was a reservoir in East Lothian, a privately-owned reservoir, not a big dam, only about 4m high and 50m long, but the interesting thing about it was it is a very long narrow reservoir and when I was looking at the Ordnance Survey map I thought, every other reservoir that I know that looks like this has got a dam at the other end, so I went to inspect it and I asked the owner, who had only bought it recently, if we could look at the other end. And guess what I found? Another dam! A 1.5m high low embankment at the other end stopping the water escaping in the other direction. None of the engineers who had inspected previously had ever gone up there and seen it and the owner didn't know about it.

Martin – I've not done that much ARPE work since getting on the panel, largely because I've been extremely busy with the SESRO project but I think I've done about ten inspections. The first two were almost immediate; I think I got on the panel in July and inspected them in August of 2023. Two nice embankment dams, one of them 25m high, a decent size for a first inspection. It was a lovely sunny day, good to get out. I did have to go down a very slimy wet well tower but I quite enjoy my confined spaces, so didn't mind too much.

If you've read any of the previous BDS interviews, the question often asked is what is your favourite dam, the one you look forward to visiting (or perhaps miss visiting if you've already handed it over to another SE!)

Ken – There isn't one, there's probably several ones. It probably changes over time because it's always the last one that you've worked on that you remember fondly. One from early in my career that I always liked was Burnhope Reservoir. It was the probably the first reservoir project where I was the lead engineer for the detailed design. The project was putting in an auxiliary overflow. I always thought that was a nice dam and we did a good job of incorporating the auxiliary overflow in a sympathetic way.

I recently visited Orrin Reservoir which is an SSE reservoir, where we did some stability analysis and I was very impressed with it. Quite a large concrete dam, with a very dry gallery which is always good.

Martin – I was always struck by the beauty of some reservoirs. You go there and they're just absolutely peaceful – little wildlife havens. You get a sunny day, you're surrounded by trees, birds are singing, fish are jumping and all is good in the world. There's one reservoir outside Glasgow that is run by a little fishing club – it's called Cuffhill and its always like that. I inspected an SSE dam this year out on the Outer Hebrides and I understand it rains there all the time, athough it wasn't on the day that I went, so we had glorious sunshine at a superb arch dam, called Loch Chliostair. The setting was pretty spectacular. the geology of the Outer Hebrides is really fascinating, it's the oldest rock in the country.

Ken – That's West Harris! There's a reservoir on the way up to it on the right hand side which I briefly supervised.

Given the wealth of experience and development required to get onto the ARPE panel, is there a particular scheme that you remember as most memorable?

Martin – For me the most formative experience was not a dam but my year out with Farrans, as an undergraduate going out to site, setting out reinforced concrete line and levels, getting the quality right etc. I thought the whole team of people pulling together to get something built to the right quality as quickly as possible was invigorating. And it was early on my career, so it gave me a bit of drive and set me up.

Ken – I worked on a reservoir, it was primarily a flood storage reservoir but it was intended to provide a secondary amenity use at a permanent water level unlike most flood storage reservoirs, it involved embankment design, slope stability, there was a slurry trench cut off, there was grouting, there was reinforced concrete element, it was one where all different aspects of reservoir engineering came together in one project.

We have talked about your early career development and role models. As an ARPE what are your thoughts of how we can help to develop and inspire the next generation?

Ken – I've been involved in training Supervising Engineers for a long time and have had a role in training or mentoring 5-6 Supervising Engineers over the years who have been appointed to panel but then they keep either emigrating to Australia or leaving and going to work for another organisation so it's a sort of constant process of trying to pick people who you think might be interested and give them a bit of exposure to see whether it takes root or not. It's a constant process.

Martin – I agree there is a need to do some mentoring. I also feel that the industry as a whole could do more in that it seems it is down to individuals to progress themselves and to mentor other individuala. We're all very busy and there is little time available to sit down and just read some guidanceor context around a problem. It's harder and harder to find the time. With dam engineering there's so many different aspects you have to understand – geometry, geotechnics, hydrology, hydraulics, structures, materials, legislation – there's a whole lot of stuff that you need to keep on top of and there is not the time budget. I don't think it's a coincidence that myself and Ken who got on the ARPE last year both work part time. The industry needs to do more to give people the time to develop themselves in work hours.

Ken – I think Fairhurst has been good in supporting people who have wanted to go for Supervising Engineer panel and allowed them to go along to inspection and supervision visits. However it does have to be self-motivated. I think a lot is now expected of new Supervising Engineers. The role has become more onerous because they're expected to know more about more and more things compared to when I was first appointed.

So what are your key bits of advice that you can pass on to prospective SEs or ARPEs that are looking to take that next step?

Martin – I tend to recommend that people focus on learning. One of the best bits of advice I've had in my careers was from somebody who was listening to me moan about the project management that I was doing and the need to keep the budget right every month. It was clear to him that I was not enjoying that aspect of the role because it wasn't what I wanted to do. I wanted to do interesting technical work. He said that was fine, that I could just do the interesting technical work and find somebody else to do the other work. I could delegate it and focus on my passion. I particularly think about people going for chartership, to sign off the chartership attributes you need to have a bit of project management experience and good solid engineering understanding as well and you end up with people in their 20s and 30s and they're doing such a mix of different roles in consultancy, in commercial management, people management, project and process management and they're trying to develop themselves technically, and in my opinion they're all spread too thin.

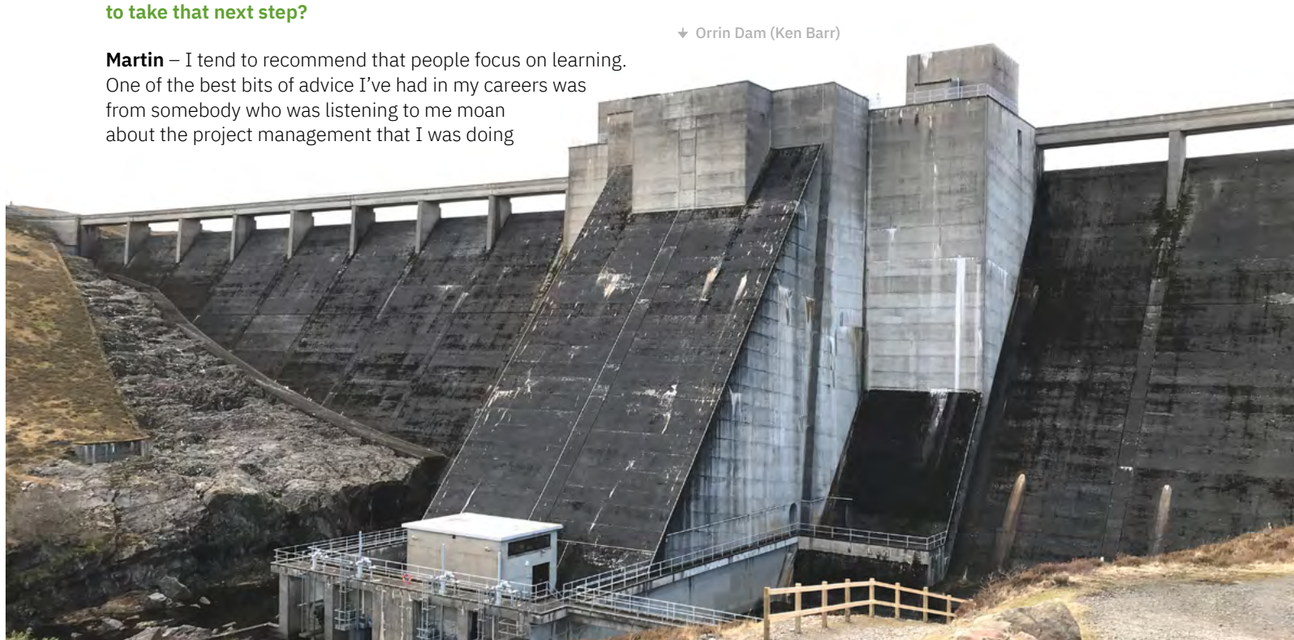
It is perfectly reasonable to try and focus on technical excellence then on developing yourself. Focus on learning, and then take the opportunities that come up and be willing to travel about the place. To have flexibility in where you live, helps greatly in getting the best experience. and then in terms of maximising that learning you need to be in the same room as the people you are going to learn from (even if that's a virtual one!). I've learned the most at the times I worked on projects with really great senior people. Maximise that time and ask questions; don't be embarrassed to show the extent of your ignorance - that's the only way close it.

So be flexible to travel around, focus on the learning, strip out the activities that you're not learning from and stay with the people that you're learning from.

Ken – I agree, interacting with senior people and learning from them is something I've benefited from enormously over the years, working with different ARPEs. I've not really travelled about though! – I've stayed in Glasgow for my career.

Thank you both for agreeing to talking to me and sharing your experiences and wisdom. Andrew Thompson (BDS Technical Secretary).

Orrin Dam (Ken Barr)



SITE VISIT

West Moor

Geraint Richards, of Natural Resources Wales, attended the BDS site visit to West Moor Reservoir on Wednesday 28 August 2024.

IT WAS A PLEASANT LATE SUMMER'S EVENING on the site visit to West Moor Reservoir, on the other side (from Wales!) of the Severn Bridge. The attendees were met by the contractors on arrival, who coordinated vehicle movements due to the ongoing works at the site. The group was given a safety briefing by Kier, the contractor for the works, followed by a presentation of the history of the site by Sam Carter on behalf of the client, Environment Agency. Silvia Antonello and Laura Yuste Zaballos from the design team at AtkinsRéalis then gave a presentation on the reservoir improvement works. After the briefing, and cakes, the group was escorted around the site by Alice Davis and Richard Terrell from Binnies.

We were informed that West Moor Reservoir is an offline flood attenuation reservoir in the Somerset Moors, located on the confluence of the River Parrett and River Isle some 7km upstream of Langport.

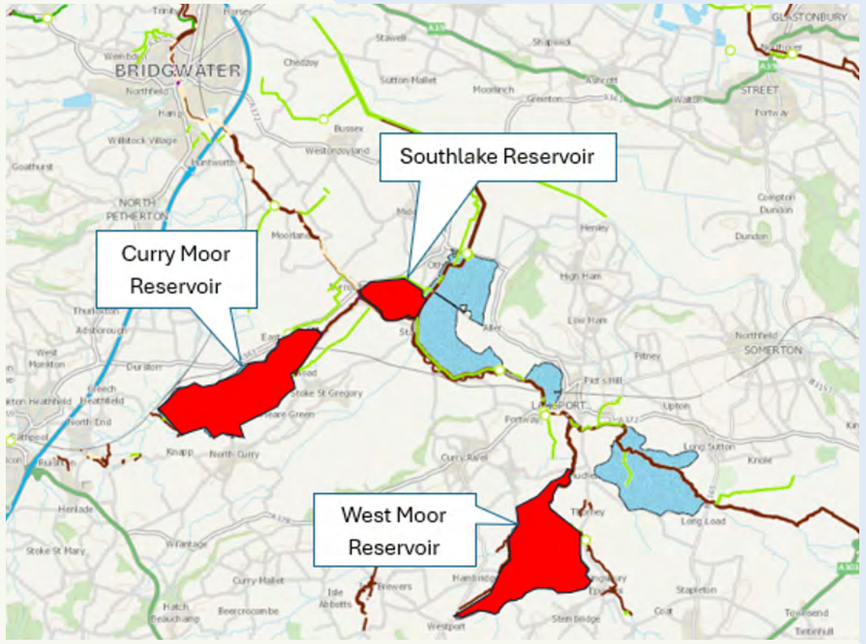
The original purpose of the reservoir when constructed in the 1800s was for land drainage. The structure provides the storage of 8.5million m^3 of water during wet winters and extreme flood events. During dry weather, the reservoir is a low lying moorland used as arable and pasture farming as well as being designated as a RAMSAR site, Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI), forming part of Natural England's 'super' National Nature Reserve on the Somerset Moors and Levels. During flood events, the river level rises and overflows the inlet/outlet spillway and the raised river banks, spilling into the reservoir basin.

Water management is important - both during the winter and summer

Learning about the water management at Midelney Pumping Station

The site visit commenced with the earthworks to formalise the existing perimeter embankment low spots to a designated spillway level. The site visit continued to the pumping station, with discussion on the management of the water levels in an effective way in what would otherwise be a constantly wet marsh land. The Environment Agency operates the Midelney Pumping Station to release water from the West Moor main drain to regulate water levels inside the West Moor Reservoir rhyne system to comply with the Water Level Management Plan. This is done actively during summer and winter periods. The Internal Drainage Board manages water levels inside the reservoir within the rhyne system under the same Water Level Management Plan. The agreed level in the Water Level Management Plan will not change as part of the project.

During the site visit there were ongoing works to bore a new siphon under the river which will allow the existing historic structure to be decommissioned. The group was given an overview of the tunnelling by Ian Hughes of the contractors Stockton Drilling.



Overview of reservoir works by the Environment Agency at the Somerset Levels

The project team mentioned some of the challenges working in such a remote site. Given the terrain, water levels can rise quickly, and remain high for a long period of time. To manage this risk the works are being undertaken in phases with no winter works.

Access to the site is another important consideration, especially with larger plant and cranes for the tunnelling works.

Thanks to Sam Carter from the Environment Agency, Kier, and Silvia Antonello and Laura Yuste Zaballos from the design team at AtkinsRéalis, Alice Davis and Richard Terrell at Binnies and Ian Hughes, Stockton Drilling for arranging an informative site visit to a reservoir with ongoing construction works and complex water management operations.

Specialist contractors Stockton Drilling progressing with boring new siphon under river channel

Midelney Pumping Station – Environment Agency

Tunnel boring machine – boring a new siphon under the river

SITE VISIT

Llyn Celyn

Geralt Richards of Natural Resources Wales and **George Hewitt** of Binnies were a part of a group in attendance at the BDS site visit to Llyn Celyn and the new spillway on Thursday 17 October 2024.

Walking along the tunnel below Llyn Celyn

LLYN CELYN is situated on the River Tryweryn, a few miles to the north-east of the town of Bala, North Wales. The construction of Llyn Celyn between 1960 and 1965 by the Liverpool Corporation Waterworks was highly controversial as the reservoir to supply water to Liverpool resulted in the flooding to the village of Capel Celyn, leading to much opposition and protests.

Llyn Celyn is retained by an embankment dam with a rolled clay core. The embankment is 44.8m high and 670m long, with an impressive 4km of open drains spread across the dam that need to be cleared regularly. The reservoir is currently used for regulating water on the River Dee for both flood and drought conditions. Hydroelectricity energy is generated from the discharge and the reservoir is also used for water supply to households and businesses in North Wales, Chester and north-west of England.

Llyn Celyn has a capacity of 80,930,000m³ when full to its top water level and has a direct catchment area of 60.66 square kilometres and an indirect catchment of 9.83 square kilometres from the Afon Hesgyn. The annual rainfall at Llyn Celyn is reported as 1956 mm.

The group was given a safety briefing by J N Bentley, followed by a presentation of the history of the site by Sam Tudor. The presentation stated that a recent flood study showed that the current spillway arrangement of the drop shaft overflow would not be able to pass flood flows greater than the 1 in 10,000-year event. Options such as raising a 2m wave-wall were considered, but the preferred option was a new spillway at the left abutment of the reservoir.

Thankfully during the site visit the weather remained dry which allowed the group to observe the concreting works within the spillway.

The new spillway weir is to be constructed to the same level of the dropshaft overflow, with a series of nine tipping gates within the new spillway. Flood flows within the spillway will then pass into a culvert, which was under construction, and discharge on the land downstream of the reservoir. It is expected that remedial works would be required to the sacrificial topsoil after an overflowing event.

As the works are within Snowdonia National Park, there are a number planning conditions to be met, including that the finish on the concrete sidewalls is to replicate a stone wall. Once works are complete the plan is to reinstate the layby parking, plant wildflowers atop the culverted section of spillway and install a picnic area to enjoy the wonderous views.

The site visit continued within the tunnel through the Llyn Celyn dam, which gave the group an understanding of the operations of the reservoir and how the flows within the reservoir are regulated to allow abstractions within the Dee catchment, and also to allow local businesses such as the National White Water Centre, a few hundred metres downstream, to operate.

Thanks to Sam Tudor at Dwr Cymru Welsh Water and the staff at J N Bentley for an interesting and informative site visit, seeing physical works on a reservoir site.

New spillway at Llyn Celyn

Llyn Celyn, Wales - Roger Bissel

CONFERENCE FEEDBACK

BDS Conference first impressions

Attending the 22nd biennial British Dam Society (BDS) Conference at Keele University was an exciting milestone for **Prithula Roy Choudhury** as a first-time attendee. Here she talks about how this year's theme, "Managing Risks for Dams and Reservoirs," provided a rich platform for knowledge sharing and collaboration among the industry's leading experts and practitioners.

Dam building with interesting materials!

SALLY SUDWORTH (ReDR) gave a keynote speech about how engineers have worked as part of the response to emergencies around the world.

The Geoffrey Binnie lecture was presented by wAlan Brown on Friday evening, whose presentation was titled "Risk-based or Risk-informed Reservoir Safety Management? Reflections on Current Practice."

The Conference gathered a diverse group of over 300 delegates from across the country, ranging from All Reservoirs Panel Engineers to young graduates aspiring to establish themselves in this field. The event was so popular that it was oversubscribed, highlighting the high level of interest and engagement within the industry. The list of attendees also included undertakers overseeing reservoir maintenance and operations, representatives from water companies, and enforcement authorities like NRW, SEPA, and the EA.

Spanning four days, the conference was a hub of expertise and innovation. The theme "Managing Risk for Dams and Reservoirs" resonated strongly throughout the presentations and discussions. Each day was structured with morning presentations grouped by similar themes into single sessions, totalling six sessions between Thursday and Saturday. There was a Q&A at the end of each session. I was impressed by the wide range of speakers and the material shared during these sessions. It was a valuable learning experience, as it's easy to become pigeonholed into one's own work and perspectives. Listening to all the presentations allowed me to appreciate the breadth and scale of challenges faced by the industry at a national level, as well as the innovative solutions implemented across different contexts. However, having these sessions back-to-back first thing in the morning made it hard to concentrate throughout. It might be better to break these sessions up throughout the day.

The afternoons were dedicated to workshops and site visits, which we could pre-select based on our interests. These workshops were particularly impactful, providing deep dives into pressing issues and facilitating hands-on engagement with the topics. The workshops were not only informative but also interactive, allowing participants to discuss and brainstorm solutions to real-world problems. The collaborative environment fostered a sense of urgency and collective responsibility, inspiring me to apply these insights to my own projects. The variety of topics covered ensured that there was something for everyone, regardless of their specific area of expertise.

However I did feel that it would have been beneficial to have some workshops specifically targeted towards young professionals. It would be good to have some discussion around our views of the industry, the current challenges faced from our perspective, and how we see the industry versus how we might like to see it evolving, especially in light of the climate crisis. It would also be interesting to discuss how, as an industry, we can attract more young professionals.

On Thursday night, the BDS Young Professional committee hosted the "BDS YP Night," which included a quiz and a construction activity where each team had to build a dam using some interesting materials, which then had to withstand a fan directly blowing on it. The YP Night was thoroughly enjoyable and provided a fantastic opportunity to network not only with other young professionals but also with other members of the BDS.

Attending the BDS conference was a great experience. As a first-time attendee, I learned a lot and, most importantly, meeting many of these people in person was incredibly useful. It helped put faces to the names I work with regularly and allowed me to build a wider network within the dam's community. Despite being a first-time attendee, I found the event to be incredibly inclusive. Everyone was very friendly and welcoming, making it quite easy to strike up conversations and feel part of the community. The conference struck a good balance between learning and socializing, making it both an learning and enjoyable experience. This experience broadened my professional network and provided me with invaluable insights and connections that I will carry forward in my career.

Statistical summary of post-conference feedback

The British Dam Society is always trying to improve events and make them more relevant to our members, so it is important to understand what went well, and what was less popular. After the BDS Conference 2024 all delegates were sent a feedback form, with a number of questions on a range of matters. Delegates were asked to score each question in the range from 0 (Poor) to 5 (Excellent), and also had the option of providing comments to clarify their scoring and to suggest changes.

The feedback can be summarised as follows:

- Of the 319 delegates who booked for the conference, responses were received from 84 (36%), which is a satisfactory proportion.
- The scoring generally indicated very positive satisfaction for the conference overall.
- The new poster presentation and speed sessions did not score as highly as the well-established elements of the conference, but the scores were still satisfactory or better, and the feedback suggests that they were welcomed. In planning for the next conference the committee will look in more detail at the comments provided for these elements and look to improve them.
- Other lower scores related to the organisation of the conference programme. The overall scoring suggests that the current format is generally acceptable to the majority of delegates. However, the committee will look into alternatives when setting out the programme for 2026.
- For the venue for the next conference, two-thirds of those who responded to this question would be happy to return to Keele. The committee is currently reviewing options for the 2026 conference and will consider both this score and the suggested alternative locations provided in the feedback responses.

QUESTION	Average score	No of respondents
Overall how did you rate the 2024 BDS conference in Keele?	4.50	84
How did you rate Chancellor's Building as a conference venue?	4.50	84
How did you rate the accommodation provided (campus or hotel)?	4.25	83
How did you rate the food and refreshments provided by the University?	4.49	84
How did you rate the lecture theatre & workshop rooms (including audio visual facilities)?	4.06	84
How did you rate the exhibition space?	4.23	84
How do you rate the current format of Weds evening registration to Sat lunchtime?	3.57	84
How do you rate the current daily format - AM technical presentations / PM workshops or site visits?	4.35	83
How did you rate the quality and range of the technical papers presented given the theme of the conference?	4.06	81
How did you rate the quality and range of the workshops?	4.19	72
How did you rate the site tours?	4.33	40
How did you rate the new 'speed sessions' on Saturday morning?	3.87	54
How did you rate the new poster display?	3.89	75
How did you rate the Exhibitor Reception on Wednesday night?	4.14	71
How did you rate the Young Professionals' Challenge on Thursday night?	3.65	37
How did you rate the Geoffrey Binnie lecture and formal meal on the last night (Friday) of the conference rather than on Thursday evening as has been in previous conferences?	3.84	73
How did you rate the information provided prior to the conference and during the conference?	4.51	83
How did you rate the conference app?	4.39	79
Would you like the next conference in 2026 to be held at the same location, Keele University?	49 Yes	26 No

CONFERENCE SITE VISIT

Forge Mill Flood Storage Reservoir

Lucy Monkhouse of Canal & River Trust attended the Forge Mill Flood Storage Reservoir site visit on Thursday 12 September 2024 during the BDS Conference.

Group by inlet channel with control structure and building

WE BOARDED THE COACH and commenced our journey to the site, 5km north-east of West Bromwich. A photo-pack of the scheme was provided so attendees could familiarise themselves with background information during the trip. Upon arrival to the site, our largest delay was due to 60 six-year-old school children on a tour of the nearby RSPB reserve!

The visit commenced at the entrance of the RSPB reserve in Sandwell Country Park. Representatives from the Environment Agency (EA) explained how the reservoir fits into the overall flood alleviation scheme for the River Tame. Phase 1 of the scheme, completed in 2016, brought new flood walls, flood gates and flow conveyance improvements in Witton. Phase 2 was the construction of Forge Mill flood storage reservoir between 2018 and 2022. The benefit of the scheme to provide protection downstream to 1400 properties was clearly explained with the total cost of both phases in the region of £50m.

We arrived onto the crest of the secondary spillway where we had a clear view of the control structure. This consists of 4no. 3×3m box culverts with penstocks on the upstream face and a trash screen.

It was great to hear how the reservoir had been used to provide flood protection for the first time during Storm Babet in 2023. The penstocks are automated to progressively close after storage in the downstream river channel has been maximised, based on set thresholds being exceeded at two downstream monitoring stations (Atlas Bridge & Walker Drive), and thus allowing the water level in the reservoir to rise, to provide the 1% AEP flood protection. Environment Agency duty officers then receive alarms to visit site and undertake surveillance, although control relies on a fully automated system.

We were provided with a tour of the control building with explanations on how the Environment Agency is prepared for managing the flood protection scheme (many checklists, regular training of duty staff and exercising contingency plans such as manual operation of the penstocks using mobile actuators). Redundancy and resilience were considered throughout the scheme, examples included a power supply from two different substations, facility for the use of a generator, and failure of a penstock gate in flood conditions.

The attention to detail of the design and its execution was evident. I was particularly impressed with the hatch for the generator cable, the safety measures for operatives, beacon alerts to park users and the use of the path concrete edging as the control point for TWL. The Environment Agency team continues to build on improving the ability to manage the reservoir; changes include increasing the spacing between the bars of the trash screen and the use of a spider excavator to clear the screen four times per year.

Redundancy and resilience were considered throughout the scheme, examples included a power supply from two different substations, facility for the use of a generator, and failure of a penstock gate in flood conditions.

Embankment slope with grass damage

Control structure with four 3m x 3m box culverts and penstocks

Small areas of reduced grass coverage were visible on the reinforced spillways stimulating a group discussion on the challenges with 3-D matting erosion protection. The Salix and grass had been damaged during grass cutting, with the regrowth of grass proving problematic as the matting is designed for grass to grow through the mesh. An attendee offered input from a different project where an inch of topsoil is added on top of the matting to make future grass growth easier. Installation time is increased but operational interventions reduced. It was acknowledged a key consideration was the use of a landscaping contractor for this type of work.

Representatives from the Jacobs design team and the Construction Engineer provided commentary on challenges overcome during the construction. These included diverting unmapped land drains, securing a supply of suitable embankment fill from a quarry with competing demands (HS2) and ensuring appropriate quality checks, overtopping of the temporary defences and flooding of the work area, and delivering a project through the Covid-19 pandemic. Whilst the dam construction was longer than originally anticipated, an added benefit has been that the majority of settlement was likely to have occurred during construction, with post-construction settlement of less than 50mm being helped by a well-drained foundation.

Engaging group discussion prevented the full embankment walkover, however the visit concluded looking out towards the eastern dam where the primary spillway is located. Thanks to Steve Haywood and his colleagues from the Environment Agency and the Jacobs design team for making an interesting site visit.

Further information is provided in the site visit flyer and a paper written by Ciara Gill in Dams and Reservoirs titled *Perry Bar & Witton FRMS: Forge Mill flood storage area – lessons learnt* (Issue 32 No 3, September 2022).

Inside the control building

CONFERENCE SITE VISIT

Tittesworth Reservoir

Rachel Dawes of Arcadis attended the Tittesworth Reservoir site visit on Thursday 12 September 2024 during the BDS Conference.

TITTESWORTH RESERVOIR, located in the upper reaches of the River Churnet, about 3km north-east of Leek, Staffordshire, is a key water supply reservoir managed by Severn Trent Water. Constructed in 1963, the reservoir has a capacity of 6,400,000m^3 and provides water to the local town of Leek and the North Staffordshire region via the Tittesworth Water Treatment Works. The dam itself is an embankment dam with a concrete core, standing 24m tall, and incorporates elements of an older dam built in 1858.

The visit began with a presentation from Severn Trent Water, offering insights into the dam's history and the role of the adjacent water treatment works. Following the presentation, delegates participated in a guided tour around the site, which included access to the bellmouth spillway, a walk up the dam shoulder to the crest, and the valve house via the walkway bridge. Discussions during the tour covered the ongoing inspection and maintenance requirements of the spillway and drainage systems.

A significant feature of the site visit was the opportunity to explore the 20.73m diameter bellmouth spillway, a crucial component for flood management at the reservoir. Delegates walked along the outlet tunnel of the spillway, which led into the centre of the dam, eventually reaching the bottom of the bellmouth spillway. Standing at the bottom of the shaft, the group was able to look directly up and see the entrance to the bellmouth spillway from below – an impressive sight that underscored the scale and functionality of this structure. The view from the bottom of the shaft provided a unique perspective on how excess water is efficiently funnelled from the reservoir into the vertical shaft for safe discharge downstream.

Thanks to Emma Hawkes, Chris Smith and Ian Davies at Severn Trent Water for providing excellent support and information on the visit.

Bellmouth spillway and valve tower along crest

Bellmouth spillway

View upstream from dam crest

CONFERENCE SITE VISIT

Macclesfield Cascade

Veronika Martin of Arup, attended the Macclesfield Cascade site visit on Friday 13 September 2024 during the BDS Conference.

THE BDS CONFERENCE visit to the Macclesfield cascade promised to showcase not one but two reservoirs Trentabank and Ridgegate (both Category A), and not being able to resist a 2-for-1 deal, I signed up for this trip. It was a calm and sunny afternoon when we left the campus of Keele University in a tightly packed bus for the hour-long trip to the cascade, that included some patient manoeuvring by the bus driver when we neared the reservoir.

When we disembarked, we were invited to the Trentabank Nature Reserve visitor centre for a short presentation on the history of the two reservoirs given by the Supervising Engineer from United Utilities. The focus of the visit was Ridgegate Reservoir which, following an S10 inspection in 2020, had a MITIOS to complete a flood study. The study identified that the primary spillway has some shortcomings. Malcolm Wearing from CRM took on the presentation to demonstrate, through videos, the physical model of the spillway. It showed that the extreme steepness of the chute, paired with some steps half-way up the chute, had the flows in the safety check flood event separating from the chute floor and remaining in the air until the flow hit the small stilling basin. This would pose a risk of embankment erosion from the flow leaving the confines of the chute, and toe erosion. With that demonstration we left the visitor centre to play a game of "Guess the spillway solution" during the Ridgegate walk.

Ridgegate dam was completed 1852 and has two embankment dams. The primary embankment on the Bollin Brook (Short dam) is 75m long and 17m high. It was built with a gradient on 1:2 (V:H). The primary spillway is located to its right just off the right mitre (and with similar slope). The access and the steepness of the embankment prove a challenge for any future works on the embankment and the spillway. Indeed, sheep were chosen to maintain the grass cover of the embankment, after an incident with the robotic mower skidding down the bank. The Long dam, which we visited first, is a 200m long saddle dam and is 4.5m at its highest. An auxiliary spillway was added in the 1990s, with a grassed tumble bay located to its left. It was revealed that this is the location where future works to improve the spillway capacity are considered, due to the access difficulties at the primary spillway.

After the trip to Ridgegate, we had only a short time to visit Trentabank, which had recently undergone its S10 inspection. A flood study was part of the new MITIOS, and I was left wondering what it will show for its bellmouth spillway. The sheep were happily maintaining the grass cover to the required length on the 230m long embankment.

Steep Ridgegate Primary Spillway

Ridgegate Long dam

Trentabank embankment and grass maintenance sheep

Trentabank reservoir, view towards spillway and draw-off tower

CONFERENCE SITE VISIT

Rudyard Reservoir

Naomi Ashcroft of Stantec was on the visit to Rudyard Reservoir on Friday 13 September 2024 during the BDS Conference.

RUDYARD RESERVOIR is a hidden gem located in the Staffordshire Moorlands, just to the north west of Leek. Designed by John Rennie and built between 1797 and 1801, the reservoir is the Canal and River Trust's (CRT) third largest by volume, serving the Caldon Canal, a feeder to the Trent and Mersey Canal, which served the local cotton mills and the Stoke-on-Trent pottery industry. As well as the natural catchment the reservoir is fed by a feeder from the River Dane at the north end. With the arrival of the North Staffordshire Railway in 1849, Rudyard and the reservoir soon became the "Blackpool of the Potteries". Commercial leisure activities are now managed by Rudyard Lake Ltd who report that over 500,000 people visit the reservoir each year.

A group of around 24 of us visited the reservoir to learn about its heritage, the current challenges with maintaining the ageing dam and the potential it may hold for enhancing Severn Trent Water's (STW) local public water supply during periods of drought. Thanks to Steve Maxwell (CRT) and Kamila Etienne of Arcadis for leading the tour. The Rudyard Lake narrow gauge railway was also a draw for many of the group.

The reservoir is 3km long, sitting in a strikingly narrow valley, running almost north to south and is impounded at its southern end by a 11m high, 155m long earth embankment dam with a puddle clay core. The embankment crest is relatively wide (around 14m at its narrowest), thought to have provided potential for future raising, but historically accommodating a variety of recreational structures, including a dance floor and bandstand, now long gone. The primary spillway, located at the lefthand side of the dam, consists of a dramatic-looking masonry chute curved in both plan and section. A dwarf masonry retaining wall abruptly demarcates the toe of the spillway, in which sits a V-notch weir. A small channel follows the toe of the embankment dam linking up with the feeder channel to the Caldon Canal at the righthand end of the dam. When the spillway is in flood, significant flows are likely to by-pass this channel and pass directly down the now tree-lined valley. The alignment of the formal overflow channel does appear to make the toe of the embankment vulnerable to erosion.

↑ Rudyard reservoir from the dam crest

↓ Group in front of curved masonry spillway

Two valve houses are located at the right hand end of the dam, housing the controls for the upstream guard valve and two downstream control valves on dual 300 mm cast iron pipes, passing through the clay core and controlling the feed to the Caldon Canal, via a channel and weir structure known as the "coffin". CRT undertook improvements to the draw-off system in the early 1990s and again in 2013 to reduce the risk of seepage through the core and improve the safety of the valve operations.

Whilst there are no archive drawings for the reservoir, CRT does hold John Rennie's specification for the works, which is reportedly and reliably very detailed.

A Section 10 inspection was completed in July 2024 and the measures in the interest of safety are likely to include re-pointing and grouting repairs to the spillway, spillway investigation to establish the presence of any key into the core, drainage improvements and tree works to protect the left wing wall.

Water level management has changed over the lifetime of the reservoir. As waterways traffic peaked and ebbed, the need to reduce flood risk downstream became important, while the reservoir continues to be very popular for amenity and recreational purposes and is now being considered for water supply.

The water level was raised above the original top water level in 1904 by 570mm through the addition of timber "greedy" boards across the original crest of the spillway. This increased the volume in the reservoir by 13% to continue to serve the demand on the canal system.

We understand that the water level has been held down in the reservoir, below the original TWL, since the 1970s, due to the flood risk posed to properties sitting in the valley downstream and the lack of capacity in the culverts beneath the B5331 road that crosses the valley a short distance downstream.

With the potential drought mitigation scheme to provide water to STW's Tittesworth Water Treatment Works the defined top water level will need to be raised by around 650 mm from its current level. The impact of this on the embankment, spillway, over-topping and flood risk downstream will need to be carefully reviewed, not forgetting the impact on recreational activities and associated infrastructure "at the water's edge". Akin to the tightrope walks performed across the lake in the late 1800s by Carlos Trower, a tightrope has to be carefully negotiated between reservoir safety, water supply and flood risk.

Whilst the focus is currently on the UK's strategic water supply options it is refreshing that an asset built over 200 years ago to serve the UK's industrial revolution is now being considered as a local water resource whilst continuing to provide amenity for many, supporting the local economy in the process. FOR MORE INFORMATION *RUDYARDLAKE.COM*

PROFILE

Binnie Lecturer 2024

THE GEOFFREY BINNIE LECTURE was set up by BDS in 1990 in memory of Geoffrey Binnie, who was born in 1908 and died in 1989. It is an invited lecture given at the biennial BDS conference by a senior member of the profession, to share their experience in dam engineering and provoke discussion on topical issues. It is similar to the Rankine lecture which is an invited lecture in Geotechnics.

It commemorates Geoffrey Binnie, who came from a long line of distinguished dam engineers – both his father and grandfather being eminent in the profession and who together founded the firm of Binnie & Partners in 1902. A brief summary of Geoffrey's career was given in the 2008 Binnie lecture by Bill Carlyle, a senior partner at Binnie and Partners. Geoffrey also wrote two books on the history of dam engineering in UK (1981, 1987) which are recommended reading for young dam engineers.

The 2024 Binnie lecturer, Alan Brown of Jacobs, was born in Carlisle and lived overseas for the first ten years of his life in Sudan and Jordan with his parents who were missionaries. His father, David Alan Brown, went on to become Bishop of Guildford 1973–1982. Alan graduated from Peterhouse Cambridge in 1977, following which he joined Sir M MacDonald and Partners in Cambridge, working on dams mostly located overseas. Since then he has moved employers several times, including Halcrow, Soil Mechanics, Scott Wilson, KBR (Howard Humphreys), Jacobs, and Stillwater Associates. He has written around 70 technical papers on dams. Alan was appointed to the Supervising Panel in 1985 when this role first came into force, and to the All Reservoirs Panel in 2001. He became discipline lead for dams at Jacobs in 2008, and global technology lead in 2019.

↑ Alan Brown
↓ Evretou dam

His early experience at Sir M MacDonald and Partners included head office support during construction of the Hull Barrier, engineering of various overseas dams and irrigation schemes. It included 14 months resident in Sudan on supervision of construction of 180km of surface dressed road on the Rahad Irrigation scheme. The latter included overseeing the materials laboratory carrying out soils testing on subbase and road base, the arguments with the contractor's laboratory in interpretation of plasticity index testing awakening an interest in geotechnical engineering.

He completed an MSc in soil mechanics with Distinction at Imperial College in 1984. He then worked as a geotechnical engineer at Halcrow Water, Soil Mechanics Associates and then Scott Wilson. At Halcrow he won the BDS prize in 1986 with his paper on Evretou dam, subsequently written up in Geotechnique (Brown, 1988). While at Soil Mechanics Associates (SMA) he worked on interpretative reports and outline design for basements in London; water and dam schemes for North West Water; and various highways schemes. On the latter the assessment of suitable and unsuitable materials as present in excavation for both clients and Mowlem (the parent company of SMA) being a good grounding for design of embankment dams from materials locally available in the reservoir basin.

Time at Scott Wilson included 3½ years in Hong Kong from 1991–1995, where Alan was deputy head of the 20-strong geotechnical section, working on major infrastructure including site formation and access road/rail for the new airport and container terminal nine. He also worked on the GEO landslide prevention measures contract assessing

↑ Kannaviou dam

Kannaviou dam

the stability of 10 government and 100 private slopes and retaining walls, recommending the issue of improvement notices where deemed unsafe.

On joining Howard Humphreys in 1995 he started work on the Paphos water supply scheme in Cyprus, which included four dams, a conveyor and water treatment works. He first carried out the feasibility review of Kannaviou dam, a 70m high concrete faced rock fill dam which was well described in the 2020 Binnie lecture by John Gosden, who was Project Director. He then became project manager and Lead engineer on the scheme for around 10 years as they progressed through detailed design and construction. One of the other elements of the scheme was Arminou dam, a 40m high clay core dam, where Alan co-authored a paper in Geotechnique with the Resident Engineer, Tony Bruggeman, on joints in diaphragm wall cutoffs (Brown et al, 2002).

Alan was technical lead on a number of Defra R&D projects between 2001 and 2007, with key outputs being summarised in Table 1, the research reports generally being available on the BDS website under historical research contracts. These in turn led onto being one of the authors on the 2013 update as RARS (Environment Agency, 2013, Wallis & Brown, 2017), and in scoping breach research in 2023 (Environment Agency, 2023)

He has been, and continues to be, Construction Engineer on around 30 new reservoirs, and is currently chair of the Review group for the two new Anglian SRO reservoirs. He is the BDS representative on the ICOLD embankment dams committee. He has also been on the BDS committee, Reservoirs Committee (twice), ResRAG since 2019 and the ICE Panel Engineers' Committee since 2022.

He continues to take a keen interest in risk assessment for safety management of dams, carrying out ALARP assessments as part of S10 and QCE roles in dams in UK. As global technology lead at Jacobs he is also reviewer for risk assessments carried out by Jacobs in the United States and Australia. Risk assessment is the subject of his 2024 Binnie lecture, with the written version due to be published in Dams and Reservoirs in 2025.

Publications by Alan Brown and others relating to Defra R&D 2001–2007

Viability of comparison of likelihood of floods and internal threats

Brown, A. J. & Gosden, J. D. (2002) 'A Review of Systems used to Assess dam Safety', Dams 2002, BDS Conference, Dublin.

Brown, A. J. & Tedd, P. (2003) 'The probability of a dam safety incident at an embankment dam, based on historical data', Hydropower & Dams, Issue 10, Vol. 2.

Incident reporting

Brown, A. J. & Gosden, J. D. (2003) 'An Incident Reporting and Investigation System for UK dams', Presentation to British Dam Society at the Institution of Civil Engineers, October 2003. Dams & Reservoirs, Vol. 14, No. 1.

Emergency planning

Brown, A. J. & Gosden, J. D. (2006) 'Development of a Guide to Emergency Planning for UK reservoirs', BDS Conference, Durham.

Early detection of Internal erosion

Brown, A. J. & Gosden, J. D. (2004) 'Outline strategy for the management of Internal Erosion in embankment dams', Dams & Reservoirs, Vol. 14, No. 1.

Aspinall, W. & Brown, A. J. (2004) 'Use of expert opinion elicitation to quantify the internal erosion process in dams', Dams 2004, British Dam Society Conference, Canterbury.

Brown, A. J. & Gosden, J. D. (2008) 'Defra research into Internal Erosion', BDS Conference, Warwick.

Interim Guide to QRA

Brown, A. J., Gosden, J. D. & Telford, T. (2004) 'Interim Guide to Quantitative Risk assessment for UK reservoirs'. Published Thomas Telford, UK.

Brown, A. J. & Gosden, J. D. (2006) 'Preliminary feedback on Interim Guide to QRA', BDS Conference, Durham.

Brown, A. J. & Peters, A. (2007) 'Update on the use of the Interim, Guide to Quantitative Risk Assessment', Dams & Reservoirs, 17(1), pp19–24.

Selected key references authored by G. M. Binnie and Alan Brown

Binnie, G. M. (1981) 'Early Victorian Water engineers'. Published Thomas Telford, 410pp.

Binnie, G. M. (1987) 'Earley dam builders in Britain'. Published Thomas Telford, 181pp.

Brown, A. J. (1988) 'Use of soft rockfill at Evretou Dam, Cyprus', Geotechnique, September 38(3), pp333–354.

Brown A. J. & Bruggemann, D. A. (2002) 'Arminou Dam, Cyprus and construction joints in diaphragm cut-off walls', Geotechnique, February 52(1), pp3–13.

Brown, A. J. & Gosden, J. D. (2004) 'Interim Guide to Quantitative Risk assessment for UK reservoirs'. Published Thomas Telford, UK.

Environment Agency (2013) 'Guide to Risk Assessment for Reservoir Safety Management Report', SC090001/R2. Available at https://assets.publishing.service.gov.uk/media/6034c964d3bf7f265824d056/_SC090001_methodology.pdf

Environment Agency (2023) 'Scoping research to improve dam and levee breach prediction'. Available at https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/scoping-research-to-improve-dam-and-levee-breach-prediction

Wallis & Brown (2017) 'Erratum: Guide to risk assessment for reservoir safety management – addendum No. 2', Dams & Reservoirs, 27(3), pp142–153.

Jonathan Hinks – Honorary Member of ICOLD

Since 2000, the International Commission on Large Dams (ICOLD) has bestowed Honorary Membership of ICOLD on engineers who have made an exceptional contribution to dam engineering during their careers.

At the 2024 ICOLD meeting in New Delhi, Jonathan Hinks, a past chair of BDS and a BDS Honorary Member since 2016, was conferred with the honour of Honorary Membership of ICOLD.

The citation reads: Jonathan Hinks – He has worked as a professional civil engineer for more than 45 years. The last 33 years have been spent on the design and inspection of concrete, earthfill and rockfill dams. He has been involved with the design of a number of RCC dams up to 154m high and has taken a particular interest in the seismic design of dams having been on the ICOLD committee for seismic aspects of dam design for a number of years. He has published over 50 technical papers on dam related subjects. Since joining HR Wallingford in 2012 he has inspected dams in UK and has also been appointed to Panels of Experts for dams in Albania, Rwanda, Malawi, Vietnam and Tanzania.

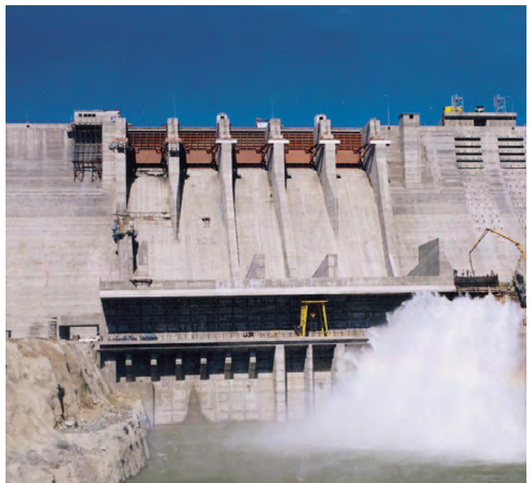
Jonathan receiving the ICOLD award from Darren Shaw, BDS Vice-Chair

Unfortunately Jonathan was unable to attend the ICOLD meeting at which the award was conferred. This was instead accepted by the BDS Chair, Rachel Davies.

Jonathan, accompanied by his wife Krista, attended the BDS evening meeting at the ICE in London in October 2024, and was presented with the certificate of Honorary Membership of ICOLD by BDS Vice-Chair Darren Shaw.

In accepting the certificate, Jonathan magnanimously stated that he considered the award to be recognition of the role that all UK dam engineers play in dam engineering worldwide, and in their support of ICOLD, rather than just his contribution.

Platanovryssi RCC Dam Greece – one of Jonathan's projects



ICOLD Study Tour to Pinnapuram Pumped Storage Project

Alan Brown of Jacobs, attended the study tour on Friday 4 October 2024 after the 92nd ICOLD Annual Meeting in New Delhi, India.

THE SITE VISIT was arranged by Carpi to a new Integrated Renewable Energy and Storage Project (IRESP) under construction in India. It is located 35km to the south-east of Kurnool in Andhra Pradesh state, and is part of a green energy park with 2000MW of solar panels, 400MW of wind turbines and 1680MW of pumped storage. The pumped storage project (PSP) is designed for up to 7 hours of generation, with upper and lower reservoirs each 1.7Mm³, and a flow rate of up to 240 m³/s, generating a velocity of 2.3m/s in lower link channel.

The developer is Greenko, an Indian Green power company formed in 2006 and the project is part of India's drive towards renewables, aiming to increase the proportion of power from renewables to over 50% by 2030. Further details of the scheme are available at https://greenkogroup.com/ap01.php and an overview of the project can be seen here https://www.youtube.com/watch?v=91oR8sP7w4A

It is the first of over 20 planned pumped storage projects in India with total capacity of 24 GW.

The study tour arranged by Carpi was hosted by Greenko. It was attended by around 26 people.
We visited each of the main elements of the scheme, namely downstream and upstream reservoirs and linking channels, temporary cofferdams in each reservoir and the power house.

Greenko is both developer and project manager, with the PSP constructed through separate contracts for earthworks, concrete, MEICA (Andritz, an Austrian company) and the upstream membrane lining (Carpi).

Placing Carpi membrane on upstream face of lower dam

One of the impressive aspects of the project was speed of construction, with work starting on site in November 2021 and due for completion in 45 months, to meet the requirement of the development licence from the Government of India. Workers on site peaked at up to 9000 staff, including 200 engineers from Greenko, who are managing the various contracts. At the time of the visit the earthworks and concrete works was substantially complete, with some lining to complete, whilst two of the turbines had been installed and tested in air, with wet commissioning due in a few months.

The dams and linking channels are rockfill embankments with upstream Carpi membrane, selected for technical and performance reasons including speed of construction. An overview of the use of geomembranes in PSP, and details at Pinnapuram were given at the 2024 BDS conference at Keele in the paper by Gabriella Vaschetti et al in session 2: (https://britishdams.org/assets/documents/conferences/2024/Papers/S2.3%20%2822%29%20Vaschetti%20et%20al.pdf).

Key design criteria at this site include a 50 year design life, 197km/hr design windspeed and an underdrainage system with collector pipes at frequent intervals along the reservoir perimeter embankments to allow monitoring of leakage. Further details on the anchorage and collector system are given in the table. There are no spillways, stated to be as the reservoirs are a closed system, but they have 3m freeboard.

The project included various environmental enhancements is the area as part of the project, including that attendees on the site visit each planted a tree within the project owner's compound!

Aerial view of upper reservoir, with upper power intake in distance

Aerial view of lower reservoir

Tailrace connecting channel with lower power intake on right

Element	Link channels	Perimeter of reservoir
Length (km) – Upper reservoir		6.5km (fully bunded)
Length (km) – Link channel	1.6km	
Length (km) – Lower reservoir		3.3km (3 dams to infill between high ground)
Membrane	2.5mm PVC Geocomposite	3.0mm PVC Geocomposite
Slope anchorages (at 8m centres along slope)	4mm thick x 50mm wide stainless steel button plates	Membrane at base of 2m wide gravel trench, welded to face
Underdrainage	Geosynthetic Geodrain	Porous concrete
Secondary membrane to collect any leakage	100mm lean concrete	

Reservoir Safety Reform Programme

The Reservoir Safety Reform Programme is being developed and delivered in response to the recommendations set out in the Independent Reservoir Safety Review Report.

In a Written Ministerial Statement in July 2022 the Government set out its intention to reform reservoir safety management practices and modernise the Reservoirs Act 1975. The Deputy First Minister for Wales has confirmed the Welsh Government's intention to join the Reservoir Safety Reform Programme and implement the reforms across Wales. We are working closely with our Welsh colleagues to ensure there is consistency across roles and responsibilities for reservoir safety engineers who work across both nations.

The programme will be delivered in a phased way over several years, by the Department for Environment, Food and Rural Affairs (Defra) the Environment Agency (EA), along with the Welsh Government and Natural Resources Wales (NRW).

The need for reform

Reservoir safety is about ensuring the physical structure of a reservoir, its dams and embankments are safe. In England, around 2.6 million people are potentially at risk from reservoir dams failing and causing flooding which could endanger life.

We have an excellent reservoir safety record. However, the Toddbrook incident in 2019, increasing demands on water supply and the impacts of climate change, are all reasons to re-evaluate how we regulate reservoir safety.

Daer Reservoir, Scotland - Finch Conan

Our vision for change

Our vision is to create a safety regime for reservoir dams in England which protects our communities, by making us ready for and resilient to climate change – today, tomorrow and the future.

We will do this by:

- Strengthening the roles and responsibilities for reservoir owners, operators, engineers, and the regulator (EA).
- Improving the safety practice and culture, through a programme of continuous development of skills, capacity and training across the reservoir community.
- Modernising legislation and safety management practice to ensure a robust and proportionate safety regime that is fit for the future.
- Engaging with stakeholders to help shape our approach and deliver reforms.

Key reforms

Responsibilities for reservoir safety regulation are divided between the following three communities:

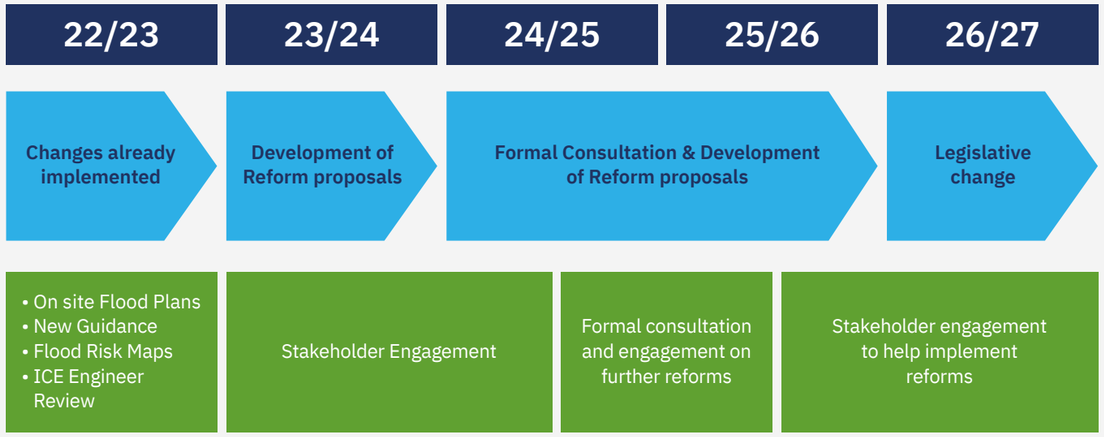
1. **Reservoir owners and operators**, who are responsible for the safety of their reservoirs. They must appoint engineers from the reservoir panels of engineers to inspect their reservoirs and they must act on the engineer's recommendations.
2. **Reservoir panel engineers**, who are appointed to supervise and inspect reservoir construction and operation.
3. **The Environment Agency** manages and enforces reservoir safety regulation in England.

The reform programme aims to strengthen and modernise safety procedures. It will not change this overall three-way approach but will mean some changes for all these communities.

Torduff Reservoir, Scotland – Chloe Fisher

Timeline for changes

The programme will be delivered over several years through new guidance and legislation. Timings are provisional and may change as the programme progresses. The details of what will be included in each legislative stage may change.



How you can get involved

We engage regularly with the industry and professional bodies and are planning a public consultation in 2025 to gather thoughts and ideas on the reform proposals. We encourage you to share your views with your representative body so they can represent your interests in shaping the reforms.

For more information

To find out more detail on our plan for reforms and how the programme is progressing, our information page provides the latest updates. Reservoir Safety Reform Programme Information Page – Environment Agency – Citizen Space (environment-agency.gov.uk)

Reservoir Safety Research Advisory Group Updates

THE RESERVOIR SAFETY RESEARCH ADVISORY GROUP (ReSRAG) is supported by the ICE and has a home under the Joint Flood and Coastal Erosion Risk Management R&D Programme (Defra, Environment Agency, Natural Resources Wales, Welsh Government). ReSRAG is made up of representatives across academia, industry, government, and other organisations, who advise on research, and identify future priorities. The group is always keen to hear from members for their views and ideas on future research needs.

The group is also connected to a wide range of international developments across many partnerships such as ICOLD and The Centre for Energy Advancement through Technological Innovation (CEATI) & The Dam Safety Interest Group (DSIG).

Joint Flood and Coastal Erosion Risk Management (FCERM) R&D Programme

Ongoing and recently published research

- All outputs are published at www.gov.uk/government/organisations/flood-and-coastal-erosion-risk-management-research-and-development-programme.
- Extreme Flood Hydrograph Estimation and Extreme Flood Estimation – Assessed the suitability of existing methods for estimating Probable Maximum Precipitation (PMP) and Probable Maximum Flood (PMF) and aims to develop new methods and guidelines to ensure that we understand the risk posed to our highest risk reservoirs from extreme flood events. It has created a catalogue of extreme historical rainfall events, benchmarked current methods, reviewed international practice and considered potential alternative methods for estimating PMP and PMF. This project has also examined snow melt calculations and provides a worked example to ensure these are applied consistently. The full report is expected to be published in December 2024.
- Benefits in removing or adapting redundant reservoirs - Commissioned by the Environment Agency to HR Wallingford this R&D considers not only discontinuance, but adaptation. It draws on a wide number of existing case studies to provide a good practice overview. This was published in July 2024.
- Flood and coastal erosion risk management areas of research interest – The Environment Agency's Flood and Coastal Erosion Risk Management research team published their areas of research interest to concentrate how research funding is used, and link to the research community with industry partners and government.

The eight topics provide a list of pressing research issues, outcomes needed to be achieved and where existing research can be collated. This was published in May 2024.

What's next?

The following research project has previously been prioritised and is likely to be the next project to start:

- **A Standard Methodology for estimating loads on and the behaviour of reservoir wave walls of various types and shapes** – To assess existing methods across a number of disciplines (wave overtopping, wave forces on structures and soil mechanics) and considers the key inputs/measures for this type of analysis.

For further information on the Joint FCERM R&D Programme:
Dr Sarah Twohig, Environment Agency
sarah.twohig@environment-agency.gov.uk

Construction Industry Research and Information Association (CIRIA)

Ongoing and recently published research

Thrust blocks for buried pressure pipelines C816
Due for imminent release this guide looks at the design and build of thrust blocks for supporting buried pressure pipelines.

Tunnel Asset Management
Slated for early 2025 publication this guide is looking at managing tunnel assets over their whole life. Has included input from reservoir service tunnel owners.

Engineering in Chalk
This project just underway in earnest – updating classic C574 guide with learning from major projects and outputs of Chalk 2018 conference.

What's next?

Geosystems
An update to previously published WRAP guidance on the use of geosystems for engineering application, lowering whole life carbon and delivering multiple benefits. Starting Autumn 2024.

Geotechnical Slope Drainage
This will examine the design and maintenance of drainage for slope stability under climate change and extreme weather events. Starting Autumn 2024.

Update to Observational Method Guidance
Update to previous guidance for the application of Observational Method drawing upon major project examples such as Crossrail and HS2 in reducing time and cost. Starting Spring 2025

Contact – Dr Andy Moores – andy.moores@ciria.org

CEATI (the Centre for Energy Advancement through Technological Innovation)

The Dam Safety Interest Group is a sub-group of CEATI, with over 80 member organisations across the world. Members contribute to a central project fund, with the outputs shared we have access to nearly £500,000 of research and development annually. We contribute financially, and through the provision of information or resource. Tony Deakin (Environment Agency) currently sits on the DSIG Executive Committee, with Maddie Prendergast contributing to project delivery through their working groups.

Involvement with CEATI is a great opportunity to deliver R&D work with substantially reduced costs, whilst also enhancing the UK's international reputation.

Ongoing and recently published research

In 2024, CEATI published 'Best Practises for Dam Breach Inundation Mapping', to which the Environment Agency contributed information.

The Environment Agency has proposed two projects which are in the pipeline for delivery – "The Operational Impacts of Climate Change on Dams and reservoirs", and "Community response to reservoir risk – a toolkit for emergency planners".

Contact – Maddie Prendergast – Maddie.Prendergast@environment-agency.gov.uk

ReSRAG Strategy Refresh 2025

In 2025, ReSRAG will refresh the Reservoir Research Strategy. The strategy was last updated in 2016. It provides the framework for the group to deliver R&D through the Defra Joint Programme and other relevant delivery channels.

Since the last strategy review, ResRAG has facilitated the delivery of 13 new R&D projects. We will be reviewing the themes under which research is grouped and prioritised, ensuring current and future needs are at the forefront of decision-making when delivering new R&D. Climate change will be a significant focus for this refresh, with a review of the current research available pertinent to the reservoir industry. This will enable our studies in the future to address the uncertainty associated with the changing climate and how this impacts our infrastructure, both for existing and future sites. We will be looking holistically across the industry to identify where research we can deliver can contribute to our knowledge base. This will involve frameworks to deliver new studies, as well as identifying how we can improve access and applicability to existing studies across neighbouring borders and industries.

Reservoir-Focused Research Projects

Estimation of PMF using ReFH2

WHS (Wallingford HydroSolutions), University of Bath and UKCEH (UK Centre for Ecology & Hydrology) collaborated on a study for developing a new modelling framework for PMF (Probable Maximum Flood) estimation using ReFH2, the rainfall-runoff model used for estimating UK design events at lower return periods. The assumptions made within the current FSR/FEH PMF procedure were translated and applied to the ReFH2 rainfall-runoff model and peak flows were compared with those from the FSR/FEH model for 400+ catchments. The study highlights the potential for ReFH2 to be used as the rainfall-runoff model for all return periods, up to and including the PMF, thereby paving the way for using the ReFH2 model for reservoir safety studies.

The results are published (open access) in Hydrology Research (The journal of the British Hydrological Society) https://iwaponline.com/hr/article/54/3/360/93909/Probable-maximum-flood-the-potential-for

Contact – Dr Thomas Kjeldsen – trk23@bath.ac.uk

Hole Erosion Test Equipment

The construction of a Hole Erosion Test apparatus for UK conditions, the development of which is funded by the ICE Research & Development Enabling Fund, is underway at the University of Sheffield. The Hole Erosion Test, HET, is considered to provide the best quantitative measure of the resistance of a soil against seepage-induced piping and can provide erosion parameters for a given soil that may be used in practical risk evaluation.

A new element for the UK design is the inclusion of a 200L constant pressure tank for the storage of reservoir water (as needed) and application of a high pressure input (up to 700 kPa) to enable the most resistive soils to be assessed. The apparatus includes close control of a variable applied head, and measurement of flow rate, head loss and turbidity over time.

If it is desired to incorporate soil-water chemistry effects, specific reservoir water may be used as the experimental flow fluid. Interpretation of HET data enables the Hole Erosion Index IHET to be directly established for a soil of interest, placing it into erosion classes from "extremely slow" to "extremely rapid". Applied to soils that form the core and filter zones of embankment dams, IHET can be used directly within risk assessment frameworks towards better decision making for reservoir owners. The apparatus is expected to be available for internal erosion testing from April 2025 for both industry-facing and research applications.

Contact – Dr Elisabeth Bowman – e.bowman@sheffield.ac.uk

Committee Representation

We are keen to hear from members of the industry who are interested in joining the committee to help inform ongoing research needs for the benefit of the reservoirs community. If you would like to contribute to the group, please get in touch with Dr Sarah Twohig.

OBITUARY

Alan Johnston

BSc, FICE

(1935–2024)

ALAN JOHNSTON, who was chairman of the British Dam Society from 1995 to 1997, passed away peacefully on 10 July 2024 at the age of 89. Alan was born in Glasgow on 15 March 1935 and was educated at Kelvinside Academy and Glasgow University where he graduated with a Bachelor of Science in Civil Engineering in 1957. He joined the Institution of Civil Engineers as a graduate member, becoming a Member and then a Fellow in 1976. He was appointed a Fellow of the Royal Academy of Engineering in 1995, presented the Binnie lecture to the BDS Conference in Bath in 2000, and became one of the first Honorary Members of the BDS in 2013.

As a student, Alan spent a summer with the Glasgow based firm of consulting engineers, Babtie Shaw & Morton, working on the site of the Alt-na-Lairige prestressed concrete dam, part of the Glen Shira hydro-electric project. This was to imbue Alan with a keen interest in dam design and construction, which was to stay with him throughout his life. A trip to the nearest dam and reservoir was in integral part of any family holiday!

On graduating, Alan joined Babtie working on the design of a range of infrastructure projects. He met Anne at a Glasgow University Union dance and they were married in 1961. To gain contracting experience he joined John Laing Construction, working on various projects throughout the UK. This involved both site work and a spell in the estimating department which provided Alan with a fundamental understanding of what was important to contractors when tendering. In 1960 he completed a diploma in public administration, gaining an understanding of management in the public and private sectors.

Returning to design work he rejoined Babtie, initially working on major improvements to the motorway and trunk road network throughout Scotland. However, it was not long

Bradan reservoir

Mentoring and supporting the next generation of reservoir engineers was seen by Alan as a key part of his role. He always looked for opportunities to develop staff working for him and he actively encouraged the writing of technical papers and the giving of presentations at conferences or evening meetings.

before the lure of dams came calling and he was appointed as Project Engineer to lead the firm's work on Bradan reservoir, involving two concrete gravity dams, the highest being 31m. These were completed in 1973.

He was appointed to Panel 1 of the Reservoir (Safety Provisions) Act 1930 and subsequently to the All Reservoirs Panel under the Reservoirs Act 1975.

Mentoring and supporting the next generation of reservoir engineers was seen by Alan as a key part of his role. He always looked for opportunities to develop staff working for him and he actively encouraged the writing of technical papers and the giving of presentations at conferences or evening meetings. One young engineer recounts being on holiday, cradling his one-week-old son at home, when the phone rang. This was Alan to ask if he could give a presentation to an institution evening meeting in three days' time. This was before the days of parental leave and PowerPoint! Naturally the answer was yes, it being typical of the opportunity that Alan gave his staff to challenge themselves to succeed.

Alan was appointed a Partner of Babtie, Shaw & Morton in 1979. In that role he took on responsibility for the firm's work on Colliford reservoir in Cornwall and Roadford reservoir in Devon. Both were embankment dams with upstream asphaltic concrete membranes and bellmouth spillways. Colliford was formed from china clay residue from nearby mineral workings, the material being relatively incompressible and ideal as a base for the membrane below a filter layer. Roadford was constructed of a locally won low grade rockfill with a wedge of china clay residue behind the inspection gallery. Based on results from pre-construction trials Alan insisted on a method specification for the embankment construction to reduce the risk to the contractor.

Arguably the highest profile project in Alan's reservoir experience was on the design and reconstruction of the 34m high Carsington dam, following its failure in 1984. All parties involved were keen that the reconstruction contract would go smoothly and by gaining an early appreciation of what was important to each stakeholder the contract was delivered on budget and 12 months ahead of programme.

Over time Alan became more involved in the management of the firm and he played a major role as it moved from a partnership to incorporation as a limited company. He became the first chief executive of Babtie Group Ltd in 1993. He retired from this role in 1996 but continued as a senior consultant undertaking reservoir inspections and acting as Qualified Civil Engineer under the 1975 Act on many measures in the interests of safety, including major works to improve freeboard at the 43m high Ladybower dam, required due to long term settlement problems.

As well as being a very active member of BDS, and chairman from 1995 to 1997, Alan served on the ICE Reservoirs Committee, and the ICOLD Committee on Dam Safety. He and Anne were regular attenders at BDS Conferences, and ICOLD Annual Meetings and Congresses. Alan was one of the authors of the Guide to the Safety of Embankment Dams in the United Kingdom and helped to develop guidance to Panel Engineers to address concerns from the profession following publication of the Flood

Ladybower dam

Carsington dam

Alan & Anne Johnston

Estimation Handbook in 1999. This guidance was eventually incorporated into the 4th Edition of Floods and Reservoir Safety.

Those who worked closely with Alan knew that he was going to question every detail with tremendous discipline and self-control. There was huge respect for the practical engineering and commercial expertise he brought. His advice and comments on work done were always delivered in a measured and highly professional way. Former clients have described him as a true gentleman of whom they had the greatest respect.

Alan and Anne were devoted to their family. They had four children, Kirsty, Roderick, Fiona and Moira, 10 grandchildren and 10 great grandchildren. Alan was a family man, a talented engineer and businessman, and will be missed by all who knew him.

Alex Macdonald
September 2024

BDS Corporate Member pages

The Benefits of BDS Membership

THE BRITISH DAM SOCIETY would like to thank all of its Corporate Members for their continued support, which helps the society grow, and which contributes to the success of all events – ranging from the biennial conference to site visits.

The British Dam Society is the key UK organisation for exchange of information and networking regarding all engineering and safety matters concerning dams and reservoirs and is part of the International Commission on Large Dams (ICOLD), giving members access to a wide range of contacts and guidance.

The BDS membership includes many senior staff and managers in top consultancies, dam owner organisations, government agencies and major contractors, who are involved in dams and reservoirs both in the UK and overseas. While the BDS has many hundreds of individual members, it also has scores of corporate members, who support the society's activities in many ways, and in return are able to inform the general BDS membership of their capabilities and project examples.

The BDS has involvement in national and international technical committees and steering groups, influencing guidance and research projects, the progress and results of which are publicised by the BDS to all members. The BDS informs and supports their members on national and international issues and best practice in planning, development, maintenance and operation of dams and reservoirs.

The BDS organises a number of events each year which provide an opportunity for the exchange of experience and information while meeting other professionals, clients, competitors and suppliers. These events provide valuable opportunities for the continuing professional development (CPD) to our individual members and to the staff of our corporate members.

Conference

The BDS three-day conferences are held every two years at locations around the country, and include presentations, workshops, site visits, poster displays and corporate member exhibits, as well as the chance to network with other dam professionals. The 2024 conference had the highest attendance yet, with well over 300 delegates attending and 18 exhibition stands.

Supervising Engineers' Forum

An SE Forum is held on years alternating with conferences, and is aimed existing or aspiring Supervising Engineers. The one-day forum covers presentations and discussions on matters such as legislation, updates from the regulators and case studies in topics such as monitoring and surveillance.

Young Professionals' Forum

The YP Forum, launched in 2024, aims specifically at developing the next generation's knowledge of the industry and nurturing young talent, which is vital for the ongoing success of all our corporate members. This forum complements the BDS Young Professionals' mentoring scheme, where young engineers can accompany experienced and qualified reservoir panel engineers on inspections with a view to becoming qualified themselves.

Evening meetings

The BDS typically hosts six evening technical meetings in London each year, which are streamed live, with the BDS arranging hubs across the UK to allow for networking and viewing the meeting in the company of other professionals. Streaming also gives the opportunity to contribute to the discussion from anywhere in the world. As these London meetings are recorded there is also the opportunity to watch them at a later date.

Additional Benefits to Corporate Members

In addition to the benefits of individual membership, outlined above, Corporate Membership includes the following:

- Corporate members' names and addresses listed in each issue of the BDS peer-reviewed journal, *Dams and Reservoirs*
- Three named representatives, each of whom has all the privileges of individual members, including the *Dams and Reservoirs* journal and the Yearbook.
- Each corporate member may take a full page in the Society's Yearbook, to publicise a project, outline the company's capabilities and provide contact details.
- The company's logo and link to their website can be published on the BDS website.
- If the corporate member provides a PowerPoint slide to advertise the company, this will be shown before each of the society's evening talks.
- The corporate member's three named representatives will have voting rights at the society's AGM or Special Meetings and at all elections for new committee members.

How to become a Corporate Member

If you wish to discuss any matter relating to Corporate Membership, whether you are an existing Corporate Member or are considering becoming one, please contact our Corporate Membership Manager, Stephen Lockett at stephen.lockett@mottmac.com

The subscription fee for a Corporate Member of the British Dam Society for 2025 remains at £375 per year.

To apply for Corporate Membership, please download the form via the link below: BDS Corporate Membership Application Form and return completed forms to the BDS Secretary at bds@ice.org.uk

Beacons Reservoir, Wales

#1 TOP 500 ENR 2021–2023 DAMS & RESERVOIRS

AECOM

Glen Earrach Pumped Storage Hydropower (PSH)

Client
Glen Earrach Energy Ltd

Services
Front End Engineering Design

Region
Highlands, Scotland

View of Proposed Headpond Location

Tapping into the power of Loch Ness, AECOM is partnering with Glen Earrach Energy Ltd to design a pioneering pumped storage hydropower scheme that will generate enough clean energy to power one million homes. Combining cutting-edge engineering with over a century of water expertise, AECOM's design will support the UK's renewable future while protecting Scotland's natural resources.

Our dam's team is currently focusing on creating a new headpond, designed to store water pumped from Loch Ness and release it for power generation. Our role in the Front End Engineering Design (FEED) includes overcoming a range of technical challenges and ensuring long-term environmental stewardship.

AECOM's expertise and experience are key to the success of this project, with our services including:

- Geotechnical Site Investigation (invasive and non-invasive)
- Geological Mapping & 3D Modelling
- Dam Type and Location Selection
- Hydrology and Hydraulics
- Dam Break Inundation Mapping
- FEED of the Preferred Dam Type

At AECOM, we understand the constant challenge of managing, protecting, and conserving water to meet the needs of communities, agriculture, industry, and the environment. Recognised globally as a leader in dam and reservoir design, AECOM consistently ranks as the #1 Dams and Reservoirs firm by Engineering News-Record. With over a century of experience in dam and water engineering, we're proud to be part of a scheme that will shape the future of renewable energy in the UK.

Contact:
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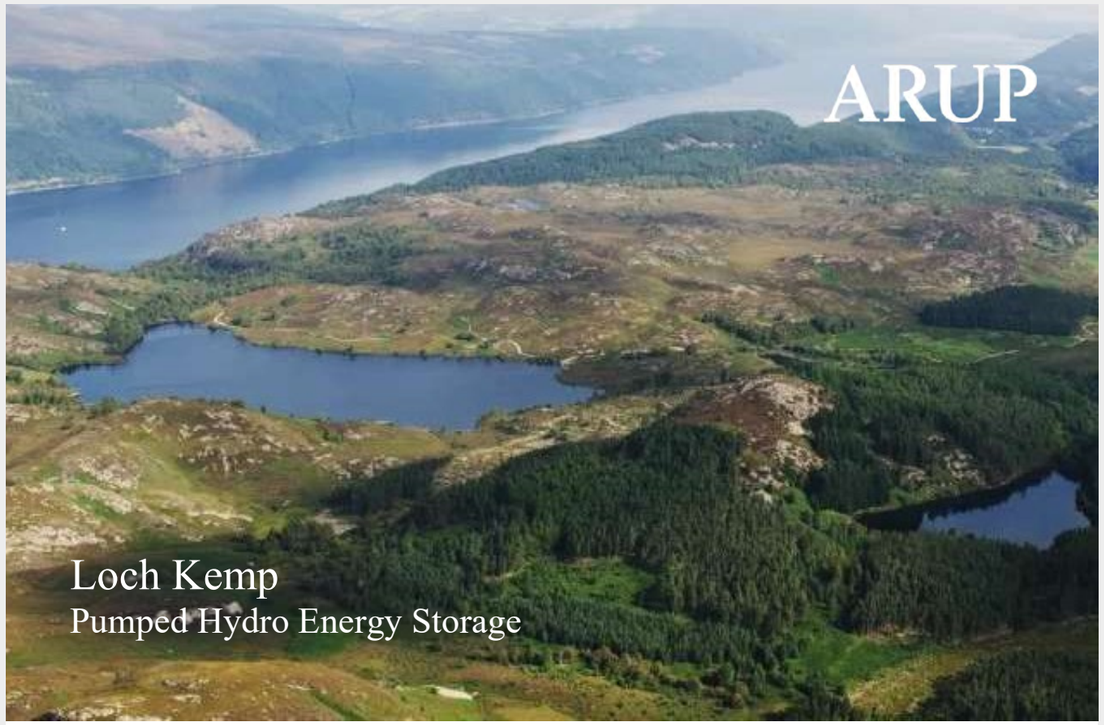
aecom.com/markets/water/dams-hydropower-levees/



Engineering a more sustainable world

Loch Kemp is a pumped storage power plant with a potential capacity of up to 600 MW. It comprises a large lower reservoir (Loch Ness) and an extension of an existing natural upper reservoir, Loch Kemp, with the reservoirs connected by tunnels.

The powerhouse shaft and building will be constructed on the banks of Loch Ness. The complex project entails the construction of eight new dams, utilising a mixture of embankment and Roller Compacted Concrete (RCC), aimed at augmenting the capacity of the upper reservoir to meet the energy production requirements of the scheme.

Our services

Arup and ILF have established a design joint venture to undertake the reference design role for Statera, the scheme developer. Our responsibility encompasses developing a robust Front-End Engineering Design (FEED) and reference design that aligns with the requirements of planning and Environmental Impact Assessment (EIA) assessments, serving as the foundation for a competitive tender process.

This complex multi-disciplinary project located in the Highlands of Scotland offers several unique engineering design challenges which draw on the experience and skills of the Arup team.

About Arup

Dedicated to sustainable development and formed in 1946, Arup is a collective of engineers, consultants and experts with a specialist water consultancy providing excellence in water and environmental engineering. Arup has expertise in investigation, feasibility, design, and construction supervision of new dams, as well as the design of remedial and improvement works to existing dams.

Arup is actively involved in the design of multiple pumped storage hydro projects in the UK ranging in scale from 200MW to 1500MW. We thrive on working with both developer and constructor clients to help bring innovative solutions to projects to accelerate them from the planning stage through to operation.

Find us on social media:

LinkedIn: linkedin.com/company/arup/
X: @Arup
Instagram: @arupgroup
Facebook: @ArupGroup

For further details contact:

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e: anthea.peters@arup.com
t: +44 141 332 8534
arup.com

AtkinsRéalis

Crummock Water

West Moor - Siphon replacement via direct pipe drilling

Sustainably delivering dams, reservoirs and hydropower

As part of our wide-ranging dams and reservoirs workload, AtkinsRéalis is partnering with the Environment Agency to deliver safety improvements at a number of dams in the South West. Led by AtkinsRéalis from feasibility through to detailed design and construction support, the programme improves reservoir safety whilst maintaining environmental sustainability and managing a broad range of stakeholder interests.

Works at West Moor Reservoir form part of an extensive programme at four reservoirs in an environmentally sensitive area. Key improvements designed by AtkinsRéalis at West Moor Reservoir include:

- Replacing an aged siphon under the River Isle essential to the operation of the reservoir. Health & Safety risks of improving the existing structure have been removed by installing two new 220m steel pipe culverts using the direct pipe method.
- A replacement twin penstock outfall to support emergency draw down. The design also gives operational cost and carbon savings by reducing use of an existing pumping station and improves operational safety.
- Raising perimeter banks to consistent levels and creating two new spillways to manage water overflow effectively.
- Constructing a new embankment to bypass deteriorating sections of the existing perimeter banks.

AtkinsRéalis is leading the detailed design for the removal of three impoundments at Crummock Water, Over Water, and Chapelhouse Reservoir for United Utilities, to support a planning application. This project aims to re-naturalize the lakes and restore the river environments. The environmentally driven scheme balances natural recovery with safe decommissioning, ensuring no increase in flood risk. AtkinsRéalis has engaged with local communities and stakeholders to minimise impacts and promote positive environmental benefits.

Crummock Water: Located in the Lake District National Park, the proposed works include removing a 1.4m high weir and wave wall, reconnecting the River Cocker, and restoring the channel and alluvial fan at Park Beck. Public rights of way will be reconfigured to support natural recovery while retaining access for visitors and residents.

Over Water and Chapelhouse Reservoir: Over Water's low-level weir and embankment will be removed, and Chapelhouse's dam will be replaced with a new highway bridge. The River Ellen will be realigned, restoring over a kilometer of river channel including reconnecting more than 3 hectares of floodplain and woodland planting.

Contact us to find out more about AtkinsRéalis and our capabilities:
+44 (0)7834 507403 | mike.hughes@atkinsrealis.com | www.atkinsrealis.com

BACHY SOLETANCHE

Aled Isaf Reservoir

Bachy Soletanche designed and delivered a geotechnical solution to stabilise the embankment dam of the Aled Isaf Reservoir in North Wales. Working on behalf of Lewis Civil Engineering, for client Dŵr Cymru Welsh Water, Bachy Soletanche proposed an alternative design during a phase of early contractor involvement. The new design consisted of two secant retaining walls, constructed using the sectional flight auger technique, which is ideally suited for restricted-access locations and avoids the use of heavy rigs.

Following this, the team delivered a combination of compaction grouting, to strengthen the clay in the dam's structure, and contact grouting, to seal any remaining flow paths. The project was completed on schedule, enabling the prompt reopening of the local access route running through the site.

Find out more about our solutions for the British Dam industry by contacting:

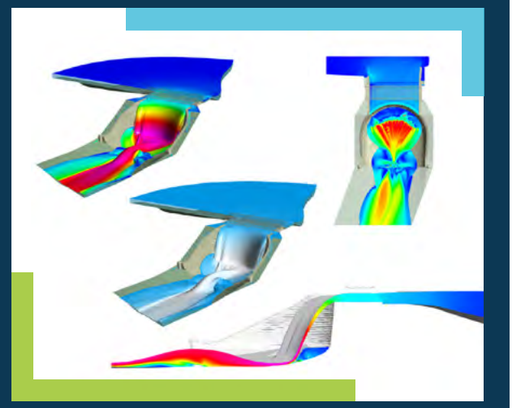
enquiries@bacsol.co.uk
01704 895686
bacsol.co.uk

Enhancing lives, communities and the environment

binnies
an RSK Group Company

CFD Modelling

Binnies UK Ltd was commissioned by Canal & River Trust to undertake Computational Fluid Dynamics (CFD) modelling of a reservoir spillway. This was carried out following the results from a Quantitative Risk Assessment carried out for the reservoir. The Risks Assessment for Reservoir Safety (RARS) output recommended that CFD modelling could refine the analysis and reduce uncertainty. The CFD modelling assessed the hydraulic performance of the spillway by testing peak flows for various return periods up to and exceeding the Probable Maximum Flood (PMF). Other outputs of the assessment included a rating curve for the overflow as well as water level, velocity, energy, and stagnation pressure analysis.



Reservoir Inspections in Hong Kong & Singapore

Binnies UK Ltd have been commissioned by clients in both Hong Kong and Singapore to undertake inspections of impounding and service reservoirs. These structures are key sources of potable water in the regions which lack access to significant sources of drinking water. UK-based engineers on the All Reservoir and Service Reservoir Panel of Engineers travelled to Hong Kong and Singapore for two to fours weeks at a time to complete the inspections. Upon completion of the inspections, the engineers produced comprehensive inspection reports equivalent to a Section 10 report in the UK.

Contacts

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Follow us on

Blackhall valvologists

renoV8™

Blackhall take major step in reducing both carbon emissions and costs for water companies

A new initiative launched this year by the Yorkshire based valve manufacturers was able to demonstrate its combined advantages to the water industry in the spring of 2024 with the renovation of fixed cone valves at Kielder reservoir, Northumberland. Blackhall Engineering Ltd have a long history in the manufacture and service of valves for the water industry, but its most recent trademarked initiative, RenoV8® aims to make serious efforts to enable water companies to significantly reduce costs whilst meeting carbon reduction targets.

No better example was demonstrated in February of this year when Blackhall were commissioned by Northumbrian Water to repair and upgrade their fixed cone valves at Kielder reservoir. The 36" Glenfield valves, originally manufactured in the 1970's were factory refurbished and upgraded in just 6 weeks. The rapid turnaround was vital to ensure Kielder, the largest man-made lake in Europe could still meet its regulative requirements; something that looked impossible after the valve was initially condemned by the OEM.

In a study carried out by Blackhall Intern Leo Foulds in April and using the Kielder Reservoir as its main focus, the merits of refurbishing in the UK over importation of new valves was compared. Utilising the research skills gained from Edinburgh University Foulds's conclusion demonstrated that a new imported fixed cone valve would have a carbon output ranging from 9733 KgCO2e to 5694 KgCO2e whilst the refurbished valve would have a carbon output ranging from 1376KgCO2e to a mere 621KgCO2e; in short averaging eight times more carbon emissions to replace rather than refurbish. Further to that, with Blackhall's commitment to engaging predominantly local suppliers and materials, the transport carbon is reduced by 4 times when compared with replacement valves.

With Blackhall's mission that a philosophy of re-use should be at the forefront of the water industry, RenoV8's ethos aligns synergistically with the Code of Conduct for professional engineers by respecting cultural, historical and archaeological heritage, in addition to protecting the "health and well-being of present and future generations and to show due regard for the environment and for the sustainable management of natural resources". (Institute of Civil Engineers Code of Conduct).

Project Details:

Customer: Northumbrian Water

Project: Kielder Reservoir

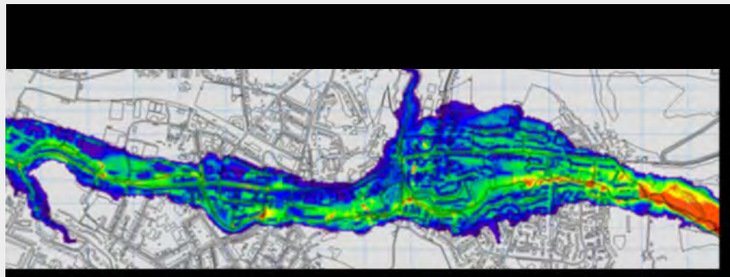
Product: Glenfield Fixed Cone Valve

36" Dia Manufactured 1977

Refurbished and re installed: February 2024

Lead Time: 6 weeks

For any further information please contact Dean Wheatley at Blackhall Engineering Ltd Tel: 01484 713717



Reservoir Flood Studies
CFD Assessments for Large Structures
Flood and Yield Assessments
Fluvial / Pluvial Assessments
Tailings Dam Inundation Assessments
Flood Risk Assessments
Compensation Flood Storage
Coastal Surge Modelling

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CC Hydrodynamics is a specialist numerical modelling house focussed on wet infrastructure and flooding. We predominantly help other businesses with their numerical modelling needs by using our in-house automation and computational cluster to undertake assessments such as dam failure inundation assessments, flood risk assessments, hydraulic modelling including CFD, geospatial analysis, hydrological studies, and big data manipulation and interrogation. We work both within the UK and globally. CCH also provides Supervising Engineer services.

CC Informatics focusses on insights from drone surveys, remote vehicle inspections, and uses machine vision/artificial intelligence to aid with post processing. CCI has specialist in house tools which can be used for defect identification and tracking for large structures. The current focus of CCI is masonry and concrete structures (including dams, spillways, tunnels, viaducts, etc.) since these are difficult to survey without roped access and scaffolding. We use unmanned aerial and ground vehicles, including bespoke solutions, to collect data; which can reduce reliance on roped access or confined space entries.

Shaft inspection vehicle

Tunnel inspection vehicle

Feature identification using AssetScan on a flattened image of brick-lined tunnel

Feature identification using AssetScan on a concrete external wall

Physical Hydraulic Model Services CRM

On a project for a major UK Reservoir owner, CRM worked alongside the design team to develop and optimise the design solution for a new spillway which was to be built on an alternative routing to replace a Victorian era spillway with inadequate capacity.

The proposed weir was two stage with a lower broad crested straight weir and a labyrinth weir set slightly higher to provide additional capacity in larger events. The purpose of the two-stage weir design was to try to replicate or provide some betterment on flood outflow up to 1:500 years, before the labyrinth became operational to pass the higher flows at a lower water depth, keeping it below clay core level.

The project was quite challenging with a very flat upper section, the need to reduce the spillway width significantly for the long straight section, and then discharge into a very steep section at almost 1:2 gradient at the bottom of the chute. At the end of this steep section, the spillway had to turn almost 90 degrees into a tight and poorly accessible watercourse, this was achieved using a lidded bend with a lidded discharge.

By trialling various shapes of channel physically, CRM were able to produce an upper chute solution, which worked with fixed bay lengths to make construction simpler, whilst optimising overall flow performance and water depths.

web: www.crmrainwater.co.uk email: info@crmrainwater.co.uk

DUGLAS ALLIANCE — CREATING VALUES THROUGH GLOBAL PROJECTS

DUGLAS ALLIANCE LTD. specializes in the development and execution of projects in the field of industrial construction and construction of hydropower facilities. Main services offered by the company:

- ✓ project management,
- ✓ engineering services,
- ✓ industrial construction,
- ✓ trading.

SENDJE HPP PROJECT (under construction)

Country: Equatorial Guinea (30 km south of the capital of the continental region of the city of Bata and 20 km east of the town of Mbini on the Wele River)

Client: Government of Equatorial Guinea

General Contractor: Duglas Alliance Ltd.

Particularities: Upon completion of the construction, the Sendje HPP will be the largest among all the generating facilities of Equatorial Guinea with the highest dam in the country (63.0 m)

Main characteristics of the project:

Installed capacity - 200 MW.

4 hydro units with a unit capacity of 50 MW.

Power output voltage - 220 kV.

Average annual production is 1 402 million kWh.

Estimated head - 67.5 m.

Reservoir:

- Surface area of the reservoir - 21.57 km^2.
- Normal water level of the reservoir - 88.0 m.
- Useful volume of the reservoir - 60.2 million m^3

tel.: + 44 203 608 18 46 **e-mail: office@duglasalliance.com** **www.duglasalliance.com**

Dŵr Cymru Welsh Water has a portfolio of 142 reservoirs, which includes 81 impounding reservoirs, 15 non-impounding reservoirs and 46 service reservoirs under the Reservoirs Act 1975. Below are details of two discontinuance projects which have been recently completed in North Wales.

Cilcain 1&2 Discontinuance

Cilcain 1&2 reservoirs were located approximately 7km to the west of Mold in Flintshire, having been constructed towards the end of the 19th Century as water supply reservoirs. The reservoirs had not been used as a water resource for several decades and presented an ongoing flood risk liability from dam failure. Both dams had a number of long-standing issues, which would have required significant capital investment to bring them up to UK dam safety standards, including a spillway upgrade and significant upgrades to the pipework and valves. A 2019 feasibility study identified discontinuance as the most cost-effective long-term solution for the site.

The project included the complete removal of Cilcain No. 1 dam and the partial removal of Cilcain No. 2 dam, with the fill material retained on site and relocated within the naturalised reservoir basins.

Llyn Bran Discontinuance

Llyn Bran, located in Denbighshire, was a natural lake that was raised in 1899 by a concrete dam. The reservoir was used to supply water to the North Wales Hospital in Denbigh but hadn't been used for supply since the hospital closed in 1995. As part of a separate discontinuance scheme at Llyn Anafon, Llyn Bran was identified as a 'compensatory site' for the loss of habitat at Anafon. Although the primary reason for discontinuing Llyn Bran was for compensation, it had the added benefit of removing a dam which was no longer needed for operational purposes.

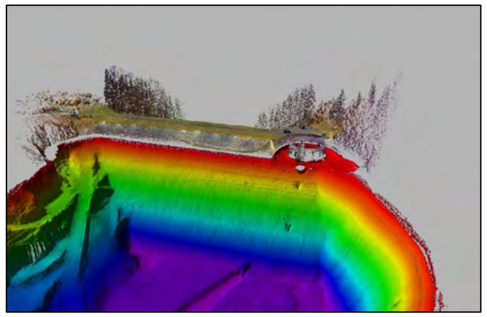
One element of turning Bran into a compensation site was the removal of the dam, as well as other ecological enhancements. Long term ecological monitoring of the lake is required to ensure the compensatory criteria are met. A condition of the water vole licence is that activity is monitored until 2034. Through careful management and monitoring of the site, it is hoped that Llyn Bran will become recognised as a Special Area of Conservation.

Dŵr Cymru Welsh Water

Stephen Shakespeare
Head of Dam Safety
Stephen.Shakespeare@dwrcymru.com

Edwards Diving Services (EDS) successfully completed an underwater syphon installation as part of a pioneering project at Whiteadder Reservoir in Scotland. The project took place in East Lothian, with EDS working as the diving sub-contractor for Emtec Energy, on behalf of Scottish Water.

This installation sought to utilise compensation water released from the reservoir to generate electricity. The new turbine is expected to generate 0.82GWh of renewable energy each year by utilising the water released for compensation to the existing waterway, without impacting the reservoir's capacity to meet its customer needs. This project is particularly noteworthy as being the first in Europe to use a syphon-fed turbine system which draws water from the reservoir, passes it through a 199 kW hydro turbine, and releases it downstream to ensure a continuous flow whilst maximising energy production.



To address the challenges of working underwater, EDS deployed the latest underwater survey methods, including multibeam sonar, to create a detailed 3D model of the underwater environment. This model guided the design of underwater components and helped with planning for the ground preparation, removing risk from the project. The installation required precise grading along the syphon area, installing approximately 30 tonnes of material, levelled by the divers to a vertical tolerance of 20mm. Spending time getting the ground preparation right ensured the successful installation of 24 four-tonne concrete bi-flex mattresses and 26m of flanged 800mm diameter ductile iron pipework, supported on pre-cast concrete blocks. Each pipe flange was bolted together and torqued by divers to ensure they met the installation requirements. The dive team also installed the bespoke syphon inlet, complete with an air diffuser system to reduce operational maintenance costs of the system by preventing silt and vegetation build up.

In line with strict environmental controls for drinking water, EDS faced challenges in minimising fuel use. The team utilised a single HVO fuelled 20 kVa generator to power all equipment on the diving barge, alongside a 5-tonne, three-phase lifting gantry system and an electrically driven hydraulic powerpack for underwater tools. These innovations ensured a cleaner, more environmentally-friendly operation for the duration of the work.

The renewable electricity generated from the Whiteadder hydroelectric turbine will offset the energy consumption of the Hungry Snout pumping station. The largest station in the region, this energy offset is projected to provide a saving of approximately 111 tonnes of carbon each year.

EDS is proud to have contributed to a project with such a positive environmental impact and we look forward to participating in more hydroelectric projects in the future, demonstrating the potential for sustainable practices in water and energy management.

For information about other projects we are working on, take a look at our website and follow us on LinkedIn.

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Geotechnical Observations
Trusted Monitoring Solutions

Geotechnical Observations Ltd is a leading provider in geotechnical and structural monitoring, data visualisation, and data analysis. We have extensive experience in monitoring ground water levels and pore water pressures (both positive and negative), ground movements (for slopes, embankments, cuttings, and deep excavations), structural movements (including buildings, tunnels, retaining and diaphragm walls, bridges, piers, …).

Our mission is to provide the right monitoring solution and to install it to the highest standard to allow our clients to make informed decisions and deliver safe, efficient and economic projects.

Our services include advice on what instrument is best for each specific application, procuring the right instruments, installing the instruments properly, reading the instruments correctly (manually and automatically), reporting the results and helping the client to understand the measurements.

The top three risks to quality in projects where geotechnical and structural instrumentation is of high importance are:

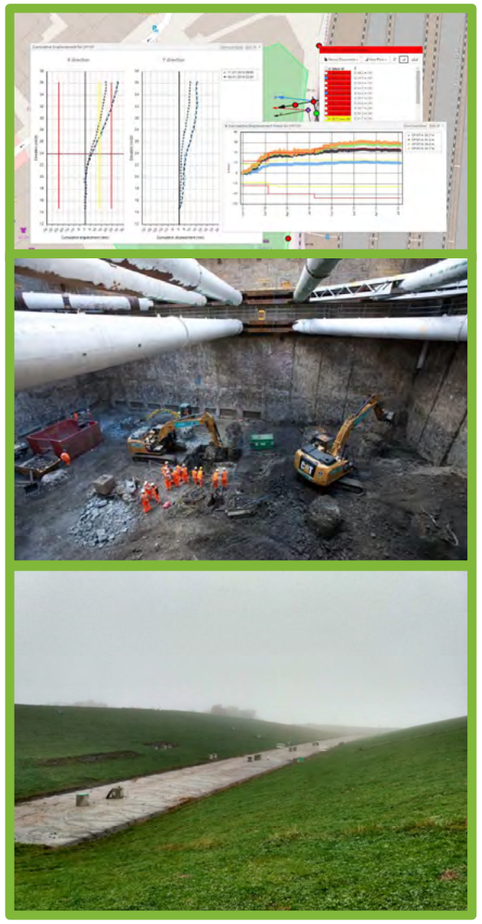
Using the wrong instrument in the wrong place,

Installing and/or reading the instrument badly regardless of whether it is the right instrument and in the right place, and

Not being able to understand if the monitoring data makes sense in the context of the problem being investigated.

Geotechnical Observations mitigates all of these risks by firstly employing geotechnical engineers with knowledge of instrumentation, so we are able to advise our clients on what instruments will work well in the context of the engineering problem being investigated, thereby ensuring that the instrumentation is defined properly. We are also able to advise our clients about the results that are obtained from the instrumentation and interpret them in the context of the engineering problem. Probably the biggest risk though is not installing the instrument properly and we mitigate this by making sure all of our field technicians are given time to prepare properly for a project and all installations are supported by an appropriate inspection and test plan with clearly identified check points.

In the last 25 years Geotechnical Observations has been involved in some of the largest and most challenging projects in the UK: Heathrow Terminal 5, Heathrow Terminal 2B, Crossrail, Northern Line Extension, Hinkley Point C, HS2, Claridge's Hotel Extension, Elan Valley Aqueduct, York Potash mine, the Curdworth sludge lagoons, the Frankley Reservoir and the King George VI Reservoir.



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Dams & Reservoirs Specialists

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Delivering Project Solutions

Our aim is to provide customers with a single-source solution covering the critical stages of the complete project, from design, consultancy through to installation and commissioning, and to trust us to deliver them safely, on time and to the highest standards.

New Valve Supply

Llyn Celyn Reservoir

Supply & Commissioning of Four DN1100 Series 54 Gate Valves at Llyn Celyn Reservoir

Glenfield Invicta successfully installed four DN1100 Series 54 Reservoir Specification Gate Valves at the Llyn Celyn reservoir. The project involved the use of custom-engineered spool pipes, hydraulic actuation, and a remotely located hydraulic power unit, operated from an SR4 security kiosk approximately 100 meters away from the gate valves.

Refurbishment & Servicing

Munnoch Reservoir

Refurbishment of 24” Gate Valves Manufactured Around 1900


Original Valve


During Refurbishment


After Refurbishment

Two 24” gate valves, manufactured around 1900, were subjected to a detailed condition assessment. Based on the recommendations of the condition assessment report, Scottish Water decided to refurbish the two valves such that they could be returned to service. This significantly cut down on the carbon emissions involved with production of a new valve.

GREG MORRIS
BUSINESS DEVELOPMENT MANAGER
DAMS, RESERVOIRS & HYDROPOWER

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Scan to read other case studies featuring the project solutions we’ve helped customers with.

EXPECT... SOLUTIONS NOT ONLY PRODUCTS

HESSELBERG HYDRO

Contact: Roger Smith Tel: +44 (0) 203 488 7723 or +44 (0) 7831 378649
E: rsmith@hesselberg-hydro.com WEB: www.hesselberg-hydro.com

Hesselberg Hydro specialises in the use of asphalt in hydraulic engineering for erosion & scour protection. The company supplies & installs reinforced geomats for river training, Open Stone Asphalt for flood protection structures, estuarine revetments & dams, and grouted rock for the most exposed coastlines. Our services also include feasibility studies, inspections, design, and maintenance of asphaltic structures for dams, rivers, coastlines & ports.

Waskerley Upstream Face Rock Works, 2024

We have been strengthening upstream faces and spillways using Open Stone Asphalt (OSA) on UK reservoirs since 1991 and have worked with most of the UK’s major water companies to provide solutions to strengthen deteriorating upstream faces. In our recent works at Waskerley we replaced ageing pitching with new Rip-Rap.

In 2023 & 2024 the company has focussed on a large coastal defence project on Canvey Island in Essex but expects dam work to increase in 2025.

Jacobs Challenging today. Reinventing tomorrow.

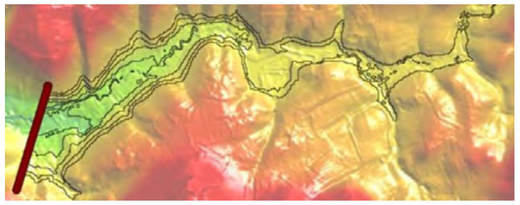
PROJECT SHOWCASE

As delivery partner on two of the Environment Agency's regional delivery hubs for the Northwest and the Thames & Anglian regions, Jacobs are providing engineering, environmental and planning services to develop several new flood detention reservoirs, from assessing feasibility at Strategic Outlie Case (SOC) stage through to detailed design and construction supervision, with some examples given below.

Assessing feasibility of potential new flood detention reservoirs

This year Jacobs have carried out studies to assess whether upstream flood storage could offer a viable means of managing flood risk within various catchments including Rochdale, Kendal, Carlisle, Birmingham, Warrington and the Thames Valley. These studies include ,including hydraulic modelling, development of concept designs, economic and environmental appraisal.

For example, to identify and screen potential reservoir sites on the Thames Valley Flood Scheme in a transparent and objective way, Jacobs have developed new GIS methodology to analyse and compare large amounts of spatial data and have developed a calculation tool to provide a consistent approach to sizing and costing conceptual dam designs. 19 sites are being evaluated, balancing storage capacity requirements with environmental and economic considerations. The approach could be replicated for other regions of the UK and even globally to help with identification of new reservoirs.



(Extract from GIS tool to identify and screen reservoir sites)

(Casting base slab of double baffle flow control structure at Shonks Mill Flood Detection reservoir)

Construction commences for two new Flood Detention Reservoirs

In 2024 construction commenced of two new flood detention reservoirs designed by Jacobs:

Gale Reservoir, on the outskirts of Littleborough in Greater Manchester. This 75Ml reservoir will be retained by a combination of earth embankments up to 5m high and a 300m length of sheet pile wall, with three flow control structures. The complex site is dissected by a mainline railway embankment and lies on a buried glacial outwash channel making ground conditions challenging. Construction of the main reinforced concrete control structure is progressing well, using a deep cofferdam with well points.

Shonks Mill Flood Detention Reservoir, on the River Rodding in Essex has also recently started construction. This 1400Ml reservoir will be retained by a 6m high earth embankment with an innovative 'double baffle' passive flow control structure. The sheet pile cut-off and foundation treatment below the structure have been recently completed and construction of the reinforced concrete is underway. Jacobs are providing design support and construction supervision.

RESERVOIR ENGINEERING AT JACOBS

Jacobs provides a full range of dam and reservoir engineering solutions covering the full life cycle of dams, from prefeasibility through to detailed design, inspections, studies and repurposing/ discontinuance. Globally, Jacobs' Dams Community of Practice includes 350 staff, with centres of excellence in the UK, Australia and USA, with decades of experience in delivering solutions to complex problems for a variety of clients.

Within the UK, we have specialist reservoir engineers across five offices. This includes three All Reservoir Panel Engineers and nine Supervising Panel Engineers under the Reservoirs Act 1975. Our team works alongside specialists covering all relevant disciplines, including hydrology, geotechnics, hydraulics, structural analysis and environment. Our projects range from statutory inspections and remedial works to design and construction of new dams. Reservoirs range from small amenity lakes and service reservoirs to the largest reservoirs in the UK.

Our purpose is to create a more connected, sustainable world.
Our values are:
We do things right.
We challenge the accepted.
We aim higher.
We live inclusion.

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www.jacobs.com

JBA Consulting is an employee-owned independent water and environmental engineering consultancy with 16 offices in the UK and international offices in Ireland, Romania, Singapore, Australia and the USA.

We specialise in all aspects of dam and reservoir safety including design, inspection, hydrological / hydraulic analysis, and emergency planning.

JBA consulting

Our dams and reservoirs team are currently providing services for water company, local authority and private clients in Australia, Romania, Ireland and the UK. A selection of recent projects is provided below:

Grytviken, South Georgia

We are currently designing a new hydropower scheme on this remote island in the South Atlantic. It forms part of a strategy to decarbonise the human footprint on the unique landscape. The strictest biosecurity standards need to be followed, and the challenging logistics has heavily influenced the design.

Grytviken, King Edward Cove, South Georgia

Derkmore Reservoir

Working under a design and build contract we provided design services for a new concrete dam and associated structures. The reservoir will provide drinking water to the surrounding community.

Derkmore Dam, Donegal

Reservoir Flow Forecasting

JBA operates a flood forecasting service for reservoirs and rivers. We couple calibrated models to high resolution weather forecasts from the Met Office. Upcoming events are predicted, and users alerted by email and SMS. Clients including the Canal and Rivers Trust and J N Bentley use the forecasts to support works on dams and river channels.

Emergency Reservoir repair

Following flood damage to an amenity reservoir dam in October 2023, JBA designed and supervised the repair works which were completed within 10 weeks.

Training Courses

JBA is a leading provider of on-line and in-person specialist training in dams and reservoirs. Our scheduled programme includes:

- Training for new Supervising Engineers
- Geotechnics for Reservoir Engineering
- Hydrology & Hydraulics for Reservoirs
- Reservoir Emergency Planning
- Reservoir Surveillance

We can also offer bespoke training to meet particular requirements.

JBA Consulting, No.1 Broughton Park, Old Lane North, Skipton, BD23 UK
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Bentley

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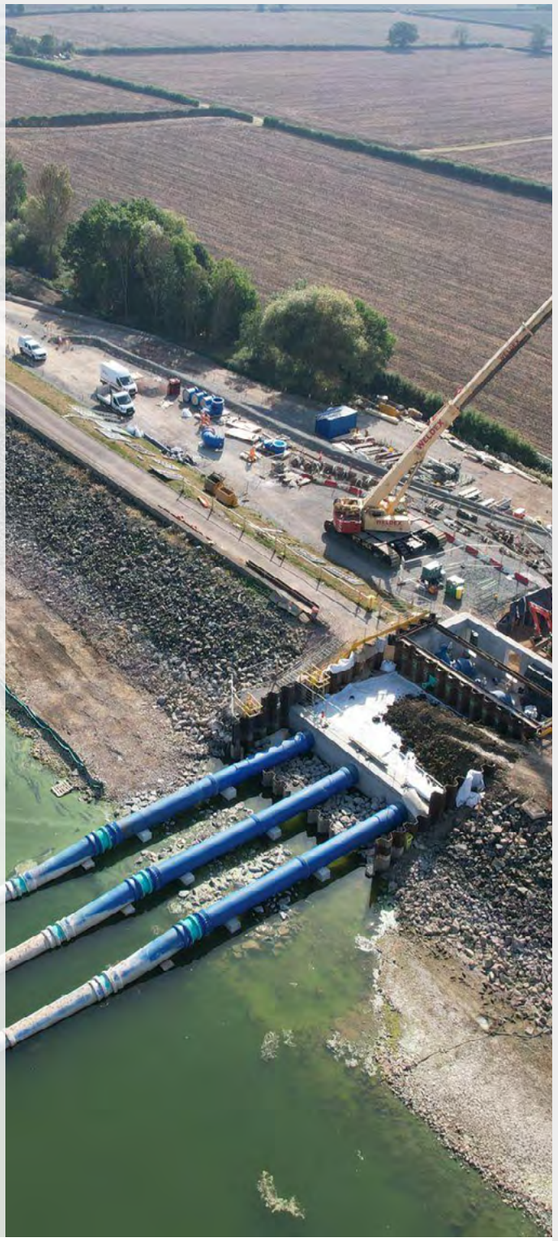
Drawdown Enhancement at Draycote Reservoir



For the Draycote project, JN Bentley was the principal contractor and Mott MacDonald the designer. The design and construction were delivered over a 3-year period.

Draycote Reservoir is predominantly a non-impounding reservoir impounded by six earth embankment dams ranging in height from 4.6m to 19.7m, and in length from 210m to 940m. The reservoir dates from the late 1960s and currently impounds 22.7Mm^3. All embankments have rolled clay cores, and stability berms on the upstream and downstream shoulders.

The existing drawdown system includes an 18"diameter scour pipe discharging through the main dam and a 1.6m diameter high-level draw-off through natural ground between two embankments with a combined capacity of 6m^3/s. This equates to an installed drawdown rate of 0.13m/day, clearly deficient compared to the rate recommended by the Environment Agency's *Guide to drawdown capacity for reservoir safety and emergency planning*.

Following a 2019 statutory inspection, a number of measures in the interests of safety (MIOS) were recommended including one to investigate the drawdown capacity and if need be, enhance the capacity. The MIOS recommendation was addressed by:

- 3 No. 1200mm diameter vacuum-primed siphon system over and through an embankment with all valves and instrumentation operated and monitored via a control panel in the crest chamber;
- An upgrade of the existing high level draw-off system to enable it to be 'wet' tested and enhance its capacity.

The enhanced drawdown system was designed to empty the upper 5m reservoir depth in approximately 5 days, with the discharge capacity increasing to 30m^3/s.

The construction works caused negligible impact to the client's water resource requirements for public water supply during construction, with the works able to be completed with no significant artificial reservoir drawdown required.

The MIOS was certified prior to the statutory deadline in October 2023.

JN Bentley is a civil engineering, building and MEICA contractor specialising in the safe and efficient delivery of sustainable solutions.

Flexible in our approach, we offer design and build or build-only services and support clients at all stages of project delivery, from concept to completion – whilst remaining agile and tailoring our approach to provide the support you need.

As part of the Mott MacDonald Group and delivering many projects, like Draycote reservoir, through our fully-integrated design and build company Mott MacDonald Bentley (MMB), we have seamless access to the pooled technical capabilities and resources of a global consultant, with a local presence – enabling us to bring the latest expertise and innovation to solve your challenges.

We work across the majority of England and Wales and have dedicated reservoir safety delivery teams based regionally throughout our operational area. With more than 100 projects completed to date our teams are experienced in delivering: spillways, dam stabilisation, wave walls, scour pipework, valve repairs and replacement, tunnel refurbishment and in-filling, de-silting, scour protection, discontinuance, siphon installation, drawdown improvements and much more. Our clients include many of the national water companies and other key reservoir owners.

Learn more:

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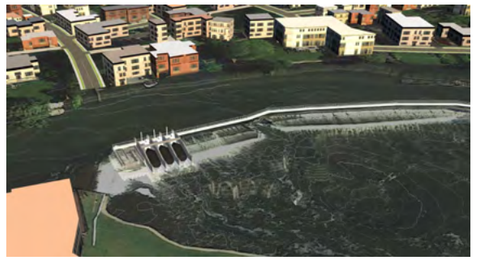
Multiconsult

Marlow Weir Hydropower Project

Multiconsult was engaged to undertake the technical (engineering) assessment and the development of outline designs, construction planning, cost estimates, preparation of an engineering summary report, and to manage the overall project, including coordinating the inputs from other suppliers.

The feasibility assessment included the technical (engineering) assessment of the site and the development of outline designs, construction planning and cost estimates; a weir pool habitat survey and impact assessment; financial modelling and identification of potential customers; and a preliminary community and stakeholder consultation.



Engineering assessment of the site and development of outline project designs, included:

- Obtaining, processing, and assessing topographic and bathymetric data, geological/geotechnical and hydrological data.
- Assessment of flow available for generation, accounting for operational site restrictions and requirements.
- Site selection, development of outline layouts, turbine technology selection, assessment of generation. potential (including sensitivity assessment), and grid connection assessment.
- Assessment of flood risk and fish passage requirements and appropriate mitigation measures.
- Preliminary construction logistics assessment and scheduling.
- Preparation of 2D outline construction drawings in AutoCAD and 3D modelling in Revit and Infraworks.
- Construction cost estimation and preliminary risk assessment.
- Identification of further investigations and studies for the next stage of project development.
- Reporting on feasibility assessment.

Loch na Cathrach Pumped Storage Project

Multiconsult has entered into two new international contracts for pumped storage projects. The contracts include feasibility studies and other preliminary work for one plant in Scotland and one in Albania.

In Scotland, Statkraft and Multiconsult UK Ltd have signed an agreement for feasibility study and tender documents for a pumped storage power plant at Loch Ness. The project will have an installed capacity of circa 500 MW and is located 14 km southwest of Inverness, Scotland. The plant will utilise water from Loch Ness to store surplus energy and release it when needed, thus enhancing the UK's energy security. The project includes an underground power plant with associated tunnels, a dam, and an upper reservoir with a capacity of over 5 million cubic metres, while Loch Ness will be used as the lower reservoir.

In Albania, a consortium of Multiconsult Norge AS and Tractebel Engineering SA has signed a contract with Statkraft for a feasibility study for a pumped storage plant, including an environmental and social impact assessment. The project involves the Moglicë Pump Storage Extension Project, located on the Devoll River in Albania, and includes an underground power plant with associated tunnels, a dam, and an upper reservoir, while the existing Moglicë reservoir will be used as the lower reservoir. The planned installed capacity is up to 1620 MW, with an estimated energy storage capacity of around 28 GWh.

Contact: Email: hydro-uk@multiconsultgroup.com | Tel: 01233 754485 | Website: www.multiconsultgroup.com

Natural Cement

Knypersley Spillway

Project – Knypersley Reservoir Spillway Repairs
Product – NATCEM® AC
Main Contractor – Kier
Client – Canal & River Trust
Designer – Arcadis

Overview

NATCEM® AC was successfully applied in a series of critical repairs at Knypersley Reservoir's spillway, addressing key safety concerns identified in the latest Section 10 Matters in the Interests of Safety (MIOS) report.

Goals and Objectives

Enhance Structural Integrity

Restore the spillway's stability by repointing missing mortar, filling cracks, and replacing damaged masonry blocks to prevent further deterioration.

Ensure Compliance with Safety Standards

Implement design recommendations from the Section 10 MIOS report to address safety concerns related to the draw-off culvert, spillway, and dam toe drainage.

Utilize Durable, Flexible Materials

Employ NATCEM® AC for its flexibility and suitability in thin applications, ensuring a resilient repair that withstands the reservoir's demanding environment.

The project focused on essential maintenance of the reservoir's spillway and draw-off culvert. As part of these works, the Canal & River Trust engaged Arcadis to develop a design plan that would meet MIOS recommendations and address structural issues, including missing mortar and damaged blocks.

The spillway, primarily constructed from masonry, required careful repointing and crack filling to restore its integrity. Initial inspections had identified areas of missing mortar, cracks, and masonry damage, especially where durability was essential to prevent further structural degradation.

Following cleaning and preparation of the affected areas, NATCEM® AC was selected for use. Its flexibility and performance in thin applications made it the ideal choice for repairing narrow gaps and small voids in the spillway structure. This flexibility was critical in ensuring the mortar adhered well and provided a long-lasting repair, even in the structure's most challenging areas.

Natural Cement

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Barnsley, South Yorkshire
S75 6FW

Gwaith diogelwch yng nghronfa ddŵr Llyn Llywelyn rhwng mis Mawrth a mis Awst 2023
Safety works at Llyn Llywelyn reservoir between March and August 2023

Cyfoeth Naturiol Cymru
Natural Resources Wales

Fel yr awdurdod gorfodi yng Nghymru ar gyfer Deddf Cronfeydd Dŵr 1975, rydym yn rheoleiddio tua 400 o gyforgronfeydd dŵr mawr gyda chapasiti o 10,000 metr ciwbig neu fwy.

Ein nod yw sicrhau bod perchnogion a gweithredwyr cronfeydd dŵr yn dilyn y gyfraith a, thrwy hynny, roi tawelwch meddwl i'r cyhoedd. Rydym hefyd yn rheoli ystod amrywiol o gronfeydd dŵr sy'n darparu buddion o ran rheoli perygl llifogydd a chadwraeth. Rydym bob amser yn hyrwyddo defnyddio adnoddau naturiol yn gynaliadwy er mwyn helpu i wneud Cymru'n lle gwell i fyw.

Ac os ydych chi'n chwilio am le braf i fynd am dro - wel, gallwn ni helpu gyda hynny hefyd! Rydym yn rheoli nifer o gronfeydd dŵr sy'n agored i'r cyhoedd - er mwyn i bawb allu mwynhau'r golygfeydd hardd.

Cysylltwch â ni:

0300 065 3000
cronfeydddŵr@cyfoethnaturiol.cymru
cyfoethnaturiol.cymru/diogelwchcronfeydddŵr

Byd natur a phobl yn ffynnu gyda'n gilydd

As the enforcement authority for the Reservoirs Act 1975 in Wales, we regulate around 400 large raised reservoirs with a capacity of 10,000 cubic metres or more.

We aim to ensure reservoir owners and operators follow the law and give the public peace of mind. We also manage a diverse range of reservoirs that provide flood risk management and conservation benefits. We always promote the sustainable use of natural resources to help make Wales a better place to live.

And if you're looking for a nice spot to go for a walk, we've got you covered! We manage several reservoirs that are open to the public, so you can enjoy the beautiful scenery as well.

Get in touch:

0300 065 3000
reservoirs@naturalresources.wales
naturalresources.wales/reservoirsafety

Nature and people thriving together

Whiteadder Drawdown Improvement & Hydro Project- Scottish Water

Cost	Designer	Contractor
£3M	EMTEC Energy & Dulas Ltd	Dulas ltd

Whiteadder Reservoir is an impounding reservoir located on the Whiteadder Water to the west of Cranshaws in the Lammermuir Hills. It is formed by an earth embankment with a central puddle clay core and a concrete cutoff. The reservoir was completed in 1969 and is used for water supply for East Lothian. The reservoir has a designed storage capacity of 7.955 million m3 and a surface area of 830,000m2 at top water level of 243.84 m AOD. The embankment has a very wide crest to provide for future raising. Water is Pumped via the 'Hungry Snout' pumping station to Castle Moffat WTW 100m vertical lift and a volume of 32 M/litres per day.

At the statutory inspection under the Reservoirs (Scotland) Act 2011 completed by an All-Reservoir Panel Engineer in 2021, several safety recommendations were made which included: - Consider options for improving the drawdown capacity and implement any such improvement option subject to judgement or determination that it is proportionate.

Working in conjunction with Sottish Water Horizons a proposal was developed to implement a Hydro Turbine Syphon to improve drawdown capacity to current requirements whilst optimising the impounded water volume.

The works were commissioned in September 2024. The addition of the new Syphon and turbine have met the drawdown requirements and the generator is sized at 199kW and will reduce our carbon emissions by circa 111 tons per annum and provide 30% of the power for Hungry Snout.

sse Renewables

Generating power from the Glens

Recent projects

At-a-glance:

- SSE roots firmly planted in hydro-electric
- Today SSE operates 76 Reservoirs impounded by 93 Dams
- Currently generates 1450MW of hydro capacity

Tummel Aqueduct

The Tummel Aqueduct is a 4.4km long aqueduct channel designed to divert 80m³/s from Dunalastair Reservoir to feed Tummel Bridge Power Station. Run-off from the catchment on the hillside above the aqueduct can be diverted into the aqueduct itself, or bypass it via 12 piped crossings passing below.

SSE Renewables has recently undertaken works to close out measures in the interests of safety to replace the crossings. The works, undertaken over an 18-month outage period, required the aqueduct to be empty. This was programmed to be undertaken at the same time as the recently completed refurbishment of Tummel Bridge Power Station. Significant works were required in the preceding 3 years to improve access along the length of the aqueduct and undertake investigations, requiring two additional outages.

Pitlochry and Clunie Dam Drum Gate Refurbishments

Clunie and Pitlochry dams are at the downstream end of a large hydro cascade, with the 1,650km² direct and 186km² indirect catchment areas draining to Pitlochry including 11 reservoirs, 15 dams, multiple diversion intakes, tunnels and aqueducts, and 8 power stations.

Clunie and Pitlochry dams are concrete gravity, although both have been strengthened with anchors to increase their structural stability. Provision to pass floods is provided by two 4.88m high drum gates at each dam. The drum gates are 18.3m and 27.4m wide at Clunie and Pitlochry respectively, with the larger gates at Pitlochry weighing 150 tonnes each.

SSE Renewables is currently 9 years into a 10-year programme to refurbish the drum gates at both dams. This includes the gate structure, hinges and seals, but also the strutting support mechanism, automatic float control, and back-up manual operating systems.

Find out more at: **sserenewables.com/hydro**

Stantec

Hydropower and Dams

At Stantec, we create sustainable and reliable water and power solutions that improve quality of life in communities around the world. We have over 160 years of hydropower and dams experience, delivering over 5,000 dams and reservoirs projects including storage schemes for water supply, flood alleviation, river regulation and more. In the UK, Stantec provides reservoir inspection and Qualified Civil Engineer services under the Reservoirs Act.

Grassholme Reservoir: Enhancing safety and building resilience

Built in County Durham in 1914 to supply raw water to Lartington Water Treatment works, Grassholme Reservoir sits in an area of outstanding natural beauty. When a statutory inspection found the northern embankment had become unstable, Northumbrian Water appointed Stantec to investigate and provide concept and detailed design services to reconstruct the embankment and reduce risk of further slips and failure. Part of the works included relocating 325m of an adjacent upland watercourse.

While successfully addressing the embankment instability risks, Stantec also looked to the area's biodiversity, taking care to protect an ancient semi-natural woodland by translocating circa 100 trees and planting 3,700 more. 35,000m³ of material were sourced from a nearby borrow pit to reinstate the new embankment with local soil instead of imported material, reducing the project's carbon footprint. Delivered under an extremely tight time frame and various ecological constraints, the completed works provided water supply resilience and improved biodiversity, while maintaining the sensitive landscape setting.

Find out more about our work, services, and opportunities to join the team at **Stantec.com/uk**

Matthew Hill
Senior technical director
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Stillwater Associates

2024 has seen significant change and growth for Stillwater Associates with the appointment of a number of new staff members to our technical team and a change in company ownership.

In terms of company ownership we were excited to announce in November 2024 that **Stillwater Associates Limited** is now an **Employee Ownership Trust** (EOT) business.

Stillwater Associates has grown steadily since its formation in 2008 to become a successful engineering consultancy specialising in dams and reservoirs. Establishing an EOT is the next step in our company's growth, and marks a significant milestone for us, with full ownership of the business being transferred from the company's founder (David Littlemore) to the EOT.

This change will give all our employees a greater sense of ownership and representation whilst ensuring the long-term sustainability of the company as a successful, independent business. It will also continue to strengthen our workplace culture of quality, technical expertise and teamwork, ultimately delivering an even greater service to our clients.

Some of our major projects in 2024 have included...

Sywell Reservoir

We are currently working with North Northamptonshire Council on a major reservoir safety upgrade at Sywell Reservoir. A recent drawdown study identified a significant shortfall in the emergency drawdown capacity at this reservoir. A drawdown feasibility assessment carried out by Stillwater Associates assisted with the selection of the preferred option which will consist of the installation of two large siphon pipelines through the upper part of the embankment. The project is now in the detailed design stage with construction due to commence in autumn 2025.

Melbourne Pool

The need for improvement works at this estate reservoir in the Midlands was identified following a Section 10 inspection. Recognising the many constraints at this estate, not least the potential for heritage and landscape impacts associated with any significant works, Stillwater Associates worked closely with the estate team to develop a sympathetic solution for increasing spillway capacity. A risk- informed approach was taken, reflecting a significant, although relatively low, downstream risk to life and property in the event of dam failure. Having assessed the risk of dam failure a range of options were considered. The most cost-effective and least impact option consisted of a wide plain grass auxiliary spillway through the bankside area adjacent the dam. The detailed design of the preferred option has been optimised with physical modelling and ground investigation, ready for construction in 2025.

Rheidol Hydropower Scheme

We are currently undertaking a series of detailed reservoir safety studies / investigations, in collaboration with ARQ and CCI, at several of the large concrete dams that form part of the Rheidol Hydropower Scheme built in Wales in the 1960's. These include a finite element analysis of a 50m high concrete buttress dam, a detailed condition assessment involving photogrammetric surveys and associated automated defect identification, and strength testing / leakage investigations associated with the effects of AAR.

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Securing reservoir safety: Spillway repair

United Utilities partnered with Stonbury to repair an impounding reservoir spillway after the existing gabion baskets supporting the structure had degraded.

The spillway, located at a reservoir in the north of England, was supported by gabion baskets which had perished at its lower end, undermining its structural integrity.

After completing an assessment, Stonbury and United Utilities Ground Engineering agreed that to improve the long-term safety of the spillway and increase its longevity, it was essential to replace the perished gabion baskets with a more durable reinforced concrete wall.

An ecology survey was conducted, and overgrown trees were removed in advance of the programme to eliminate the risk of delays during bird nesting season. To help reduce the programme's carbon emissions, an eco-welfare cabin was installed during site set-up, which runs solely on solar power.

Ramp and scaffolding access were installed in the upper and lower sections of the spillway and a temporary Portadam containing a central relief pipe was positioned to release flows from the spillway onto the other side of the works. Coir silt traps were placed in the lower section to catch debris and prevent it entering the watercourse.

The team dismantled the degraded gabion baskets and stockpiled the stone for reuse. The area in front of the spillway was then excavated and levelled in preparation for the casting of a concrete base. Steel reinforcements were affixed on the concrete faces and shuttering was installed before casting the new concrete wall and wingwalls.

After the concrete had cured, the shuttering was removed. New gabion baskets were installed flush with the new wall and the existing baskets to the side of the spillway. These were then filled with the previously saved stone.

The new solution has successfully restored the spillway's structural integrity and provided improved ongoing erosion protection.

Stonbury has delivered specialist, sustainable solutions within the water, wastewater and environment sectors for over 40 years. Holding framework agreements with the Environment Agency and almost every UK water company, Stonbury helps clients sustain the supply of clean drinking water and effectively manage wastewater while protecting and enhancing the environment.

Stonbury's innovative and high-value maintenance, refurbishment, and build programmes and nature-based solutions result in sustainable outcomes for both people and the planet.

Head Office - Chawston House, Chawston Lane, Chawston, Bedford, Bedfordshire, MK44 3BH t 01234 750924 www.stonbury.com

Company Profile

TerraDat specialises in non-invasive geophysical investigations of dams and spillways, identifying subsurface defects invisible to surface inspection. With three decades of experience, we provide engineers with crucial data to optimise intrusive investigation and remediation design. Our approach typically combines multiple geophysical techniques for comprehensive subsurface characterisation.

In response to increasing demands for real-time subsurface water flow monitoring, we developed SPiVolt - an innovative system utilising Self-Potential (SP) methodology to map seepages and leaks within embankments. This system offers continuous data access through an interactive portal featuring multiple visualisation options and automated processing capabilities. SPiVolt delivers rapid deployment, minimal environmental impact, and cost-effective monitoring solutions.

Oakenholt Seepage Investigation

At Oakenholt Reservoir, concerning subsidence of the wave wall indicated potential internal erosion issues. Initial Electrical Resistivity Tomography (ERT) surveys identified a zone of potential moisture ingress. A SPiVolt monitoring system was subsequently installed to track subsurface water movement. The system detected seepage initiating at 30.75m AOD reservoir level, expanding across the dam's left-hand side when levels reached 31.2m AOD. After extended periods at TWL, the area became saturated but showed no evidence of progressive deterioration. The system made approximately 29,000 measurements over 14 months, proving effective for monitoring internal seepage where traditional surveillance methods were limited. Key findings demonstrated that while seepage occurs through clay-deficient material in the upper embankment, the condition remains stable with no indication of progressive internal erosion. This case study validates SPiVolt as a practical, non-invasive monitoring solution.

Christian Bird, Technical Director
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www.terradat.co.uk www.spivolt.net

SPiVolt leak monitoring technology

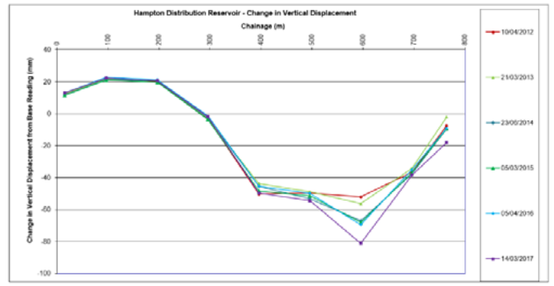
Every day, we serve 15 million customers across London and the Thames Valley, operating 59 statutory reservoirs, and 450 smaller service reservoirs and flood storage reservoirs.

Werner Delport – Interim Head of Reservoir Safety and Asset Condition
Email: Werner.Delport@thameswater.co.uk

Hampton Distribution Reservoir – Leakage Repair Project

Hampton Distribution reservoir is a non-impounding storage reservoir with a central puddle-clay core tied into the underlying London Clay. It's quite modest in capacity at 32,000m^3, but it supplies Hampton WTW with up to 300,000m^3 of water per day for treatment and onward supply to West London.

From annual crest surveying an increase in the long-term embankment settlement trend was noted by the Supervising Engineer in 2017. This was not visible to the naked eye on site, and there were no other signs of leakage or embankment movement. The Supervising Engineer consulted an ARPE who then requested that surveying and monitoring be increased to gather data on the effects of seasonal changes to the embankment.



By 2020 enough evidence had been gathered to suggest that the settlement was not related to any seasonal effects, so a Willowstick seepage investigation was undertaken which identified a possible leakage path at foundation level.

The ARPE was formally appointed into a QCE role, and Atkins-Realis were engaged to investigate further. Boreholes from the crest through the core were undertaken that showed an area of soft clay at the same level and position identified by Willowstick, and the QCE advised that work should be undertaken to reduce the risk of internal erosion. Atkins-Realis were engaged to design and supervise the works.

The reservoir site is classed as a SSSI which limited the period in which work could be carried out. This, along with a tight working space and difficult access resulted in permeation grouting using Tube-a-Manchette being identified as the most suitable solution.

Keller were engaged to carry out the works, and work commenced on-site in autumn of 2023 but had to be completed before the end of February 2024 to comply with the SSSI environmental restrictions. The crest was lowered by 400mm and a small drilling rig used (Klemm 702) to install 4 rows of 9m long TaM's at 1m centres (2 rows on either side of the core), extending for 30m centred on the leakage zone. In total 112 grout holes were drilled.

The grout injection sequence was agreed with the QCE and trial grouting undertaken to determine the most suitable grout mix. Cement bentonite grout was tried first as the most economic option, however the "grout-take" was considerably lower than the targeted volume. Ultimately a microfine cement grout was used which gave a higher volume at lower pressures indicating more effective soil permeation.

Target injection pressure was limited to soil overburden pressure, with TaM ports being grouted until the flow rate fell to less than 2 litres per minute or a grout take of 100 litres was reached.

Grouting was successfully completed in January 2024, confirmed by repeating the Willowstick leakage survey.

Project Reviews 2024

Reservoir Upgrades

Siphon Drawdown Project

A recent Section 10 Inspection under the Reservoirs Act led to a recommendation in the interest of safety to conduct a study identifying options to improve the drawdown system for the reservoir.

United Utilities carried out the options study looking at ways to increase the drawdown rate at the reservoir. This included options for increasing the existing scour; a new high-level outlet near the existing spillway; or a new siphon system. The report recommended the final option would be most feasible to implement.

A new twin DN600 pipe siphon system, designed to achieve a drawdown of not less than 1 metre per day and discharging into the cascade of the spillway channel, was installed to increase drawdown capabilities. When pairing the installation of the new siphons with existing scour facilities, the reservoir's drawdown capacity reaches 1.9m^3/s at Top Water Level.

The project to deliver the improved drawdown facilities is on site currently and due for completion in November 2024.

SupE Development

Training and Recruitment

United Utilities continues to be dedicated to the recruitment and development of prospective Reservoir Supervising Engineers. We invest time and provide development opportunities for members of our Catchment, Ground Engineering, and Reservoirs Teams and our experienced team of Reservoir Supervising Engineers offer a great support system for those completing their ICE training. With a current cohort of 4 trainee Supervising Engineers and a new Reservoir Safety Graduate set to join in 2025. United Utilities remains committed to the development and continuation of Dam and Reservoir Safety.

Reservoir Supervision

Utilising Drone Technology

As drone technology develops and becomes more accessible, United Utilities is exploring the ways in which we can use it to our advantage, e.g. reducing operational risk or accessing hard-to-reach areas. An increasingly popular technique is the use of Drones, paired with a high-resolution camera to aid in the visual examination of towers and tunnels.

Recently, United Utilities collaborated with Tetra Tech to undertake drone surveys of the chambers and tunnels at two of our reservoirs in the Burnley area of Lancashire. These were chosen specifically due to the tight space constraints that the Supervising Engineers faced when entering the tunnels. The use of the drone provided improved manoeuvrability allowing for controlled, detailed visual examination of the tunnel condition without the added risk of personnel entering the confined space.

2025 CPD and BDS Site Visits

Where possible United Utilities are supportive in offering opportunities to prospective SupEs of external employers (for example S12 and S10 attendance) and working with the BDS mentoring scheme. Please contact Ian.Scholefield@uuplc.co.uk for more information.

Vice Chair closing remarks

WE HOPE that you have enjoyed reading this year's Yearbook. It has been a very busy and successful year with a wide range of activities run by and for our membership. Our programme for 2025 is shaping up to be another fantastic year for knowledge sharing.

The 2024 conference received an unprecedented number of papers from the membership and we weren't able to fit all presentations into the programme. In order to share the learning with the membership, the themes of many of our technical evening meetings next year will come from those papers which couldn't be presented at the conference.

The Annual General Meeting will be held on 28th April and following this, new and renewed committee members will start their appointments. This coming year sees a change in Chair, Vice Chair and YP Committee with nominations for those roles to be submitted before Christmas. Nominations for the main committee will then follow early in the New Year. For those with an interest in supporting and influencing the work of the BDS, I encourage you to put yourself forward for a committee role.

The 28th ICOLD Congress and 93rd Annual Meeting will be held in Chengdu, China in May. We have had great attendance by UK representatives at recent ICOLD meetings and would like to see as many of our members as possible at the event. Presenting papers, contributing to workshops, and Technical Committee representation helps to raise the profile of the UK industry in the global arena. This in turn has many benefits to the industry with sharing of international knowledge. We will again be encouraging our YPs to travel to the meeting with the BDS Bursary scheme. Details of that will be available in the New Year.

On 18th September 2025, our biennial Supervising Engineers Forum will be held at the National Conference Centre near Birmingham. This event allows presentations and discussion around the topics of most interest to current and aspiring Supervising Engineers as well as others in the industry such as reservoir owners.

The 2025 Young Professionals Paper competition has been launched. This competition is run every two years and allows our Young Professional members the opportunity to write papers on their experience in the reservoir industry. The shortlisted finalists are invited to present at our November evening meeting and we aim to publish all submitted papers in the Dams and Reservoirs Journal. There are also cash prizes for the top three papers. I encourage our YP members to start thinking of topics and to submit their papers next year.

The biennial Inspecting Engineers Forum will be held on 17th November 2025 at the ICE Building in London. This event brings together those from the Service Reservoirs, Non-Impounding Reservoirs and All Reservoirs Panels to share knowledge and lessons of relevance to those who undertake periodic inspections of our reservoirs.

As 2024 draws to a close we would like to thank all of our members for their support. We look forward to seeing you at our 2025 events.

Dr Darren Shaw
BDS Vice Chair

Cruachan Reservoir, Scotland – Chukwuermeka Agbo

2024 BDS Photography Competition

Phoebe Erskine
Glenhove No 1 Service Reservoir, Cumbernauld, Scotland

1st

Nick Prytherch
Blackbrook Reservoir, Leicestershire

2nd

Alan Warren
Beacons discharge culvert

3rd

The British Dam Society