

# Yearbook 2023





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## Chair's Welcome



Welcome to the 3rd British Dam Society annual yearbook. We hope that you benefit from the information herein and that it makes you aware of all the great work that the society, its individual members, and its corporate members have undertaken over the last year.

My time as Chair commenced in April 2023, so I would like to take this opportunity to thank the previous Chair, David Littlemore, and Young Professionals (YP) Chair, Kyle Mclean, for all their commitment to the society during their terms in office. They both contributed a significant amount of time to ensure that the objectives of our society were at the forefront of everything they undertook. I would also like to thank the members of the committee whose terms came to an end this year, for all the time and knowledge that they gave to the committee to ensure that their roles were undertaken with professionalism.

It is a great honour to have been elected as Chair, following a two-year Vice Chair appointment, and I look forward to my term in office. I am pleased to start working alongside my newly appointed Vice Chair, Darren Shaw, and Young Professionals Chair, Rachael Lavery, as well as several new committee members. Collectively, as a committee, along with our members I hope that we will continue to raise awareness, share knowledge and passion for our industry.

As Chair of the BDS, it is my responsibility to ensure that the committee is delivering our society's strategy and vision statement:

**“BDS – a growing, inclusive and vibrant society, sharing knowledge and improving reservoir safety.”**

The existing Strategic Objective Work Groups (SOWGs) have been successful in ensuring their individual working group objectives were achieved over the last few years. However, as with anything, over time it has become clear that a significant amount of crossover has started to occur between the working groups. Therefore, following a review of the BDS Strategy 2016–25 and the SOWGs that are defined in the document, I proposed to the committee that a refresh was required. Therefore, I proposed to the committee to merge some of the objectives of the SOWGs and in the process rename them, to give clear direction and purpose once again. Alongside this, I proposed a new SOWG comprising of all members of the BDS Executive committee. This SOWG will direct our focus, enable us to continue to evolve the society, and lead it into the

future. Following full committee approval, the BDS SOWGs have been amended and the BDS Strategy will now, in turn be rewritten. We can confirm that the new SOWGs are as follows:

- Executive
- Membership
- Communication
- Events
- Schools & Universities

These new SOWGs will over the next few years ensure that our society continues to grow and support members during a period of change and transformation within the industry.

As we look back on 2023, we have as a society had some great opportunities to meet each other face to face. These opportunities would not have been possible without the hard work of our members and organisations contributing towards them. Evening meetings at the ICE have been very well attended, alongside which the growth in attendance at the Regional Hubs is extremely positive. The YP lunch time sessions have continued throughout the change in YP committee and a full calendar of events including a YP Forum is being planned for 2024.

In September, nearly 250 delegates representing owners, consultancies, contractors, suppliers and of course a large proportion of Supervising Engineers, attended the 16th Biennial British Dam Society Supervising Engineers' Forum. It was wonderful to see individuals making the most of this opportunity to come together as a society, to network, learn and share their experiences, knowledge, and insight to and from each other.

Internationally, approximately 1250 delegates from around the world attended the ICOLD 91st Annual Meeting in Gothenburg in June, including 42 delegates from the UK. It was wonderful to be joined by seven BDS YPs at ICOLD, all who were able to attend following successful application for the BDS YPs bursary. This great opportunity enabled the individuals to engage, network and share knowledge with peers internationally, as well as communicating all their learning upon return to the UK. It is vital for the future of our industry in the UK, that these international relationships are continued, and I urge individuals and companies to support their employees to be part of these opportunities, either by attending, presenting, or joining a technical committee.

Finally, I would like to thank each and every one of you reading this for your support to our society. We are all very much aware that our industry is going through a period of change and transformation. However together as a society we can ensure that we are able to positively contribute and raise awareness of the changes. I ask, as Chair, that individuals and organisations consider ways in which they can contribute during this period and move our industry forward for the better and for our future.

**Rachel Davies**  
BDS Chair



## The British Dam Society Committee

The BDS is run by a committee comprising elected and nominated members. Their roles are given below alongside their names, so if you have a particular matter relating to BDS please contact the appropriate committee member via [bds@ice.org.uk](mailto:bds@ice.org.uk).

### The committee structure comprises:

- A Chair and a Vice Chair (each for a two-year term)
- Three Honorary Officers who carry out key administrative tasks: Technical Secretary; Website Manager and *Dams and Reservoirs* Editor
- 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.

There will be an opportunity for any BDS member to join the committee at the AGM in April 2024 as an elected committee member. If you are interested in joining the BDS committee and contributing to the running of the BDS please contact any existing committee member to find out more before the call for nominations is sent out in March 2024.



**Rachel Davies**  
BDS Chair



**Darren Shaw**  
BDS Vice Chair  
& ReSRAG Chair



**Andrew Thompson**  
BDS Technical Secretary



**Rachael Lavery**  
YP Chair



**David Littlemore**  
Immediate Past  
BDS Chair



**Kyle McLean**  
Immediate Past YP Chair



**Stephen Lockett**  
Professional institution &  
corporate member liaison



**Anthea Peters**  
Reservoir Committee  
& ICOLD Technical  
Committees



**Rachel Dawes**  
YP Mentoring Champion



**Amy Carter**  
Equity, Diversity and  
Inclusion champion



**Rob King**  
BDS Newsletter



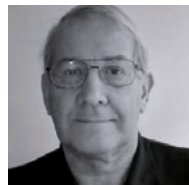
**Niall Allen**  
YP Social Media



**Roger Lewis**  
BDS Corporate  
knowledge



**Rhys Coombs**  
Website



**Andrew Pepper**  
*Dams and Reservoirs*  
Journal & Yearbook



**Matt Coombs**  
Evening Meetings



**Stephen Cavanagh**  
Technical Site Visits  
& Regional Hubs



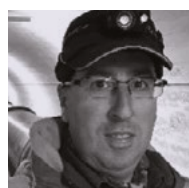
**John Foster**  
ICE Panel Engineers'  
Committee



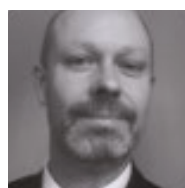
**Gerallt Richards**  
Competitions



**Henry Foster-Roberts**  
YP Events



**Chris Smith**  
Schools & Universities  
Lead



**Paul Marsden**  
Schools liaison



**Drummond Modley**  
University liaison &  
student research



**Moira Doherty**  
BDS Secretary (ICE)





## Summary of BDS events of 2023

Over the year the BDS held six evening meetings at ICE, One Great George Street, which were streamed live for remote viewing. A number of hubs were available where people could meet, network and watch together. All these events were video recorded and can be seen at any time on the BDS website's 'Listen Again' page, <https://britishdams.org/meetings-and-events/listen-again>.

### 9 January 2023

#### Innovative underwater isolations for valve and pipework replacement

David Brown (Canal and River Trust), Paul Edwards (Edwards Diving Services) and James Blackhall (Blackhall Engineering)

The team described the need for new valves in two 600mm diameter outlet pipes at Carr Mill Reservoir, St Helens so that the required drawdown rate could be achieved. The inlets to these pipes were 10m below top water level, but were installed without the need to drain the reservoir or install a cofferdam, by using a purpose-designed remotely operated vehicle (ROV). It was introduced via a submerged shaft and tunnel to seal each pipe inlet in turn so that the old valves could be removed and new service valves and guard valves installed in each pipeline.

### 6 March 2023

#### Grass cover – improving establishment and resilience to deal with increasing stresses

Mike Hughes (Atkins)

The importance of maintaining healthy grass cover for safeguarding the resilience of embankment dams and levees was stressed, as good grass cover is critical if they are designed to overflow.

The presentation provided a practitioner's viewpoint on the importance of grass cover and explored a number of current industry publications and specifications to provide recommendations for more easily enforceable definitions of acceptable grass cover. The presentation questioned the standardised approach of specifying grass-only seed mixes, and suggested that more diverse seed mixes, including a small percentage of appropriately selected herbs or legumes, may instead be beneficial.

### 24 April 2023

#### New UK Dams – A New Episode

Ruari Maybank (Portsmouth Water), Mark Malcolm (Anglian Water), Georgina Seeley (Thames Water) and Matthew Hill (Stantec).

The UK reservoir industry is currently going through significant changes with a call for increased resilience within water supplies and greater demand for renewable energy. The meeting heard how some of these challenges are being met.

The four speakers gave presentations providing updates on new major reservoir projects that are either underway or planned in England and Scotland. These included Portsmouth Water's Havant Thicket Reservoir, Anglian Water's two proposed Large Raw Water Reservoirs, Thames Water's South East Strategic Reservoir Option in Oxfordshire, and the Coire Glas Pumped Storage Project in the Scottish Highlands

### 10 July 2023

#### ICOLD Technical Committee Updates

The UK is an active member of ICOLD, contributing to the development of bulletins via the various ICOLD Technical Committees. This event consisted of a series of short presentations from the UK representatives of several of these technical committees, giving updates on recent developments in the respective committees with a brief overview of new or emerging ICOLD bulletins. (See also a summary of some new ICOLD bulletins on [pages 34 and 35](#) of this Yearbook).

### 2 October 2023

#### Lessons Learnt from Reservoir Discontinuances

Ryan McHugh (Mott MacDonald) and Michael McAree (Mott MacDonald Bentley)

Reservoir owners often consider discontinuing redundant assets; however, reservoirs can deliver amenity value for local communities as well as contributing to a desirable environmental habitat and reducing flood risk. Careful consideration therefore has to be given to balancing the advantages and disadvantages when deciding whether to discontinue a reservoir.

The presenters described the process leading up to discontinuance of reservoirs in Scotland, highlighting the differences when compared to other parts of the UK, and citing examples from their work in Scotland.

### 20 November 2023

#### Young Professionals Paper Competition (BDS Prize)

Matt Craig (Mott MacDonald), Emily Hale (Mott MacDonald), Veronika Martin (Arup), Daniel Morris (Stantec) and Thomas Rigby (United Utilities)

There were ten entries for this competition, with the authors of the top five papers giving presentations on their papers at this event. First prize was awarded to Veronika Martin, with second prize going to Matt Craig and third to Daniel Morris (see [page 6](#) for full details).



## Competitions report

### BDS Prize

On 20 November 2023 we held an evening meeting for the BDS Prize. This competition is open to BDS members under 35 years of age, with a paper of 2,500 words and a presentation on a topic of dam engineering relating to the author's experience in reservoir research, design, construction, operation, maintenance, or supervision.

Ten papers were received for the competition, and the judging panel of Alan Warren, Rachael Lavery, Andrew Pepper, Jon Holland and Mike Hughes had the task of scoring the papers on their technical content and composition in order to form a short list for the presentation evening.



Following the presentations, the judges awarded the prize to **Veronika Martin** from **Arup** on her paper and presentation on 'Exploring Efficiency of Labyrinth vs Ogee Spillway Weirs at High Hydraulic Heads – A Case Study in Zambia'.

**Matt Craig** from **Mott MacDonald** was second with his paper and presentation on 'Dunside Reservoirs Discontinuance – Taking a New Approach' and **Daniel Morris** from **Stantec UK Ltd** was third with his paper on 'Existing washout valve replacement and installation of a new control valve at the outlet at Burnhope Reservoir'.

The other finalists were:

**Emily Hale (Mott MacDonald)** – Case Study: Calverley Flood Storage Reservoir – Challenges in the design and construction of an in-river control structure

**Thomas Rigby (United Utilities)** – Yeoman Hey IR Remedial Works

The other papers submitted for the competition were:

**Andrew Basford (Natural Resources Wales)** – The delivery of multiple benefits on Wales's largest natural lake, Llyn Tegid

**Alice M Davies (Binnies)** – The RARS (Risk Assessments for Reservoir Safety management) guidance

**Prithula Roy Choudhury (Mott MacDonald)** – A stability analysis of an unreinforced concrete gravity dam

**Merlin Davis (Canal & River Trust)** – Simulating Reservoir On-site Flood Plan test: Operation Redbrook

**Lucy Monkhouse (Canal & River Trust)** – Improvement works to the bywash channel at a reservoir

You are able to listen again to these presentations via the BDS website and it is proposed that the papers presented will be published in a future volume of *Dams and Reservoirs*.



BDS Prize 2023 – Finalists. From left – Rachel Davies (BDS Chair), Veronika Martin, Matt Craig, Emily Hale, Thomas Rigby, Daniel Morris.

### Annual Photography Competition

The BDS Photography competition is an annual competition which is open to all members of the BDS, ICE, Engineering students and staff of corporate members.

This year we received 47 entries which featured reservoirs from all over the UK and overseas. The competition was judged by Andrew Thompson, John Foster, Rachael Lavery, Niall Allen, Matt Coombes and Chris Smith.

The entries were judged as follows:

**1st – Jack Lewis-Roberts** – Llyn Llywelyn Reservoir works with Eryri (Snowdon) in the background

**2nd – Barry Dooley** – Selset Reservoir, Barnard Castle

**3rd – Thomas Creed** – Scar House Reservoir, North Yorkshire

The winning photographs are featured on the back page of the Yearbook.

Thanks to all who have entered the competition, your photographs may feature on the British Dam Society Website and on the cover of the BDS Journal Dams and Reservoirs.

### Upcoming events:

Next September the Bateman award for the best paper published in *Dams and Reservoirs* journal and the Conference proceedings will be presented at The British Dam Society 22nd Biennial Conference.

The annual BDS photography competition will again open in September 2024 – so remember to take some photographs while visiting reservoirs over the next few months.





## BDS Event Planner 2024

**The main event for 2024 will be the 22nd Biennial BDS Conference to be held at Keele University in September. In addition the BDS is pleased to add the inaugural Young Professionals Forum to our year planner. The forum will be held at the ICE London in April.**

Throughout the year we host a number of evening talks, competitions, site visits and other networking activities for our members. Local hubs across the country are available to members away from London and Young Professionals also offer regular CPD lunchtime webinars.

### Dates for your diary

<b>January</b>	<ul style="list-style-type: none"> <li>• London evening meeting (9 January)</li> <li>• Regional Hubs available</li> <li>• Applications are open for Committee nominations – this year there are SIX positions available on the main BDS committee.</li> </ul>
<b>February</b>	<ul style="list-style-type: none"> <li>• Deadline for synopses and workshop proposals for the 22nd Biennial BDS Conference at Keele.</li> </ul>
<b>March</b>	<ul style="list-style-type: none"> <li>• London evening meeting (4 March)</li> <li>• The meeting is entitled “The Victorian approach to the sustainability of British Dams” by Pam Rigby and Andrew Thompson</li> <li>• Regional Hubs available.</li> </ul>
<b>April</b>	<ul style="list-style-type: none"> <li>• DEADLINE for the Committee nominations (8 April)</li> <li>• YP Forum Event (22 April)</li> <li>• Annual General Meeting followed by the BDS international lecture (22 April) by Michael Rogers, Honorary President ICOLD</li> <li>• Regional Hubs available.</li> </ul>
<b>May</b>	<ul style="list-style-type: none"> <li>• DEADLINE for Conference Papers – Last day to submit your paper and be part of the 22nd Biennial BDS Conference at Keele.</li> </ul>
<b>June</b>	<ul style="list-style-type: none"> <li>• Site Visits are to be held at various sites across the country throughout the year.</li> </ul>
<b>July</b>	<ul style="list-style-type: none"> <li>• London evening meeting (8 July)</li> <li>• The meeting is by representatives from Thames Water on Service Reservoirs</li> <li>• Regional Hubs available.</li> </ul>
<b>August</b>	<ul style="list-style-type: none"> <li>• Registration for the 22nd Biennial BDS Conference – book early to avoid disappointment!</li> </ul>
<b>September</b>	<ul style="list-style-type: none"> <li>• 22nd Biennial BDS Conference to be held at Keele University (11-14 September) and includes the prestigious Binnie Lecture and Bateman Award.</li> </ul>
<b>October</b>	<ul style="list-style-type: none"> <li>• London evening meeting (7 October)</li> <li>• The meeting is by representatives from Natural Resources Wales on eight years since the implementation of the 10,000m<sup>3</sup> capacity limit for statutory reservoirs in Wales</li> <li>• Regional Hubs available</li> <li>• ICOLD Event: 92nd Annual Meeting of ICOLD, New Delhi (18-24 October).</li> </ul>
<b>November</b>	<ul style="list-style-type: none"> <li>• London evening meeting (18 November)</li> <li>• The meeting is entitled “Blagdon Dam Safety Improvement Works” by representatives from Wessex Water</li> <li>• Regional Hubs available.</li> </ul>
<b>December</b>	<ul style="list-style-type: none"> <li>• DEADLINE for expressions of interest for the posts of BDS Chair and BDS Vice-Chair 2025-27.</li> </ul>

For updated information go to [britishdams.org/meetings-and-events/events-calendar](https://britishdams.org/meetings-and-events/events-calendar).



## The BDS 16th Supervising Engineers Forum – First timer insights

**Halil Ibrahim Kula** BSc. MSc  
Project Engineer (Dams),  
Stillwater Associates Limited,  
Reigate, Surrey, UK



**As a Turkish civil engineer who has been working in reservoir safety in the UK for two years these types of events are relatively unfamiliar to me as I have come from a country where the national committee would rarely organise learning events such as these. I have now had the privilege of attending the BDS Conference in Nottingham followed by the last ICOLD meeting in Sweden and now my first Supervising Engineers' Forum. Here are a few of my insights.**

Although I have attended many BDS evening and lunchtime events, this was the first event that I attended with topics specifically relevant to Supervising Engineers. As a candidate to become a supervising engineer, the topics discussed at the forum helped me understand the qualities I need to have to become a supervising engineer and the forum provided me with important information about the areas where I have deficiencies, and highlighted the topics I need to work on further.

The forum took place at the National Conference Centre in Birmingham which I thought was an excellent central location that clearly allowed a significant number of engineers to attend. It was good to see so many engineers interested in this event. Dam engineers of all levels were represented at the forum, and it provided a chance for me to meet experienced engineers from the UK dam industry. One of them was Jonathan Hinks and we had a conversation about his recently published book on the topic of dam engineering and earthquakes, as this is a very relevant subject for dams in Turkey and one of great interest to me.

The forum was divided into four sessions, each focusing on a different aspect of the supervising engineer's role. The first session, titled 'Application of Legislation', was of particular interest as I am preparing to submit my Supervising Engineer Panel application. This section provided me with a better understanding of the current issues being considered by each of the Enforcement Authorities. It also allowed me to understand the general characteristics of dams in Wales, the number considered high risk, and how NRW manages them. Additionally, I acquired information about upcoming updates to the regulations in the coming years. I learned that the new legislation is currently in the preparation stages and won't be finalised before 2027. Furthermore, the presenters shared supervising engineer report templates for both statutory and non-statutory reservoirs, sharing information about the structure of each template and the type of information that should be included in each section. They also mentioned that these template reports will be shared among supervising engineers, and based on the

feedback received, a final version will be developed. The plan is to publicly share this final version in March 2024.

The second part of the event focused on a panel discussion about exercising On-site Plans. I really liked the discussion style of this section as it promoted involvement from the audience, making the discussions more interesting and allowing for a sharing of ideas and practical knowledge. At the company where I work, we have developed nearly 300 On-site plans, and I was always curious about how this large number of plans would be exercised and the challenges we might encounter during exercises. The presenters in the panel discussion shared their experiences, providing me with knowledge of the types of issues that I may face in the future and ways to overcome them. It was interesting to hear about the different scale of tests that have been carried out by various different types of Undertaker, as the requirements of a large water company can be very different to the owner of a single small reservoir. It was good to get an understanding of how various organisations would coordinate with each other during an exercise by considering the different duties of supervising engineers, undertakers, pump suppliers, contractors etc.



Gaur Dam – Martin Deane





Storm King Dam – Tracey Williamson

The third part of the forum focused on dam monitoring and surveillance. In this section, the presentation on flood detention reservoirs was of great interest. The presentation explained the distinctions between flood detention reservoirs and normal impounding reservoirs, with 10% of the reservoirs in England under the Reservoirs Act being flood detention reservoirs. Importantly I learnt about the vulnerability of flood detention reservoirs, as they typically remain empty for large periods of time and then fill rapidly during extreme flood events. Flood detention reservoir embankments are often prone to desiccation cracks due to being empty most of the time and their performance can only be fully assessed during impounding events. These types of embankments often incorporate an auxiliary overflow section which is designed to allow water to pass across large sections of the embankment, with the quality of the grass cover playing a crucial role in resisting erosion. The supervision of flood detention reservoirs can require the attendance of the Supervising Engineer at short notice during flood events.

The last section was titled 'Matters concerning Undertakers' and consisted of a RARS Update from the Canal & River Trust, a presentation regarding the use of Section 12(6) certificates by Mike Hughes and David Steven's presentation of the value of CCTV surveys in pipework. For me the most interesting of these presentations was understanding how Supervising Engineers should direct undertakers to make visual inspections by using Section 12(6) certificates.

Overall I was impressed with how smoothly everything was organised at the forum. The registration process was easy, and the event started and ran on time. I've been to other events like this in the past, and I know it can be challenging to plan and stick to a schedule. Many thanks to the presenters and organisers for their contribution in achieving this.

The breaks between technical sessions provided me with an opportunity to meet qualified engineers working in the dam industry. The large space was excellent for this. I met people with different backgrounds in the industry and connected with many individuals whom I can consult with in the future about the challenges that I may face.

In conclusion, the interesting sessions, good networking opportunities, and the unique location made the forum special for me. The forum provided me with a greater understanding of the supervising engineer's role and the specific qualifications required. The discussions on legislation, on-site plan exercises, flood detention reservoirs, and matters concerning undertakers have equipped me with increased knowledge to enhance my professional development. As I keep working in the field of dam engineering in the UK, I look forward to more involvement with the BDS and would like to contribute and learn from the diverse community of dam engineers here. The knowledge and connections from this event will most certainly help me as I continue my career within the reservoir safety industry.

**Halil Ibrahim Kula**  
[halil.kula@stillwater-associates.co.uk](mailto:halil.kula@stillwater-associates.co.uk)



## The BDS Young Professionals Group

The Young Professionals (YP) group comprises British Dam Society members from any discipline who are under 35 years of age. The YP group was established to promote and encourage the next generation into the industry, in order to provide a continuity of professionals who can ensure the ongoing safety of the UK's dams and reservoirs.

### A new YP committee

In 2023 a new YP committee was formed, who will serve for two years, until spring 2025. The officers of the committee are:



**Rachael Lavery**  
YP Chair



**Henry Foster-Roberts**  
YP Events



**Rachel Dawes**  
YP Mentoring Champion



**Niall Allen**  
YP Social Media

### The objectives of the YP group

With the help of the main BDS committee and the wider BDS membership, the YP committee strives to engage and support the younger members of the industry, encouraging them to join the BDS and facilitating professional development and networking opportunities.

To help achieve this, the seven main objectives of the group have been set out, namely:

- 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.**

### The benefits of being a BDS YP member

The outworking of these objectives is shown in the benefits that can be realised by YP members, including:

- Opportunity to attend conferences through the YP bursary scheme
- Opportunity to join the BDS Mentoring Scheme, to support professional development in the industry
- Access to a range of interesting CPD talks from senior experts in the industry across the year
- Access to *Dams and Reservoirs* journal
- Opportunity to network with other young engineers through the ICOLD forum.

### Young Professionals at ICOLD 2023

To further objective 7 above, **Rachel Dawes**, of Arcadis, attended the ICOLD 2023 conference in June in Gothenburg, Sweden along with seven other Young Professionals from the BDS, supported by the bursary scheme.

There were several events organised during the conference for YPs, including networking, socialising and site visits. These all provided excellent opportunities to meet and network with other YPs from all round the world with varying technical expertise and experience, allowing us to share knowledge about the dam industry in other countries and share stories of projects.

Networking events, including a mentorship lunch with influential members of the dam industry, were held throughout the week. We discussed our experiences within the dam industry and heard how our mentor has gained key skills within the industry.

The ICOLD YP annual forum was held mid week, where we met the ICOLD YP committee members, elected new members, and discussed with other members from all around the world about their role within the dam industry.

An open panel discussion with influential women in the dam industry was well attended by males and females from across the industry. The panel discussion focused on how women can be empowered, using networking and mentorship opportunities.

The YP Networking event was held at Gothenburg Universeum, which included a tour around the museum and a networking evening in the aquarium with other ICOLD YP members.





YP Social Evening at ICOLD 2023 – Michael McAree, Alice Davis, Ryan McHugh, Merlin Davis, Rachel Dawes

## CPD online events

Throughout 2023 we have continued to provide our monthly CPD events and there have been excellent presentations on topics including a construction case study, seismic assessments and the Reservoirs Act. It has been great to see engagement across the YP membership and the monthly CPD events are open to all BDS members looking to widen their knowledge of dams and reservoirs.

### January

**Lucy Monkhouse**  
NEC Supervision  
at UK Reservoirs

### February

**Geraltt Thomas**  
Reservoir Regulation  
in Wales

### March

**Andrew Basford**  
Delivering the Llyn Tegid  
Reservoir Safety Project

### June

**Roger Lewis**  
The Reservoirs Act  
from an Enforcement  
Authority Perspective

### July

**Ziggy Lubkowski**  
Seismic Assessment for  
Toddbrook Reservoir

### August

**Naimh McElroy**  
Journey to Compliance  
with the Reservoir Act  
(NI) 2015

### September

**Halil Ibrahim Kula**  
Case Study of an RCC  
Dam Construction

### November

**Blackhall Valvologists**  
Diagnosis, Monitoring  
and Maintenance  
of Valve Equipment

### December

**James Smith**  
Heritage Works at  
the Garden of Wales –  
historic significance  
of reservoir structures

These and earlier presentations can be found on the YP Playlist of the BDS YouTube channel: [www.youtube.com/watch?v=9MTZGz3IDYM&list=PL5RixlQUzazUx0IO61Lku9K5eGRgoUI5](https://www.youtube.com/watch?v=9MTZGz3IDYM&list=PL5RixlQUzazUx0IO61Lku9K5eGRgoUI5).

For 2024 the following presentations have been planned so far, but more are being added, so watch out for more during the year on the events page of the BDS website or on LinkedIn.

### 24 January

**David Bell (Aecom NI)**  
Spillways, Design & Construction

### 24 February

**Chris Grogan (JBA)**  
Effects of Mining on Dams & Reservoirs

### 24 March

**Dr James Howard (JBA)**  
Geotechnical Site Investigations on Dams

We would like to thank all the presenters who have volunteered to share their knowledge and experience as part of these events. The YP committee is always looking for new speakers for the monthly CPD events to cover a range of topics within the dams and reservoirs area. Please contact us if you are interested in presenting or would like further information.

## YP Forum

The YP Forum is a new initiative for 2024 which will take place on 22 April at the Institution of Civil Engineers. This event will allow BDS YP members to expand their network while developing their learning of reservoirs. The event will have a variety of sessions that have been chosen from the feedback received from the BDS YP members. As this is a new event, numbers will be capped. Registration for the event will open in the New Year. For further information please contact [youngprofessionals@britishdams.org](mailto:youngprofessionals@britishdams.org) or see the BDS newsletters nearer the date.

## How you can help

Please feel free to contact the YPs if you have any queries or would like to provide feedback to the YP committee. We are always open to new ideas and welcome your comments.

General Queries

[youngprofessionals@britishdams.org](mailto:youngprofessionals@britishdams.org)

Mentoring

[mentoring@britishdams.org](mailto:mentoring@britishdams.org)

LinkedIn

**British Dam Society**

Instagram

**britishdams**



## Reservoir Safety Panel Appointments 2023

The British Dam Society is pleased to announce the following new appointments of our members to Reservoir Safety Panels. Congratulations to each one of them.

Appointed as All Reservoirs Panel Engineers



**Kenneth Barr**  
Technical Director, Fairhurst



**Martin Deane**  
Senior Associate – Dams & Reservoirs, Mott MacDonald

Appointed as Supervising Engineers



**Michael Ciaraldi**  
Project Manager,  
Northumbrian Water



**Phoebe Erskine**  
Senior Dams & Reservoirs  
Engineer, Mott MacDonald



**Anthony Jones**  
Associate Director, WSP



**Naimh McElroy**  
Reservoir Safety  
Manager, Northern  
Ireland Water



**Rhiannon Meredith**  
Principal Engineer,  
Stantec



**Iain Phillips**  
Catchment Engineer,  
Environment Agency



**Matthew Rhodes**  
Associate Technical  
Director, Stantec



**Paul Risdon**  
Technical Director,  
Arcadis





**The British Dam Society is also happy to announce that the following members have been reappointed to their respective to Reservoir Safety Panels. Congratulations go to each one of them as well.**

Reappointed as an  
All Reservoirs Panel Engineer



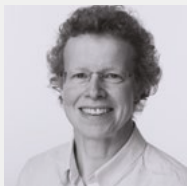
**Rachel Pether**  
Water Utilities Director,  
Binnies

Reappointed as a  
Service Reservoirs Panel Engineer



**Ken Turnbull**  
Consultant, AECOM

Reappointed as Supervising Engineers



**Naomi Ashcroft**  
Senior Associate,  
Stantec



**Peter Down**  
Senior Associate  
– Dams Engineer,  
Mott MacDonald



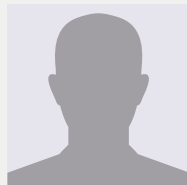
**Iain Edmonds**  
Consultant, Jacobs



**Giles Hird**  
Associate Technical  
Director, Arcadis



**Gamini Karunaratne**  
Director, GK Reservoir  
Supervision



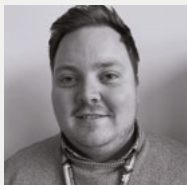
**Angus MacDonald**  
Civil Engineering  
Manager, Drax  
Generation Enterprise



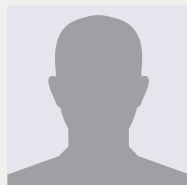
**Jasvir Mallia**  
Senior Reservoir  
Supervising Engineer,  
Scottish Water



**Chris Smith**  
Reservoir Supervising  
Engineer, Severn  
Trent Water



**Samuel Tudor**  
Dam Safety Engineering  
Manager, Welsh Water /  
Dŵr Cymru



**Bryn Williams**  
Chief Civil Engineer,  
First Hydro Company



**Richard Williams**  
Principal Dam Engineer,  
Stantec



## The BDS Supervising Engineer Mentoring Scheme



Llyn Tegid (Bala Lake) taken during a mentoring site inspection – Rachel Dawes

**The British Dam Society Supervising Engineer Mentoring Scheme has been set up to support those training to be appointed onto the Supervising Engineer Panel. The scheme is focused on training Supervising Engineers, but it is open to any and all engineers looking to develop their skills and competencies within the dam industry. The scheme is coordinated by our Young Professionals (YP) committee.**

The Mentoring Scheme is of key importance to our industry and aims to help to address the steady decline in Reservoir Panel Engineers that has been observed in recent times and help achieve the British Dam Society's vision of being "a growing, inclusive and vibrant society; sharing knowledge and improving reservoir safety".

### What does the scheme offer?

The Supervising Engineer Mentoring Scheme offers support to trainee Supervising Engineers via a series of initiatives, as follows:

- Networking opportunities with engineering professionals outside your organisation, including All Reservoir Panel Engineers, Supervising Engineers and other trainees
- Opportunities to accompany Panel Engineers on Statutory Inspections including those outside your day-to-day discipline
- Continued Professional Development opportunities including design, operation and maintenance of dams
- Guidance and support during the Application Process and Interview Practice
- Priority places for BDS Site Visits.

### 2023 Update

The Young Professionals Committee has continued its work throughout 2023 to re-establish and reinvigorate the mentoring scheme. Mentee applications were received in October and are currently being processed.

Regional mentoring hubs were previously established, with mentees and mentors groups based on geographical location. Initial introductory workshops are planned to be held to kick-start the newly established scheme and introduce members.

The scheme is a thriving group of professionals comprising a total of over 25 mentees, Supervising and All Reservoir Panel Engineer 'mentors', located throughout the United Kingdom, and from a diverse and wide range of backgrounds.

The committee and scheme mentees aim to meet once a quarter to discuss and share upcoming inspections events and activities, share general knowledge, and application tips.

### How do I join the scheme?

A new application window was opened in October with details sent to all BDS members. If you would like to join the scheme or have any specific questions about the scheme, please email [mentoring@britishdams.org](mailto:mentoring@britishdams.org) and we would be happy to assist.

### How you can help

We are always on the lookout for experienced dams and reservoir engineers, particularly panel engineers, to act as mentors for the scheme. If you can offer aspiring SE panel engineers' guidance and support in their efforts toward application to the Supervising Engineers Panel, and would like to assist with the scheme, then please contact our YP Mentoring Champion, Rachel Dawes: [mentoring@britishdams.org](mailto:mentoring@britishdams.org)





## ICE Panel Engineers' Committee



Craig Goch – David Brown

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

The committee will provide a voice for reservoir engineers working within the current reservoir safety regulatory framework, but will also 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 from both the Supervising and All Reservoirs Panels. 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** (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)

Ed McCann, Chair of the ICE Reservoirs Committee, also attends meetings in an ex-officio capacity.

An additional member, or change, will be appointed in due course who predominantly works in Northern Ireland to provide suitable coverage and knowledge for this region. Appointments will be for three years with an option of an additional year. An initial phased approach to changes will be adopted to prevent a mass change of committee members.

As a temporary measure 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 and the Environment Agency. These include:

1. Hazard classification
2. Panel engineer supply and capacity
3. Reservoir safety management plans
4. Risk management, and transitioning to a risk-based approach of safety management
5. Enforcement Authority duties and powers, and those of the panel engineer and undertaker
6. Legislation changes
7. Quality assessment of panel engineer reports

During 2023 the committee has provided oral updates to reservoir panel engineers through:

- Presentation briefings at the BDS Supervising Engineers' Forum and the All Reservoir Panel Engineers' Forum
- Updates to the ICE Reservoirs Committee and the BDS Committee.



## The BDS Interviews 2023

### Interview by Andrew Thompson, BDS Honorary Technical Secretary

I was once told that getting on the Supervising Engineer panel is a bit like your driving test. You may have learned how to pass the test but then you need to learn how to drive! With that in mind, for this year's BDS interview we invited four relatively new supervising engineers to sit down and talk to us about their journey to becoming a supervising engineer, their experiences since they were appointed and, finally, their views on the future. I was joined by Adam Reynolds (Reservoir Supervising Engineer at United Utilities), Liz Rivers (Senior Associate Director of Ground Engineering at Jacobs), Phoebe Erskine (Senior Dams and Reservoirs Engineer at Mott MacDonald) and Rhys Coombs (Director at CC Hydro and the BDS Website Manager).

#### Can you tell me a little bit about your background before becoming a Supervising Engineer?



**Adam** – So I currently supervise 26 reservoirs. Prior to being a SE I was a catchment controller for nearly 10 years working in the Blackburn, Burnley and Lancaster areas so my early career was more hands-on experience. My development is somewhat different to most, as to get on the panel I needed to catch up a bit more academically as the S12 and S10 visits were already there as I'd spent 10 years in catchment role. The difficulty was I needed to find the pathway before I could get started. Not that I wanted everything spoon-fed to me. UU have had engineers that achieved the SE route from catchment, but the application system had recently changed so there was no real precursor for me to follow. This resulted in me spending a few years going in the wrong direction and doing things I possibly didn't need to do but I soon realised what I needed to achieve and tick all the right boxes I was pretty determined to get there.



**Liz** – I've been on the panel for nearly two years and my development path was almost the opposite from Adam's. I'd been involved in dam design work, monitoring work and I'd started to think about becoming a Supervising Engineer as a nice way to carry on doing reservoir work but very much as a side part to what I saw as my main job. It still took me a while to become SE – there wasn't a really established route because I wasn't sat solely within the dams team; I was in a different part of Jacobs. So, I started accompanying our engineers on to reservoir visits to get the observations and statement side. Then I became busy with other things at work, went off on other career avenues and then thought, "am I going to do this or not?" So, I finally decided, this is what I want and made a big push for it. I'm currently appointed to 23 reservoirs,

although I'm very conscious that within a consultancy the appointments I have may ebb and flow as we obviously don't own or manage any reservoirs and we work through frameworks. So, I take the opportunities while they are there, even though it's a side role.



**Phoebe** – So I think I'm possibly the newest appointed of the bunch as I only received my letters this summer; in July I got my appointment for England and Wales and received my appointment for Scotland in August.

I've only got four appointments at the moment but I'm due to get a few more from the current SEs when they are up for their next visit and I'm also helping to do some parental leave cover in January for Scottish Water for about seven months so I will be much busier in the New Year. My background is a bit more varied; I wasn't immediately dams. I started out as a civil engineer in a rivers team, so I worked on fluvial structures and in channel structures in rivers for a few years before I moved back up to Scotland after studying here originally. I'd decided that, for me, Edinburgh was nicer than London, so I joined the flooding team here. I've got more of a hydraulic and hydrology background and started working on flood studies and that's how I came into the world of dams and reservoirs. I got really interested in it and started to tag myself onto the reservoirs team, asking if I can come along to their site visits and start training to become a supervising engineer. So, my early career was perhaps less on the design side, like Liz, but more of the observational, analysis side, I guess. It's going well so far, I've done all my site visits so far so that's it I guess until I get some more.



**Rhys** – I think I was appointed just after Liz in the October round, so just over two years ago. I am the director of both CC Hydrodynamics and CC Informatics and most of my early dam experience comes from the world of big consultancy. Like Adam I'm dams born and raised! When I was 16 years old, I did some work experience at MWH (Stantec) under Ian Carter and John Troke. After graduating I wasn't having much luck with finding jobs and so I dropped Ian a message basically asking if there was anything going. "Leave it with me" he said and within a week I had an offer. Like Phoebe I also come from a hydraulics and hydrology background. I started working mostly on flood studies and hydraulic analysis of spillways. Stantec gave me a broad base, so I was able to move quickly into considering designs, geotechnical aspects and instrumentation monitoring for some big water companies and hydropower companies. I thought this is going this was going swimmingly... so I quit and set up my two little companies. I've got 26 appointments; the majority are either farm reservoirs or estate ponds which is a completely different world to larger water





Mucklewater Reservoir, Orkney – Phoebe Erskine

companies and hydropower operators. Often, you're not required to visit them as frequently, they are usually much smaller, and the owners aren't as well-resourced so if you have safety recommendations you need to figure out how best to achieve this.

### What inspired you to start your journey to SE?

**Liz** – to be honest I'd never heard of the role! I had been working overseas with dams and when I returned to the UK and joined Halcrow (now part of Jacobs) geotechnical team one of my mentors said to me that I should think about becoming a Supervising Engineer to which I responded, 'what's that?'. He was guiding me on my career and suggested it was a route I probably would want to follow as it would allow me to continue a career working on dams. And he was right.

**Adam** – I started at UU after being a bricklayer for about 8–9 years, straight into the catchment role and within the first few weeks I met my first Supervising Engineer on site, Andy George. I was coming from the bricklaying world, where I knew what I was talking about, to this new industry and then meeting someone so technically minded I was not able to comprehend what he was telling me on site! It pushed me to up my knowledge and understanding so that I could converse with him about things, and I guess the more you know the more you want to know, and things developed from there. I grew up in Leigh, near the canals and waterways and the area is steeped in industrial history and so the dam industry was something that really interested me.

**Phoebe** – so I can remember the exact conversation, it wasn't exactly "ah ha! I want to do this," but when I was first working on flood studies and had worked a little bit with the reservoir team, I guess rather similar to Liz, my line manager had asked if I was interested in doing "dam stuff" and within minutes the All Reservoir Panel Engineer was sat next to me all excited asking if SE is something I want to do, suggesting visits to accompany him on, telling me to book my confined space training

etc. I guess I fell into the role, but I was very keen to do it, as I had a big interest in reservoirs and in my view, we engineers get the best site visits, don't we! I'm possibly biased but it's always a nice day out and I love doing the inspections and analysis, so the SE role gave me an opportunity to do all those things together. I had keen mentors and quite a lot of support from Stephen Lockett (SE) and Robert Mann (ARPE) I worked with. They took me under their wing and taught me everything they know... well perhaps I wouldn't claim everything they know but certainly having good mentors helped.

**Rhys** – I worked with Ian Carter and Matt Hill, and I guess there was an expectation at Stantec that SE was the career path and at the time I worked alongside other engineers, John Troke and Giles Hird, all working towards the same goal. After I left, I went for a couple of years thinking that I might not even do it and once I'd set up the company, I was finding that, although I was chartered, what my credibility as a small business owner needed was the formal credentials of a dam engineer. Fortunately, I had already developed quite a good network within the industry so I managed to jump onto a few S12 visits with Craig Goff and Giles Hird and a wealth of S10s with Ian Carter and Matt Hill which, along with the wide base of experience I already had developed during my time at Stantec, meant I was in a position to apply.

### How was the SE application and interview process?

**Rhys** – I found the application form OK, but I wrote my examples as job-specific rather than attribute-specific and I think my application has been used as an example of how not to write one!

The interview itself was online. I was working away at the time, so I did the interview in the kitchen of an Airbnb in mid-Wales that unfortunately had a pretty shaky internet connection. I found the questions went well on the day. My preparation was quite good and leading up to the day I was able to bounce between mock questions from other supervising engineers I knew.

**Liz** – For me it was somewhat of a relief to have finally submitted my application after having it on the back burner for several years. I was pretty nervous about my interview. It was during COVID and online and I also had external observers watching the interview process. To my relief the observers all had their cameras off and were sat quietly in the background. During the interview they talk to you about what you currently do and your previous relevant experience. I would have preferred to have done the interview in person. I generally prefer face-to-face meetings, particularly with people I've never met before. I think it helps with communication and it's easier when it's not a big group.

**Adam** – I did both my interviews in person, and I agree it's much easier to get your point across, use visual aids etc, but one thing I wasn't expecting when I went to the ICE was how imposing the building was. I'm not normally a nervous person but as I approached and walked past statues of all the great and the good outside Westminster and entered this grand building surrounded by portraits, I needed to force myself to sit down, take

a minute and sort myself out because I was a bit of a wreck! Once in the interview I was OK. It took me a few minutes but once you start talking it's all about what you do day-to-day and showing your experience to answer questions. It's all fine, the biggest issue was walking through the doors of the ICE!

**Phoebe** – I agree Adam, even though I've been there quite a few times I think it's a scary building. Perhaps I'd be OK after a bit, but my heart would be absolutely pounding if I was going into that building to face a panel for an hour and a half. By being sat in a meeting room in my office talking to someone on a computer I found I was immediately more relaxed than I would have been in person.

**Rhys** – Is this a rite of passage that's been lost do you think?

**Adam** – Ha ha – yes perhaps you're not a real SE unless you've been terrified by One Great George Street!

**Phoebe** – memories from my interview are fairly fresh as it was back in May, but it was my second interview as I'd applied the year prior. Before lockdown I had loads of concrete dam visits lined up but thanks to COVID the visits unfortunately got cancelled. I sent my first application, which was a gamble as I didn't quite have enough experience with concrete dams, and in the end that's why I was unsuccessful first-time round. I came out of the interview frustrated, thinking 'those were really stupid answers' and I felt that maybe if I could've gone back in a week later, I would have been fine. So, I waited another year and second time round it wasn't as scary, I'd done it before, I knew what I was expecting and felt confident that I knew my subject. Which is the key thing I guess.



### How was your first SE inspection?

**Phoebe** – I had some strange visits to start my SE role. Within 3-4 weeks of getting my letter I was sent straight up to Aberdeen to a privately owned non-impounding dam for a paper mill which wasn't in the best condition followed by a visit to an ash lagoon. The paper mill site is currently in administration, so I was meeting people not that familiar with the site or the problems that the embankment has. It was a bit of a funny situation to be in; with most private owners they have some awareness and understanding of their sites or have at the very least worked with an SE at previous visits. So this was a difficult challenge, it's not something you can prepare for either. For my SE training I didn't have that much experience with private owners, I worked mostly with an SE from Scottish Water sites and they are very different to working with farmers, fishing clubs etc.

**Rhys** – My first SE visit was a bit of a rushed job at a farm reservoir. I'd not long been on the panel and the previous SE was keen to hand this over. There were no safety items so all I needed to do was visit and see if it was OK and that the owner was doing everything they needed to do. I visited on 1 December with less than two weeks till the statement due date. It was cold and raining sideways; so cold that you couldn't even hold a pen, so I took photos, way too many photos. Which I only realised afterwards when I was writing up the visit and I spent more time sorting out the photos than writing the fairly short visit report. I did manage to use a drone during the visit however and carry out a top-down survey which highlighted animal burrows and other features that were not that obvious at eye level on the ground due to vegetation. Using the drone is something that I've used almost every time since and I definitely take fewer photos now.

**Liz** – I had four appointments in one go, all of which were flood storage reservoirs. The first was a recreational lake with additional flood storage and the remaining three were all dry. I was very much the same as Rhys and took numerous photos on my first visit, but I learned quickly after that visit the importance of good referencing. I think that you have to expect the first visit is about establishing the general picture. By the second visit you understand the site a lot more and will have received and reviewed all records, previous reports, monitoring etc and be better prepared to look at the key issues.

**Adam** – The first dam I visited was Stocks reservoir and I remember trying to be quite methodical about it. I'd had time to review the previous S10, looked at the matters to be watched, the last SE statements and I made a bit of a cheat sheet for me to take with me. I too was definitely guilty of taking too many photos, well over a hundred I bet. For me the observations were obviously similar to what I'd done in my previous catchment role but there was a switch, and I had more responsibility and things mattered in a different way now.

Llyn Fawr – Liz Rivers





Cant Clough in winter – Adam Reynolds

### **I know we love them all the same, but do you have a favourite child dam that you are responsible for as SE?**

**Liz** – it's all about the location isn't it! I have one in the Brecon Beacons, the dam's very old and interesting and the setting is so beautiful and peaceful, tucked up beyond one of the passes at Llyn Fawr. I've also got one down in Dorset near to the chalk man (Cerne Giant) on the hillside. The dam itself is a Flood Storage reservoir, so the walk round isn't that exciting but to stop and have lunch there is again beautiful. It has the added benefit of being quite sheltered, so I don't get battered by the weather. This might also explain why I take so many photos.

**Adam** – favourite child... I've got loads! Now due to my bricklaying past I'm a bit of an anorak for masonry. At Cant Clough, built in the late 1890s, the spillway has immaculate masonry structures; the blocks are still in the same place and the condition is as it was originally laid with 45° steps up the side and base of the channel. They are definitely my favourite steps! You see I've not just got a favourite dam but favourite dam features! The one that got away though was Sunnyhurst reservoir, located near to the Darwen Tower, Blackburn. It used to be my absolute favourite but United Utilities discontinued it in 2016. The views from there were great; you could see as far as the Blackpool coast and on a really clear day looking further north you see the hills of the Lake District... but then we cut a notch in the embankment and got rid of it.

**Rhys** – I'm quite lucky that some of mine are in nice places as they are ornamental ponds, but they do come with their own challenges. I've just taken on Stowe Park (Ten Acre Lake and Octagon Lake owned by the National Trust) which are challenging reservoirs safety-wise, but that being said they are unbelievably pretty reservoirs and very well maintained. They don't take long to walk over, and so you end up having very nice lunches and middle-class conversations with National Trust people as you walk round.

**Phoebe** – I bet there are nice cakes at those ones Rhys! Well, I've only got the four, so you are wanting most interesting or most beautiful? The most interesting I guess is the ash lagoon because I'd never been to one that wasn't filled with water. Here it's half full of coal ash with wood ash on the top half. You can completely walk on the surface, it's totally solid and unlike anything I'd been to before. The most beautiful site visits are the two on Orkney. They are a pain to get to, which I found out after several failed attempts to get there earlier this year. The ferry crossing was horrible and when I finally did arrive it was lashing it down with rain, but even so, it was such an amazing landscape and totally different from anything on the mainland of Scotland. A few weeks later I was annoyed to hear from the owner how it was now an entirely different climate, still mill-pond conditions, beautiful sunshine and blue skies.

### **In your short SE careers have you had any moments of concern?**

**Phoebe** – Four months into the role hasn't been long enough for anything to be too scary. The worst thing was probably during Storm Babet up in Aberdeen and just keeping an eye on the forecast during two days of red weather warnings. But luckily nothing scary so far and long may it continue.

**Adam** – I think that anytime you get a period of extreme weather or if it's raining heavily at night your thoughts begin to drift and you are very mindful about what's falling from the sky.

Early into the role I had been handed a reservoir near the Yorkshire border which had contractors working on site to install a downstream filter on the embankment. On the first day that I had taken the appointment, contractors had stripped off the topsoil and revealed potential evidence of leakage. I visited site and it was a minor concern in the end and was something we were able to investigate and manage.

**Liz** – a poignant question for me! I recently visited a site during very wet weather, so even access to the dam was difficult. I was aware the dam had a history of leakage, which is not unusual for these old structures, but things appeared worse during my visit. Back at the hotel that night I was going over my observations and putting it all together. I started to feel quite uncomfortable and had quite a restless night thinking about it. First thing in the morning I messaged the team and we went back to the site to check on it. We've followed up since also and put in some additional surveillance measures and made some contingency plans, so overall it's been productive and





Octagon Lake (National Trust) – Rhys Coombs

everyone involved has been really proactive. Guess it's a good example of how the process is meant to work.

**Rhys** – During a period of pretty bad weather I received a phone call, and it was the first time that the client had called me – typically it's the other way round. They told me about an 8–9m high non-stat embankment, and a tree located on the crest that had come down during the storm. I had warned them numerous times before about trees on the crest and I immediately thought, “Oh no, I think I know which tree it is,” but luckily it wasn't. The fallen tree was located on the downstream face and had uprooted, but luckily hadn't affected the crest. We managed to reinstate the slope and during the time I had made an ARPE aware of the situation just in case anything did happen.

For the owner this served as quite a nice “told you so” lesson as this incident was completely avoidable. For me it was maybe 10 seconds of terror and a stomach-churning moment but fortunately it didn't turn into anything further.

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#### The future – SE to ARPE?

**Phoebe** – at the moment I'm very new to it but if that's where my experience leads me then it's something that I'm keen to do and I've always thought that it's the next step after this. I guess we'll just see where the next ten or so years take me. I'm told the average wait in the firm is 7.8 years, so I've got a goal to aim at!

**Rhys** – if I was still working for a big consultancy then I guess it would be the expectation. It's a bit more difficult now because I'm in a position where I don't think I'd gain the necessary experience for ARPE. I don't do much design work these days and mostly concentrate on analysis, observations and reporting within the company and my SE role. One of my companies is specifically about change detection and visual inspection so I kind of feel like Supervising Engineer is the pinnacle of where I want to be. Things may change in the future.

**Liz** – I'd say no at this stage. I'm quite happy at the moment settling into the SE role. I look at my career development as a whole and want to get a good mix of the things I enjoy doing, things that I can give back at, where my skills really lie and push on to develop those things.

**Adam** – I'm enjoying my first appointment. It was always about getting established and being more comfortable in the role. I'll be putting my reapplication in next year and then have a think about a future role. It's difficult when you enjoy a job, to then aspire to other things. My working life has another 30–35 years to go – is this something I feel I can continue to do without changing roles or developing further till I retire? I'd like to think I can put myself in a better position for the future in case I wanted to pursue ARPE at a later date but at the moment I'm certainly in no rush.







## Equity, Diversity & Inclusion (EDI) Update

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 [www.ice.org.uk/about-us/who-we-are/diversity-and-inclusion](http://www.ice.org.uk/about-us/who-we-are/diversity-and-inclusion).

The Right Honourable Sir Harold Wilson once joked 'The only human institution which rejects progress is the cemetery'. With that in mind, let's recap on what progress has been made this year...

### International Commission on Large Dams (ICOLD)

Several of the committee were fortunate enough to attend the ICOLD conference in Gothenburg this year and reported back with news of a clear commitment to address the lack of gender diversity within the industry. The conference saw the launch of a new ad-hoc committee (ZA2) on gender diversity and inclusion, led by SwedCOLD president Maria Bartsch. We are in contact with the ad-hoc committee and will be looking to align ourselves on policy and ensure their outputs are shared and supported within the UK dams & reservoirs community.

### International Women in Engineering Day (INWED)

On 23 June, we were proud to put our support behind the women of Toddbrook in honour of International Women in Engineering Day. Colleagues from Canal & River Trust, Arup, Kier, and the Coal Authority met on site to share their thoughts on the day – see committee member Anthea Peters' piece on [page 24](#) for more details.



Young Professionals networking at ICOLD 2023 – Halil Ibrahim Kula, Hermann Stehle, Merlin Davis, Maddie Prendergast, Paul Dickens, Alice Davis, Michael McAree and Rachel Dawes



BDS Chairs Past and Present at ICOLD 2023 – Tracey Williamson, David Littlemore, Rachel Davies, Alan Warren and Peter Mason

### Young Professionals (YPs)

Earlier in the year we were glad to welcome a new cohort of YP Committee members, who are already making their mark. One exciting initiative is the new YP Forum, which will take place at Great George Street in April 2024, spearheaded by our new YP Chair, Rachael Lavery. Along with many other events throughout the day, including the International Lecture, we will be launching the BDS Allies network. The aim of this network is to provide a space for like-minded BDS members to share their experiences relating to EDI in the industry, to discuss these topics in a safe environment, and to work together to generate change. Look out for more information on this soon.

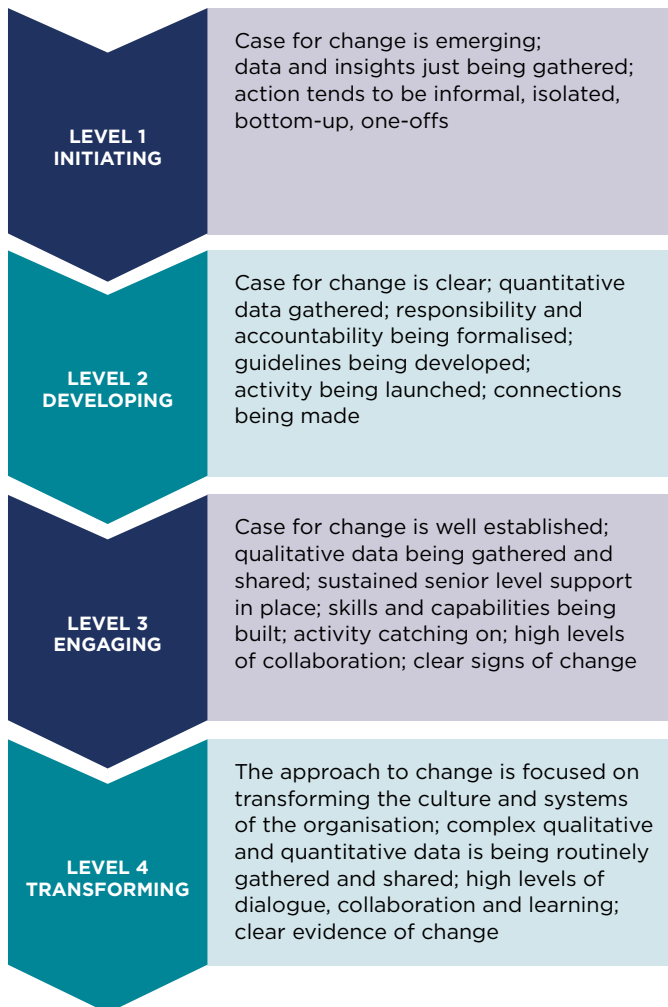
### EDI Resources

Thanks to committee member Rhys Coombs, the wheels are in motion for a new BDS website (watch this space). We are in discussions with the web developer to ensure that the new site meets both government and ICE standards on accessibility. The new website will feature a dedicated EDI page to signpost all things EDI-related, such as policies, resources, events and initiatives.

### Diversity and Inclusion Progression Framework (DIPF)

Those of you with excellent memories may recall the 2022 update, which introduced the DIPF (Fig 1) as a tool for monitoring our progression towards becoming a more diverse and inclusive organisation. At that time, we identified ourselves to be at Level 1, with minimal data and no clear system in place. We can now say that we are on the cusp of Level 2 and are optimistic about achieving this in 2024.





## Acknowledgements

The role of establishing and developing a framework for EDI within the BDS is no small undertaking, and thanks must go to those who have supported the initiative this year with their ideas and feedback; most notably our new BDS Chair Rachel Davies, whose passion for tackling these challenges has been of great encouragement.

As always, I am here to make the BDS a more open and inclusive space for you, so if you have any feedback or suggestions please feel free to reach out.

“All our members and staff should feel able to challenge prejudice, whether racism, sexism, homophobia, transphobia, ageism, ableism, faith-based or social class-based discrimination and approach their work with open and critical minds.”

### Amy Carter

Equity, Diversity, and Inclusion Champion  
[amy.carter@arcadis.com](mailto:amy.carter@arcadis.com)

Figure 1. Diversity and Inclusion Progression Framework  
 (Fairness Inclusion and Respect Committee, 2021)



Vyrnwy Dam – Ian Mach



## Celebrating International Women in Engineering Day 2023



Key women involved in the emergency response and restoration of Toddbrook reservoir

### **Anthea Peters, Arup**

International Women in Engineering Day was celebrated on 23 June 2023. This marked the tenth year for the event which aims to promote the amazing work that women engineers are doing across the globe.

To celebrate, the key women involved in the emergency response and restoration of Toddbrook reservoir met together on site in advance of the day to discuss their professional journeys, challenges and opportunities along the way and how we can help to encourage a more diverse workplace in the future.

The women involved came from the Canal & River Trust, along with Arup, Kier and the Coal Authority. Their visit to site was captured in a short video which is available to view on the Trust website and can be shared as a useful resource in raising the opportunities for careers and encouraging more women to consider engineering as a career path.

The theme of this year was #makesafetyseen. As an industry centred on the safety of dams and the protection of those living downstream, this year's theme was particularly relevant. The Toddbrook site visit and the necessity for the safety works were a pertinent reminder as to the importance of our role in society.

On the day itself, the Canal & River Trust hosted an online webinar, which was chaired by Arup and presented the career stories from some of the key team members from the Toddbrook project, before presenting a few key statistics and thoughts about the future of the industry, which was opened to the attendees for discussion and debate.

The industry is working to improve the diversity of its members and there are initiatives including ICE Connects, which is aiming to encourage more women to apply for FICE, with a target of a 50% increase on 2022 applications. At the recent ICOLD conference a special committee was announced with an aim to improve the proportion of women in the industry and the Women's Engineering Society, who host annual events such as INWED, but also celebrate the top 50 women in engineering, for which our first female All-Reservoirs Panel Engineer, Rachel Pether, was recognised in 2022.





## BDS Site Visit – Calverley Flood Storage Reservoir



BDS Contingent on site at Calverley FSR

The autumn technical site visit on 28 September saw a contingent of 26 from all corners of the UK meet up in Leeds to visit the construction works at Calverley Flood Storage Reservoir (FSR).

Calverley FSR is part of Phase II of the Leeds Flood Alleviation Scheme, complementing linear defences being constructed through the urban reaches of the River Aire. The FSR will provide online storage for 1.8Mm<sup>3</sup> of flood waters, resulting in an increase in the standard of protection of the scheme from 1% (1 in 100) annual exceedance probability (AEP) to 0.5% (1 in 200) AEP with allowance for climate change to 2069.

The visit started out in the centre of Leeds at the Mott MacDonald office, which located on the 7th floor has views over the River Aire and the city centre which will benefit from the scheme. Billy Sheehy, Shafiq Zalmay and Emily Hale (all of Mott MacDonald) presented an overview of the scheme, giving an insight into the design development: The FSR is formed by a zoned earthfill embankment dam constructed from site-won material. The dam spans the valley, interfacing with a live railway embankment and water utility assets. An online gated flow control structure provides active management of water levels within the FSR to attenuate the flow passing downstream. The presentation also touched on some of the challenges faced during construction, including working in the river, variable ground conditions encountered and interfaces with third party owned infrastructure. These were largely overcome through collaboration between the designers and site team working as part of the Bam Nuttall Mott MacDonald joint venture (BMMJV).

We donned our PPE and boarded a coach to travel to the Calverley FSR site, located approximate 8km north-west of the city centre. We were greeted by Rob Leivars and Kieran Headon from the Bam Nuttall

site team. Following a safety briefing, the tour of the site commenced, taking in the completed flow control structure, embankments and control buildings. Ongoing works observed included placement of Dycel mats for spillway protection, excavation in preparation for the embankment crest access road, connection of hydraulic lines and flood gate works, and the interface works at the interface of the dam embankment with an adjoining rail embankment. During the site visit, the 550 tonne crane required to lift the gates was in use for Dycel placement.

Although the weather was dry, rainfall over night had left the site muddy underfoot and so a trip to the bootwash was required before boarding the coach back to Leeds.

Thanks to all members who made the trip and to all our hosts for sharing their insight on the day.



View of the flow control structure and 550tonne crane from upstream



Rob Leivars (centre, BAM) points out some of the challenges of tying the FSR embankments into a live rail embankment



## German Dams – a visit by BDS members

These photos of German dams were taken a few years ago when a number of BDS members were invited to Germany to view the three dams targeted by the Dambusters' raid in May 1943, namely the Möhne, Eder and Sorpe dams, and to hear about the impact the raid had on these dams. The party also took the opportunity to visit other dams during the tour.

The BDS encourages liaison with dam professionals throughout the world, for exchange of knowledge to the benefit of all parties.



Möhne Dam – Andrew Pepper



Sorpe Dam drawn down – Andrew Pepper



Carlsfield Dam – Andrew Pepper



Eder Dam – Andrew Pepper



Eibenstock Dam spillway – Andrew Pepper





## Write for *Dams and Reservoirs*



**Have you ever thought about writing an article for the British Dam Society's technical journal *Dams and Reservoirs*? The journal is published four times a year by Emerald Publishing (having bought ICE Publishing in 2023), and is sent free of charge to BDS Members. However, it does require a continuous stream**

**of new papers to maintain that output, and clearly we BDS members need to be the main contributors, as it our journal. We do have some submissions from overseas, which are generally academic papers, but these are a relatively small proportion of the total.**

You will read elsewhere in this yearbook that ten Young Professionals took up the challenge of writing a paper

for the BDS Prize. Most had never previously written a paper for publication, but the standard of these papers was such that they will now be published in *Dams and Reservoirs* in 2024.

Every dam and reservoir, or study, is unique, and sharing your experiences of working on them may very well be of interest to other dam professionals – it may even provide ideas that readers find will benefit their own work. So think about what you might have to share with the wider profession, be it a project, a study or some research. How about having a chat with me to see how I think it could be presented? You don't need particular writing skills – that's how an editor can help. Also it doesn't have to be a long article – a short note about something interesting is just as welcome as a full-blown highly technical article.

It is said that a picture is worth 1,000 words, so photographs and diagrams help immensely for readers to understand what is written. These days every mobile phone can take good quality photographs, so when you are on site take some that will complement your text.

CAD engineering drawings that have been produced at A0 size don't really work in an article for the journal, but I can assist in creating simple diagrams from these that will show the key features, albeit without the numerous notes and minor dimensions that usually cover design drawings.

Graphs, typically from Excel, can also be used, but don't rely on colour to differentiate lines, as unfortunately we don't yet publish *Dams and Reservoirs* in colour, only in greyscale. Hence using different line styles is necessary.

If you have read an article in *Dams and Reservoirs* that you have questions about please send those in as a discussion note – I will then contact the author and both your questions and their response can be published in a subsequent issue. Similarly, if you have a useful contribution that complements a published paper, that can also be included as a discussion note.

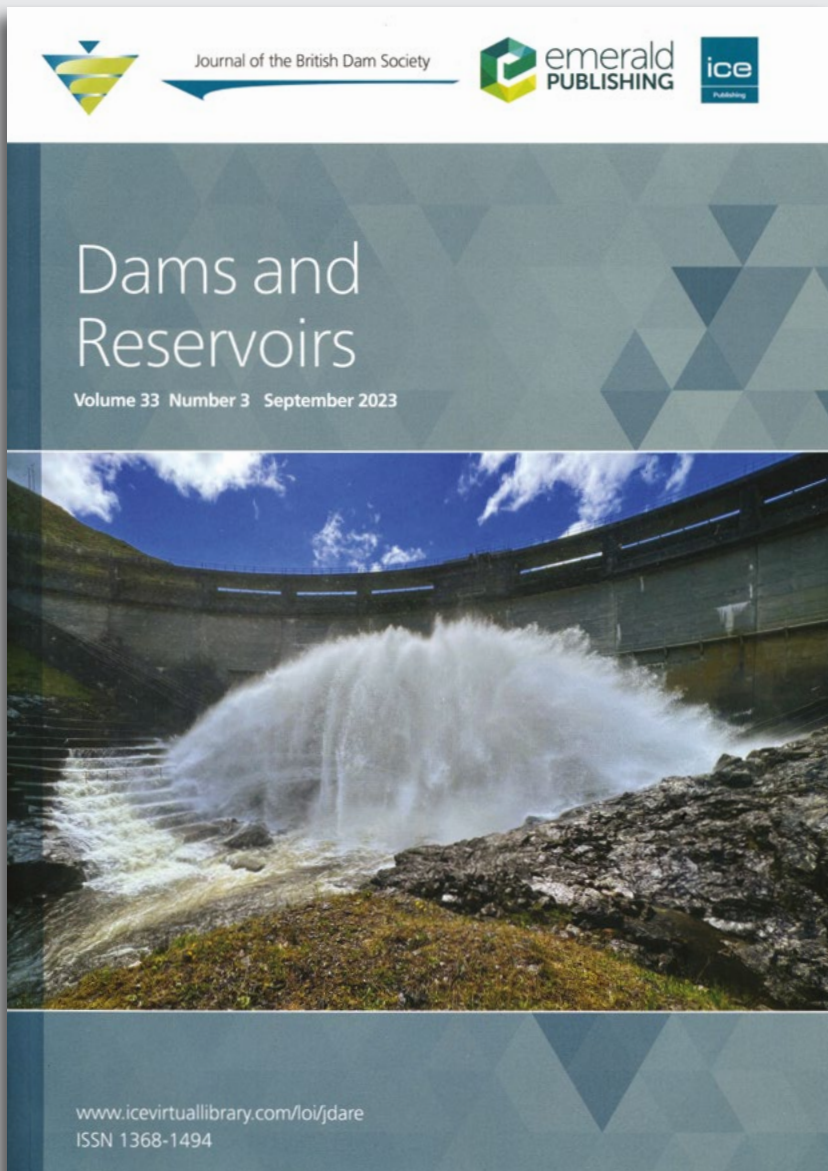
I look forward to receiving your offers of papers – or maybe just start with a call or email to discuss an idea for a paper.

**Andrew Pepper**

Editor, *Dams and Reservoirs*

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## Reservoir Safety Reform Programme

### Overview

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 programme will be delivered in a phased way over several years, by the Department for Environment, Food and Rural Affairs (Defra) and the Environment Agency (EA).

### The need for reform

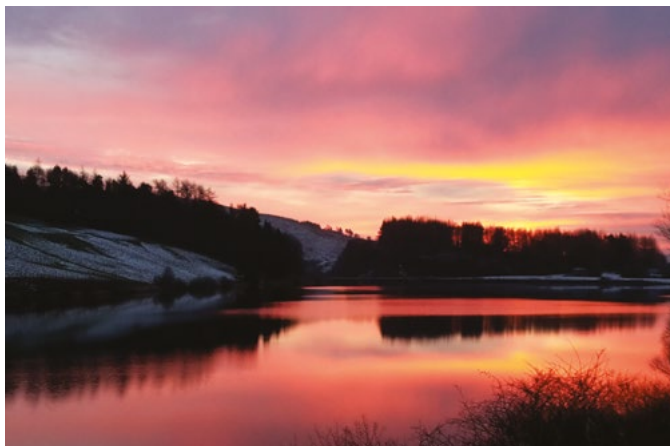
Reservoir safety is about ensuring the physical structure of a reservoir, its dams and embankments are safe. In England, around 2.2 million people are potentially at risk from reservoir dams failing and causing flooding which could endanger life.

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.

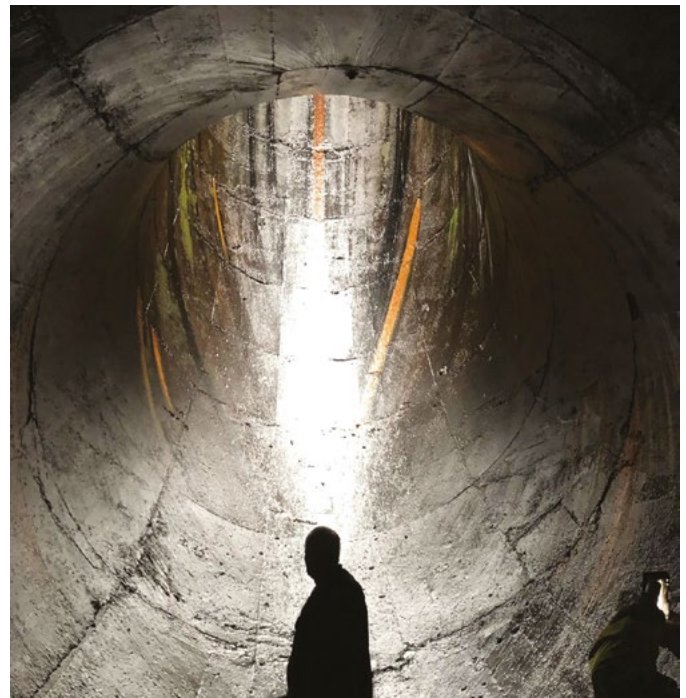
### Our vision for change

We have developed an overarching vision and set of aims that show the direction of the programme. We hope it will inspire all those involved in the delivery of these wide-ranging reforms, to strengthen and modernise how we manage and govern the reservoir industry.

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.



Castlehill Reservoir – Mark Mackenzie



Shek Pic Reservoir – James Blackhall

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.

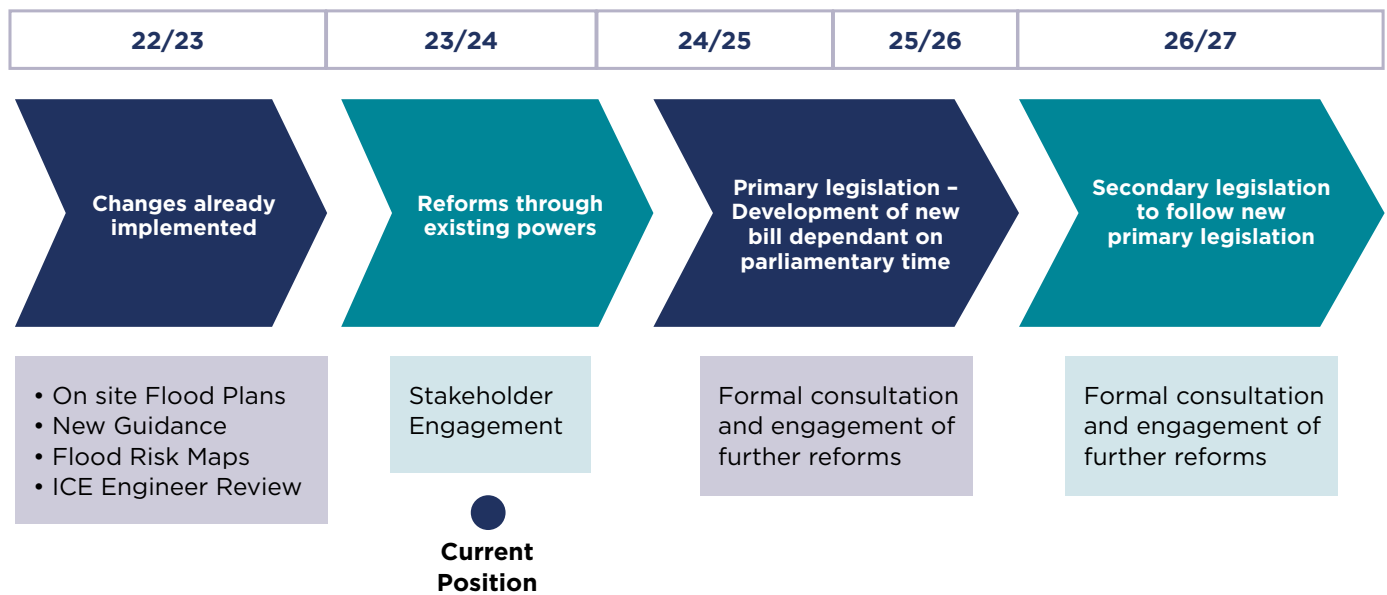
The reform programme aims to strengthen and modernise safety procedures. It will not change this overall three-way approach but will mean some changes for all these communities.





## Timeline for changes

The programme will be delivered over several years through new secondary legislation, guidance, and primary legislation (when parliamentary time allows). Timings are provisional and may change as the programme progresses. The details of what will be included in each legislative stage may change.

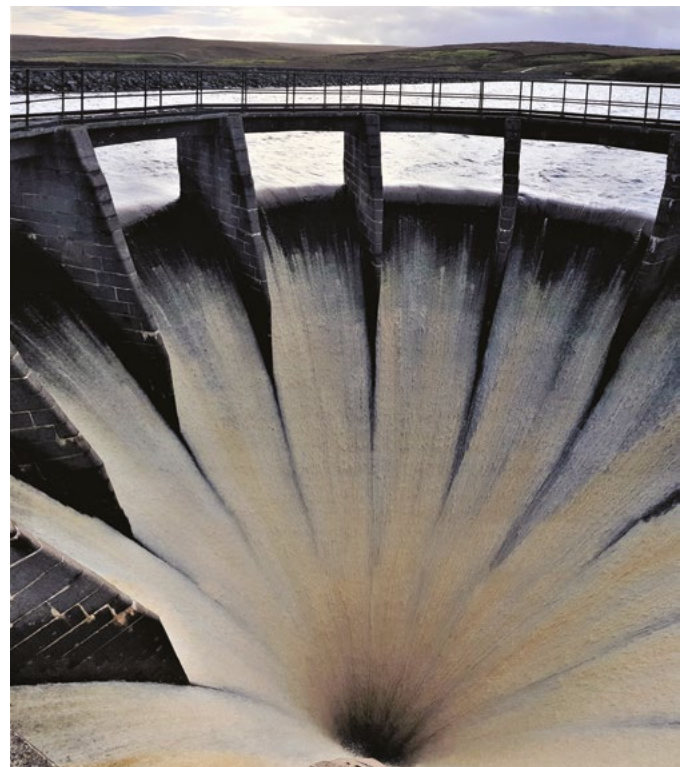


## How you can get involved

We will be engaging regularly with the industry and professional bodies such as the British Dam Society. We encourage you to share your views with your representative body so that 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: <https://consult.environment-agency.gov.uk/solent-and-south-downs/reservoir-safety-reform-programme>.



Balderhead Reservoir – Marcus Greenwood



## Reservoir Safety Research Advisory Group

**Dr Daniel Hine,**  
Environment Agency

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 (FCERM) R&D Programme (Defra, Environment Agency, Natural Resources Wales, Welsh Government). Its purpose is to advise on research, identify future R&D priorities, and to promote and publicise completed projects. ReSRAG is made up of representatives from across academia, industry, government, and other organisations. The group is always keen to hear from those in the reservoirs industry for their views and ideas on future research needs.

### Ongoing and recently published FCERM research

- All outputs are published at [www.gov.uk/government/organisations/flood-and-coastal-erosion-risk-management-research-and-development-programme](https://www.gov.uk/government/organisations/flood-and-coastal-erosion-risk-management-research-and-development-programme)
- **Extreme Flood Hydrograph Estimation and Extreme Flood Estimation** – Stage 1 to assess the suitability of existing methods for estimating Probable Mean Precipitation (PMP) and Probable Mean Flood (PMF) and develop new methods and guidelines to ensure that we understand the risk posed to our highest risk reservoirs from extreme flood events is complete. The full report is expected to be published Summer 2024.
- **Scoping research to improve dam and levee breach prediction** – This report reviews breach processes relating to levees and soil dams. It also includes a prioritised list of proposed future research to provide an improved understanding and estimates of potential consequences of dam failure and release of a reservoir. This was published in Spring 2023.
- **Benefits in removing or adapting redundant reservoirs** – This project considers not only discontinuance, but also adaptation of existing reservoirs for different uses. It draws on a wide number of existing case studies to provide a good practice overview. It is expected to be published in spring 2024.

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



Vee-notch weir measuring toe drainage – Ian Hope

### Ongoing and recently published CIRIA and ICOLD research

- **Siphons in dams – design, installation, operation, management and testing (C813)** – This addresses the demand for comprehensive information and guidance on siphons, offering valuable insights into the design and installation of retrofitted siphons at reservoirs while covering aspects of operation, maintenance, inspection, and testing.
- **InSAR and Earth Observation Techniques for Infrastructure (C805)** – This describes the different techniques available and how to use them, with case studies to illustrate a variety of applications.
- **CIRIA proposals for 2024:**
  - **Geotechnical Slope Drainage** – will examine the criticality of drainage for slope stability under climate change and extreme weather events
  - **Geosystems** – an update to previously published WRAP guidance on the use of geosystems for engineering application
  - **Engineering in Chalk** – an update of C574.
- **Internal Erosion of Existing Dams, Levees and Dikes, and Their Foundations (ICOLD B164 Vol 2)** – ICOLD has published the second part of the Bulletin 164 which provides case histories, investigations, testing, remediation and surveillance. This gives invaluable information to those managing internal erosion.





## CEATI (the Centre for Energy Advancement through Technological Innovation)

The Dam Safety Interest Group (DSIG), a sub-group of CEATI, is made up of more than 70 dam owners and regulators from across the world. Tony Deakin was recently invited to join the DSIG's Executive Committee, and The Environment Agency is already an active and contributing member of this group. Through international collaboration, the DSIG members aim to improve the safety of their dams, investigate new technologies, and address day-to-day issues including regulatory performance.

We currently contribute £7000 annually into a small project fund. With over 70 members that equates to the UK industry having access to £490,000 of research and development (R&D). Our last large project involvement was the delivery of the "Investigating the Structural Safety of Cracked Concrete Dams" project. This was delivered in partnership with three other DSIG members (two from the USA and one from Sweden). This is a great opportunity to deliver R&D work with substantially reduced costs, whilst also enhancing the UK's international reputation.



Recurved wave wall at Barrow No 2 Reservoir, Bristol – Craig Goff



Munnoch Reservoir Discontinuance – Ryan McHugh

## What's next?

- **A Standard Methodology for estimating loads on and the behaviour of reservoir wave walls of various types and shapes** – This FCERM project has previously been prioritised and is likely to be the next project to start. It will 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.
- **Hole Erosion Testing (HET)** – The University of Sheffield is planning to construct HET apparatus for use in determining erodibility of soils to better inform assessments of internal erosion. The project team is looking to undertake testing of UK dam fill materials and is seeking collaborators to join the project.

## Committee Representation

The period which committee members serve is not fixed and new members are welcome at any point in the year. There are currently vacancies on the committee. We are keen to hear from members of the industry who are interested in joining the group and help inform ongoing research needs for the benefit of the reservoirs community.

## For further information

**Environment Agency FCERM Programme and ReSRAG Membership** – Dr Daniel Hine, [daniel.hine@environment-agency.gov.uk](mailto:daniel.hine@environment-agency.gov.uk)

**CIRIA** – Dr Andy Moores, [andy.moores@ciria.org](mailto:andy.moores@ciria.org)

**CEATI** – Tony Deakin, [tony.deakin@environment-agency.gov.uk](mailto:tony.deakin@environment-agency.gov.uk)

**University of Sheffield HET Project** – Dr Elisabeth Bowman, [e.bowman@sheffield.ac.uk](mailto:e.bowman@sheffield.ac.uk)



## ICOLD Technical Excursion

**Merlin Davis**, Senior Reservoir Engineer,  
Canal & River Trust

I was very excited to attend my first ICOLD in Gothenburg and ensured I utilised every opportunity to learn and network. Three days of committee meetings, workshops, and symposium sessions were exhausting. Hence, the one-hour bus journey from Gothenburg to the Trollhättan Locks was calming and relaxing. The scenic route followed the banks of River Göta Älv, which drains the largest lake in Sweden, Vänern. Vänern is the largest lake in Western Europe, a part of the North Sea that was trapped after the Ice Age.

### Trollhättan Locks

We arrived at the Trollhättan Locks, originally part of eight world wonders when built in 1800! Having spent three years at the Canal and River Trust in the UK, I was curious how the Swedish canal lock would amaze me. To my surprise, the sheer size of the canal itself was breathtaking, not to mention the deep rock-carved locks which serve as a world-class industrial relic. Between the dramatic landscape shaped by ancient forces of nature, there lies three parallel sets of locks that are time-stamped from 1800, 1844 and 1916, getting broader and deeper with each step.

Our guide was keen to impress the group of engineers with all her data on canal navigation. The first canal lock was opened in 1800 on 14 August and could take 140 tons at a time. Göta Kanal opened in 1832, which gave a reason to build a better and bigger lock next to it that could carry 300 tons at a time. By 1916, the demand increased, making them build another lock parallel to the other two locks that could handle 4,000 tons! By then, Trollhättan canal was 82km long with a rise of 44m, negotiated by six locks on the way to Gothenburg that moved the wood, iron ore and paper up and down to Gothenburg.



Overlooking the Trollhättan locks from the overgrown 1800 one to the approach to the newer locks



Oldest rock carved canal lock opened in 1800

### Net Zero Targets

I was amazed that Sweden's net zero targets aim to increase the Canal Navigation for moving cargo. Sweden's rail network is a bit tired, and the quickest way to take lorries off the highways is to move the non-urgent loads through the canals. Ten ships pass the channel daily with about 11,500 tons, which equals 500 trucks on the road. I couldn't help thinking why we do not look at it this way in Britain. But we haven't got Lake Vänern that can supply an unlimited amount of water. After struggling to keep the channels open in the UK during the 2022 drought, I wish we had engulfed a big lake during the ice age. I guess it's a bit too late now.

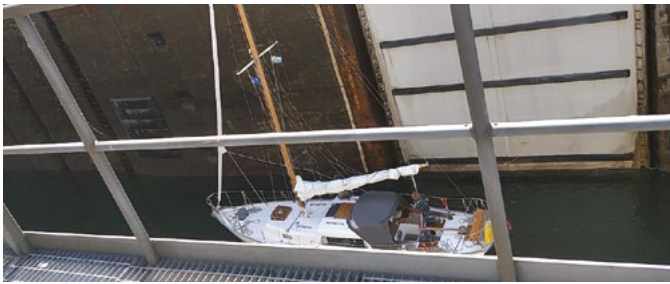
My thoughts were broken when the announcement came that the locks would be operated. I was ready to witness the mega locks work while the big log-loaded vessel crossed these world-famous locks. To my amusement, a small leisure boat, half the size of a typical UK canal narrowboat, turned up! What a waste of water, I thought to myself, but they have got plenty in Lake Vänern, so why bother about a few extra litres!

After all the sightseeing, we were taken to the canal museum, where they spoke more about their proud national monument. The museum displayed the glorious life of Swedish industrial life back in the 19th century. We were asked to sit quietly in the mini theatre, where the Swedish Transport Administration representative explained their most significant problem with the locks.

### Sweden's Serial Lock Problem

During the construction period in heavy winter, snow seemed to accumulate on the fresh layer of concrete. They had to pour 90°C water onto the concrete the following day to remove the snow. This, coupled with a lack of steel reinforcement, has caused serious deterioration to the concrete including leaching. Hence, the verdict was that the 'new lock' made in 1916 has





Leisure boat crossing the new lock opened in 1916

reached its end of life. They must find a way to build a new, better, bigger lock. But there is no space in the hilly terrain of Trollhättan. So, they have been pushed to find another challenging route requiring 6 million cubic metres of rock removal that will cost a squillion for a fourth lock. No wonder this has created political turmoil in Sweden. I could very well relate to how a new transport line can throw the nation into debate. You can follow the progress at [www.trafikverket.se/slussaritrollhattekanal](http://www.trafikverket.se/slussaritrollhattekanal).

One of the German delegates was brave enough to ask “Why can’t you reuse the now-disused canal locks from 1800 and 1844?” “Oh, we tried that, only to get a big ‘No’ due to heritage reasons!” said the project representative. I could feel the rumble in the room about the carbon footprint that heritage is causing. It got me thinking about whether heritage is a real blocker for sustainability? I have encountered the heritage requirements while critical reservoir safety works are undertaken. We usually come to a common ground after a good conversation. Still, I wondered if there is a standard assessment tool that could compare the heritage value against the future investment and whole-life carbon.

After a nice lunch in the floating restaurant, we returned to the coach, which took us to the Lilla Edet Dam.

### Lilla Edet Dam refurbishment

Lilla Edet Dam is at a hydropower plant owned and operated by Vattenfall (**Power plants: Lilla Edet – Vattenfall**) situated on the Göta Älv since 1926 to supply power for the railway line to Gothenburg. This 90m long, 10m high concrete dam has entered its end of design life due to deterioration despite the efforts to keep it alive by grouting. With the recent developments in hydrology, they also realised that the spillway is inadequate to safely pass the designed flood of 1 in 10,000 years. This meant they now needed four floodgates instead of two. They need to do all the upgrade whilst keeping the power plant functional! It sounds like a challenge, but not in front of the willpower of Swedish designers. Though I was excited to get out to the site, I chose to hear more about it while waiting for the first batch of visitors to return.

### Flood Safety

To start with, Vattenfall had to adjust the level of Lake Vänern, which has a mighty area of 5650km<sup>2</sup>. The construction works were designed to withstand a 1 in 100-year flood. Anything above this would warrant

sacrificing the works! This led to a few raised eyebrows in the room.

The triangular alignment of the existing dams allowed them to design and build a cofferdam for a section while keeping the existing floodgates open. This was achieved with the help of 10 divers to help them drive the piles to the bedrock with underwater concreting. Continuous water quality monitoring was undertaken to comply with the environmental legislation during this activity.

In the second stage, the newly built section of the dam with floodgates will operate while they tackle the remaining section of the dam which has the existing floodgates. This continuous programme meant working through winter. When asked, they mentioned that pipes with hot water will prevent frost during the winter.

### Climate Enhanced Concrete

A 120m long new concrete dam required 8000m<sup>3</sup> of concrete, that accounts for a major proportion of the carbon footprint of the project. The designers went to test supplementary cementitious materials (SCMs) to reduce the carbon footprint of concrete. They tried different materials (fly ash, ground granulated blast-furnace slag, volcanic ash and silica) to find that fly ash was the best to resist early thermal cracking while promising 100 years of durability. They collaborated with the supplier to produce this on an industrial scale and tested the constructability with a mock-up of a concrete beam.

After all these exciting presentations, I was ready to wear the PPE and witness the construction work. We were told that no labourers should be photographed in close vicinity that can reveal their identity. I was impressed by their commitment to the legislation, possibly triggered by the presence of non-European delegates who might be alien to the EU laws. I could see the sheet pile cofferdam and steel reinforcement in place for the concreting. It was a busy construction site with dump trucks and loaders moving around doing their important job to keep the project on programme.

### Lilla Edet Dam Refurbishment

I can’t thank our hosts enough for those delicious cinnamon buns and coffee when we headed back to the site office! That was a lifesaver to kick us back into our senses after exposure to the sun. I wish I could find similar buns when I get back to London. I had a good nap on the drive back and was ready for the Young Professionals evening!



Lilla Edet Dam Refurbishment



## ICOLD Technical Bulletins

**The British Dam Society forms the UK National Committee of ICOLD (International Commission on Large Dams) which is a worldwide non-governmental organisation providing a forum for the exchange of knowledge and experience in dam engineering. ICOLD was founded in 1928 and currently has 104 member states, with approximately 10,000 individual members.**

### Technical Committees

A key benefit of being a member of ICOLD is the ability to access Technical Bulletins on a wide range of dam-related topics. These are produced by Technical Committees comprising members from a number of National Committees throughout the world having expertise in a particular topic. Each Technical Committee produces a Technical Bulletin with 'state of the art' recommendations for engineers, using knowledge and examples from around the globe.

### Recent Technical Bulletins

Three recent bulletins are summarised here as examples, but information on all other bulletins is available on the ICOLD website [www.icold-cigb.org/GB/publications/bulletins.asp](http://www.icold-cigb.org/GB/publications/bulletins.asp).

#### Bulletin 162 – Environmental Fluid Mechanics

Dams are planned, constructed, and operated to meet human needs – generation of energy, irrigated agricultural production, flood control, public and industrial supply, supply of drinking water, and various other purposes. Dams impound water in reservoirs during times of high flood that can be used for human requirements during times with inadequate natural flows. Positive impacts of dams are improved flood control, improved welfare resulting from new access to irrigation and drinking water. Without dams there would be insufficient food to feed the world's people and energy would be generated by burning fossil fuels that produce greenhouse gases.

Despite this progress there remain significant concerns about the environmental impacts of dams. These environmental impacts are complex and far reaching, many being remote from the dam, and may occur concurrently with the dam construction or later, and may lead to a loss of biodiversity and of productivity of natural resources.

This bulletin compiles improvements in knowledge and state of the art technology to avoid or mitigate environmental impacts of dams on the natural ecosystem, as well as to the people that depend upon them for their livelihood, and also addresses the mitigation of environmental impacts on dams and reservoirs. The bulletin was compiled by a small sub-committee of the Technical Committee on Hydraulics for Dams. The UK was not represented on the sub-committee, but Viktor Pavlov is the UK representative on the main committee, with Paul Dickens co-opted

#### Bulletin 178 – Operation of Hydraulic Structures of Dams

This bulletin is an update of previous bulletins from 1984 and 1986. The current update was prepared using developments and progress made in the last 30 years with operational equipment, staff building and training, and regulatory requirements. The bulletin addresses the need for safe reservoir discharge under a variety of conditions; the dam operator's staffing; inspection and evaluation of the condition of operating equipment; and operation during unusual or extreme conditions. The last condition is generally focused on floods and covers the current abilities to predict significant precipitation events, monitor the flood approach and impact, and communicate and implement the actions needed for safe operation. An annex is provided with seven case studies, from Africa, Asia, Europe and Central and North America, that provide relevant histories for the subject matter.

Craig Goff is the UK representative on the Technical Committee that produced this bulletin, with Chris Restorick-Vyse co-opted. The bulletin front cover photo is of Pontsticill Reservoir's bellmouth spillway, a former BDS Photography Prize winning entry by Alexandra Murphy, and which is now used as the basis for the illustration on the front cover of this Yearbook.





## Bulletin 180 – Dam Surveillance – Lessons learnt from case histories

By means of 80 case histories, this bulletin presents the vast experience gained over past decades by the dam engineering community in the field of dam surveillance. The documented case histories endeavour to cover the practical experiences related with one or several of the following points:

- a) Methods for the improvement of the quality and reliability of information.
- b) Data processing and representation techniques.
- c) Effective Diagnostic analyses to determine behaviour patterns.
- d) Dedicated surveillance systems for the optimization of maintenance, rehabilitation, and other life cycle costs.
- e) Impact of surveillance on preventing dam incidents and dam failure.
- f) Overview of dam surveillance management systems.

The case histories cover a wide variety of technical aspects and deal with success stories but also incidents, some of them with catastrophic consequences. The time framework spans over 70 years: from the times of the Second World War up to the present. The purpose is to learn from these practical experiences, not to criticise the individuals involved, who had to work with the techniques and rules of practice available at the time. This bulletin contributes to ongoing learning from the experiences of the dam engineering community, specifically in the field of dam surveillance. Some of the case histories are widely known and have been described and analysed in numerous publications. Most of them are related to famous dam failure incidents and were compiled as international “benchmark case histories” for this bulletin to focus on the specific lessons learnt related with dam surveillance. Ian Hope is the UK representative on the Technical Committee that produced this bulletin.



Maentwrog New Dam – Andy Courtcnadge



Black Esk Reservoir – John Ackers

## Access to ICOLD Bulletins

All Technical Bulletins are available free of charge to the ICOLD membership (which includes all BDS members), with currently over 170 bulletins having been published since 1960. BDS members firstly need to register with ICOLD to gain access to any publications, so please obtain the necessary details for UK members from the BDS Honorary Technical Secretary, Andrew Thompson, on [hontechsec@britishdams.org](mailto:hontechsec@britishdams.org).

There is then an ICOLD Publications Portal to be negotiated with another login, again available from the BDS Honorary Technical Secretary, which will give you access to all the free publications (for download) and member-only discounted rates for chargeable publications, such as recent Congress proceedings or hard copies of bulletins.



Middle South Woodburn Reservoir – Niamh McElroy



ICOLD 2024



जल शक्ति मंत्रालय  
जल संसाधन, नदी विकास और गंगा संरक्षण विभाग  
भारत सरकार  
MINISTRY OF JAL SHAKTI  
DEPARTMENT OF WATER RESOURCES,  
RIVER DEVELOPMENT & GANGA REJUVENATION  
GOVERNMENT OF INDIA



विद्युत मंत्रालय  
MINISTRY OF  
POWER

2<sup>nd</sup> Information  
Brochure &  
Call for papers

**Event Date Rescheduled**

New Delhi, India

29<sup>th</sup> September - 3<sup>rd</sup> October, 2024



92<sup>nd</sup> ICOLD Annual Meeting & International Symposium  
on

**Dams for People, Water,  
Environment and Development**

New Delhi, India, 29<sup>th</sup> September – 3<sup>rd</sup> October, 2024



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# ICOLD 2024 Theme: Dams for People, Water, Environment and Development

## Integrated Reservoir Management (Basin Approach)

- Synchronous operation of multiple dams in the same river basin – flood control, storage optimization, optimization of hydropower generation, etc
- Data Acquisition, Data Sharing, monitoring and decision making for Integrated Reservoir Management.

## Dams and Renewable Energy

- Economic contribution of dam-based renewable energy
- Pumped storages hydropower
- Dam-based renewable energy and sustainability.

## Dam Safety Management and Engineering

- Dams – perceptions and realities of risk
- Risk Informed Dam Safety Management – The Systems Approach
- Whether there should be uniform criteria for design of new dams and safety assurance of existing dams – logical issues, benefits, limitations, consequences, etc
- Dealing with hazard and risks in the context of developing societies
- Dam safety real-time safety assessment, inspection and monitoring
- Resilient dams for safe communities.

## Dams and People

- Long-term impacts
- Multiple uses of dams and reservoirs in consideration of water security, flood control and allied benefits of dams on water security and economy of communities
- Economic opportunities associated with dams, reservoirs and hydropower plants for local communities
- Tourism opportunities with dams and reservoirs.

## Dams and Climate Change Adaptation

- Adaption measures – Revision in Design flood, Dam hydrology and spillways; Case Studies
- Optimizing reservoir operation in consideration of water security, protection of communities from flooding, river ecology and addressing conflicting interests of stake-holders

- Global guidelines and national approaches
- Occurrences of extreme events and their causes.

## Dam Engineering and Construction

- Advances in analysis and design
- Challenges in construction of dams and their solutions
- Advances in spillways and energy dissipation arrangements
- Addressing Challenges related to dam foundations
- Roller Compacted Dams
- Tailing Dams.

## Dam Rehabilitation and Improvement

- Diagnostic analysis and Rehabilitation of aging dams
- Residual life assessment of dams
- Underwater robotic inspection for health assessment of dams
- Digital asset management by use of augmented and virtual reality platforms for safety of dams
- Advanced materials for rehabilitation and improvement of dams.

## Evolving with modern technology for construction of dams

- Advanced materials for construction of dams
- Building Information Modelling (BIM) and use of Drones for efficient construction progress monitoring of dams
- Integration of conventional construction equipment with Robotic technology for building dams in time and cost-effective manner.

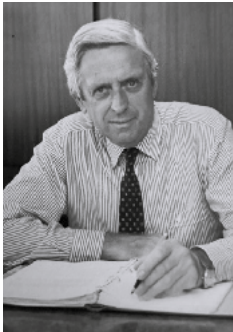
## Environmental and Social Aspects

- Ecological considerations in planning, design, construction and operation of dam and hydropower projects
- Environmental enhancement during heightening and upgradation
- Stakeholder involvement in environment management of dam and hydropower projects
- Sustainable development through dams and hydropower.





## Obituary – John Bowcock



John Bowcock  
MA FICE

(1931–2023)

John Bowcock, who has died at the age of 91, was chairman of the British Dam Society in 1992/3. He became a member of ICE in 1960 and a Fellow in 1971. John was born in St. Leonard's

on Sea in Sussex on 25 October 1931, and educated at Hastings Grammar School and St. Catherine's College, Oxford, where he graduated with first class honours in engineering science in 1953. He joined the Royal Air Force in 1953 and after three months at the Officer Cadet training Unit in the Isle of Man, he trained aircraft apprentices at Halton in Buckinghamshire until 1956, during which time he married Pauline. In 1957 he started working for the international firm of consulting engineers, Sir Alexander Gibb and Partners (Gibb). He initially worked in the firm's London office on the design of the Kariba 600 MW Hydro-Electric Scheme, a project on the Zambesi River, in the then newly formed Federation of Rhodesia (now Zimbabwe) and Nyasaland. The project included a large underground power station and a concrete arch dam which created one of the largest man-made lakes in the world. In 1958 he was appointed to the site supervisory staff at Kariba where he lived with his family for the next three years. He left Kariba in mid 1961 and later that year was sent by Gibb to the Roseires Dam project in the Sudan. This project was in a remote location on the Blue Nile, about 200 miles from Khartoum and close to the border with Ethiopia. He was appointed as Resident Engineer on the concrete section of the dam.



John Bowcock in Kariba with young engineers



John Bowcock in the Okavango Delta

In 1964 he was appointed to the site staff for the Latiyan Dam in Iran. The project, located about 25 miles east of Teheran, consisted of a high concrete buttress dam, hydro-electric power station and long tunnel for conveying water to Teheran. In 1965 he was appointed Senior Resident Engineer for the whole project. In 1968 he returned to the UK and worked on studies and designs for overseas projects located in Argentina and Botswana. He was relocated to Johannesburg in 1970 as Gibb's representative, running the operations of Gibb Hawkins and Partners. This firm was a joint venture with a South African firm of Hawkins, Hawkins and Osborne set up initially for two major dams on the Orange River (the Hendrik Verwoerd, and P.K. Le Roux. Dams). At the time of arrival, the first of these was about 50% complete and the second was about to begin. He remained in South Africa until 1978. During this period the activities of Gibb Hawkins were expanded to include Hazlemere Dam in Natal, design work on the Ruacna hydro-electric project in Namibia and the large Drakensberg pumped storage Project in South Africa.

In 1978 he returned to Gibb's head office in the UK, located in Reading and was appointed a Partner in the firm. Until his retirement he was the Partner/Director responsible for various overseas projects in Argentina and Africa, including the Lesotho Highlands River Project, a project built primarily to supply water to South Africa but also to meet all of Lesotho's electricity demands from a hydro-electric power station. The project included the 180-metre high Katse Dam, a 50km long water transfer tunnel and the power station.





During the period 1978–95 he was also involved with marketing the firm's activities in America, Asia and Africa, which involved extensive travelling throughout these regions.

In 1989 Gibb became part of the US firm, the Law Companies Group from Atlanta Georgia. Gibb retained its own identity but incorporated and became a limited company. John was appointed a director and Chief Executive of the company in 1989 and became chairman in 1993. At that time "Construction news" reported: "In giving the chairman's job to civil engineer John Bowcock, Sir Alexander Gibb and Partners has installed a bridge between the old and the new worlds of consulting engineering."

From 1978 onwards while based in the UK he took an active role in various professional organizations including the British Dam Society (chairman 1992–93); British Consultants Bureau (chairman in 1992); Association of Consulting Engineers, whose function was to protect and enhance the position of consulting engineers both in the UK and through its membership of FIDIC (chairman 1995); and FIDIC's contract committee (chairman from 1994–2004). During this period, he had overall responsibility for a major revision of FIDIC's internationally recognised conditions of contract. For this work he was given FIDIC's Prangey award in 1999. Following retirement from full time work with Gibb in 1995 he practised as a private consultant involved with projects in Eritrea, Pakistan and Abu Dhabi.

John attributes his early aspirations for a career in civil engineering in part to an Oldham's Press publication "Triumphs of Engineering", being attracted by the "sustainable" aspect of hydroelectricity long before the word "sustainable" was used in its present context. He was particularly interested in the Boulder dam project on the Colorado River, and by the dams, hydro power stations and irrigation scheme undertaken by the Tennessee Valley Authority. The various projects in which he had roles as his career developed all contributed significantly to the well-being of the whole population of the countries involved.



John and Pauline Bowcock in Rio

After retirement, golf became a major focus, and accompanied by his golden retriever Sheba, he made many friends at Huntercombe Golf Club. He also ran a bridge club composed of gentlemen from the Henley area. For a time he was governor of Shiplake College and worked for Huntercombe Young Offenders Institute on a "one to one" coaching of young offenders in numeracy and literacy.

Family was all important and he is survived by his wife Pauline of 68 years, his daughters, Anne, Susan and Jane, by ten grandchildren, and by four great-grandchildren.

**Anne Bowcock, 24 April 2023**



John Bowcock at a Kariba reunion



## BDS Corporate Membership

### The benefits of BDS Membership

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 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 biennial conferences and Supervising Engineers' forums, as well as a programme of technical meetings in London and the regions throughout the year, provide an opportunity for the exchange of experience and information while meeting other professionals, clients, competitors and suppliers.

The evening technical meetings in London 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.

A new initiative for 2024 is the Young Professionals' Forum, aimed 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.

All these events provide valuable opportunities for the continuing professional development (CPD) to our individual members and to the staff of our corporate members.

### Additional benefits to Corporate Members

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

- Three named representatives, each of whom has all the privileges of individual members, including hard copies of the Society's *Dams and Reservoirs* journal and access to the BDS Members' Area on the BDS website as well as the ICOLD Members' Section on the ICOLD website, where many of the Technical Bulletins can be downloaded free of charge
- 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 BDS 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](mailto:stephen.lockett@mottmac.com).

The subscription fee for a Corporate Member of the British Dam Society for 2024 remains at £375 per year.

To apply for Corporate Membership, please download the BDS Corporate Membership Application Form from the BDS website at <https://britishdams.org/about/corporate-membership> and return completed forms to the BDS Secretary at [bds@ice.org.uk](mailto:bds@ice.org.uk).

Where a full page of a corporate member's activities has not been included in this yearbook, [pages 65 and 66](#) give brief details of the capabilities of some of our other corporate members and provides contact details for each one.





## Llyn Llywelyn Beddgelert Forest, Snowdonia

© Natural Resources Wales

### Dam Safety + Social Value

In support of Natural Resources Wales's aims to protect landscapes that support biodiversity and reconnect people with nature, Arup delivered the design and associated ecology services needed to avoid discontinuance, meet dam safety measures, and retain the social value provided by Llyn Llywelyn for future generations.

Our design involved three main elements:

- A replacement for the undersized spillway; incorporating a two stage weir and associated RC structure, fish ramps, eel passage, penstock for drawdown, telemetry integration and a new wider span timber bridge.
- Raising sections of the embankment and downstream dry stone retaining wall to provide sufficient freeboard and improved accessibility for the public.
- Pressure grouting the predominantly peat fill embankment to reduce permeability and address concerns around seepage and leaks.

With measures in the interest of safety certified and all works complete, the reservoir and the Yr Wyddfa (Snowdon) backdrop are ready to be enjoyed by both wildlife and visitors once more.

### About Arup

Arup was formed in 1946 and is a global firm of consulting engineers, planners and scientists 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. We have delivered projects for central and local government, international funding agencies, water utility companies, banks, and design and build contractors. We have also worked for research organisations including CIRIA and DETR to produce guides on many aspects of dams and reservoirs design and maintenance.

Find us on social media:

**LinkedIn:** [linkedin.com/company/arup/](https://www.linkedin.com/company/arup/)

**Twitter:** @ArupUK

**Instagram:** @arupgroup

**Facebook:** @ArupGroup

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AtkinsRéalis

### King George V Reservoir, Thames Water

Located in North London, the reservoir forms part of the Lea Valley group of raw water storage reservoirs.

A seepage survey completed in 2020 identified potential seepage paths through the clay core along a substantial length of embankment.

AtkinsRéalis provided services ranging from the design and supervision of ground investigations, the detail design of a new sheet pile cut-off wall and provision of support during construction.

*Photo courtesy of Sheet Piling (UK) Ltd*



### DELIVERING DAMS, RESERVOIRS AND HYDROPOWER PROJECTS AROUND THE GLOBE

As a world-leading engineering professional services and project management company, our heritage of delivering excellence stretches back over a century. Our roots trace back to two formerly separate companies: SNC-Lavalin, and Atkins.

Our experienced dams and reservoirs team is actively engaged in a full range of services associated with reservoir engineering and dam safety and covering a wide array of reservoir types and uses in the UK and internationally.

- RESERVOIR PLANNING
- NEW BUILD RESERVOIRS
- STATUTORY INSPECTIONS & SUPERVISION
- ASSESSMENT, INVESTIGATION AND STUDY
- ASSET IMPROVEMENTS
- WHOLE LIFE MANAGEMENT

Our work provides significant opportunities for career development across a wide range of skills, including development to panel engineer status.

Our growing UK team is part of a 250-strong international practice with pedigree that comes from designing, constructing, and refurbishing reservoirs around the globe; including 200,000 MW of hydropower across over 100 such projects completed in the last 10 years.

Contact us to find out more about **AtkinsRéalis** and our capabilities:

+44 (0)7834 507403  
mike.hughes@atkinsrealis.com  
[www.atkinsrealis.com](http://www.atkinsrealis.com)





Enhancing lives, communities and the environment



## Pen-y-Gwaith reservoir

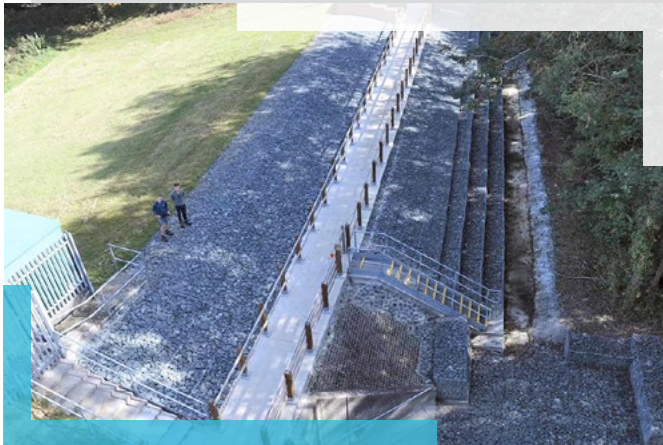
Binnies UK Ltd was commissioned to undertake the design of improvement works at a historical mining reservoir known as Pen-y-Gwaith reservoir, located within a SSSI in Snowdonia National Park and at the head of a cascade of further small mining reservoirs.

The improvement works enabled Pen-y-Gwaith reservoir to pass flows safely and satisfy measures in the interest of safety, and largely brought about by the legislative change in threshold capacity from 25,000m<sup>3</sup> to 10,000m<sup>3</sup> in Wales. The design works centred on raising the existing 75m long embankment dam and provision of a new spillway to enable the reservoir to pass flows safely. A new permanent drawdown facility, amendments to an existing abstraction service for private water supply and upgrades to the forestry trails were also included in the project.



## Afon Wydden Upper Flood Storage Area

The Afon Wydden Upper Flood Storage Area is located near Llandudno, Conwy. Constructed in 1997, it is the upper reservoir in a series of storage areas designed to attenuate the flow and hence reduce the flood risk for the properties located downstream. The main embankment is 4.4m high and about 44m long while a 240m long side embankment protects the A470 trunk road when the flood storage area is operating.



The site contains a wall which is part of a historic walled garden and needed to be retained as it forms part of a feature along a public right of way.

Work included repairing the Reno mattress® upper spillway, modification to the lower spillway and stilling basin, which included upgrading the public footpath to a non-erodible material. Construction of a training wall to divert spillway overflow away from the ancient wall and protect the left hand mitre. Finally safety improvements for access by creating layby for vehicles to safely park when attending the site.

## Contacts



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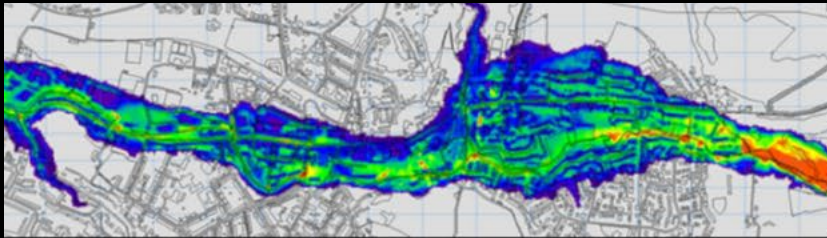
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**Tailings Dam Inundation Assessments**  
**Flood Risk Assessments**  
**Compensation Flood Storage**  
**Coastal Surge Modelling**

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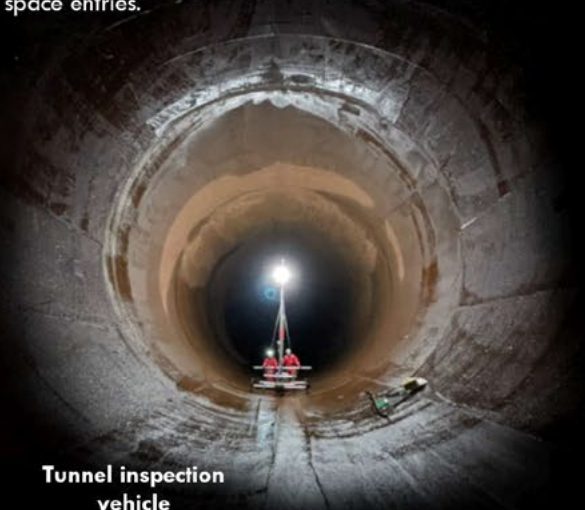
E: john@cc-info.co.uk  
T: 07813 705312

**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.

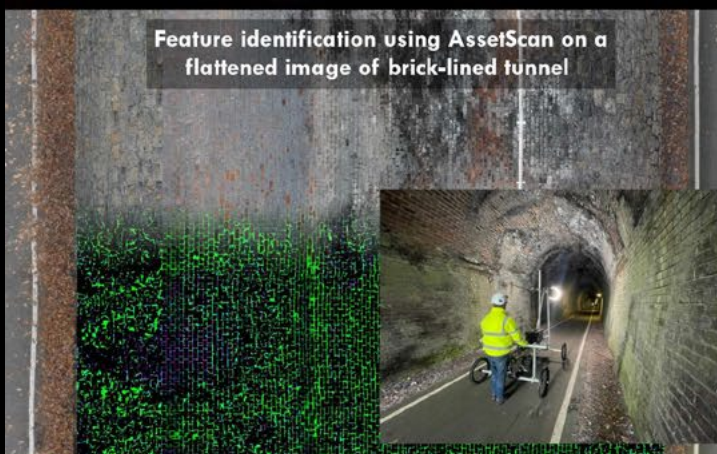
**CC Informatics** focusses on insights from drone surveys, remote vehicle inspections, and uses machine vision/artificial intelligence to aid with post processing. CCI has specialist in house tools which can be used for defect identification and tracking for large structures. The current focus of CCI 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.



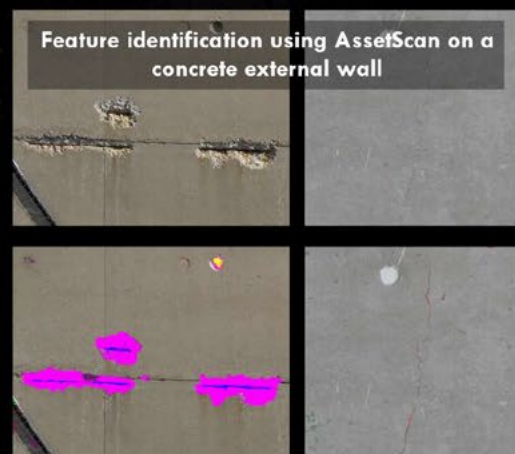
Shaft inspection vehicle



Tunnel inspection vehicle



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



Feature identification using AssetScan on a concrete external wall





**Dŵr Cymru Welsh Water** has a portfolio of 138 reservoirs, which includes 83 impounding reservoirs, 10 non-impounding reservoirs and 45 service reservoirs. Details of two projects completed during 2023 to improve reservoir safety across Welsh Water's operating area have been included below.

The earth embankment dam at **Upper Carno** was constructed in 1875 and has recently undergone full rehabilitation works to modernise the asset. Following the Section 10 inspection of the site in 2020, a range of studies were undertaken to better inform its performance against modern day parameters. The result was a significant construction programme which started on site in the summer of 2021. This included replacement and upsizing of the existing masonry spillway channel with a new reinforced concrete chute. The draw-off tower was lined internally converting it from a wet tower to a 'dry' tower, with new access facilities, draw-off pipework, and valves to provide sufficient emergency drawdown capacity. The low level scour outlet main was taken through the downstream embankment shoulder in a newly constructed liner and filter collar, passing into a 7.5 meter diameter vertical shaft where new valve facilities and drainage outlets are housed. The stability of the downstream embankment was improved by slackening the downstream shoulder and incorporating a filter blanket and toe drain. The certificate for the works was received in September 2023 and the reservoir is now returned to full operational capacity.



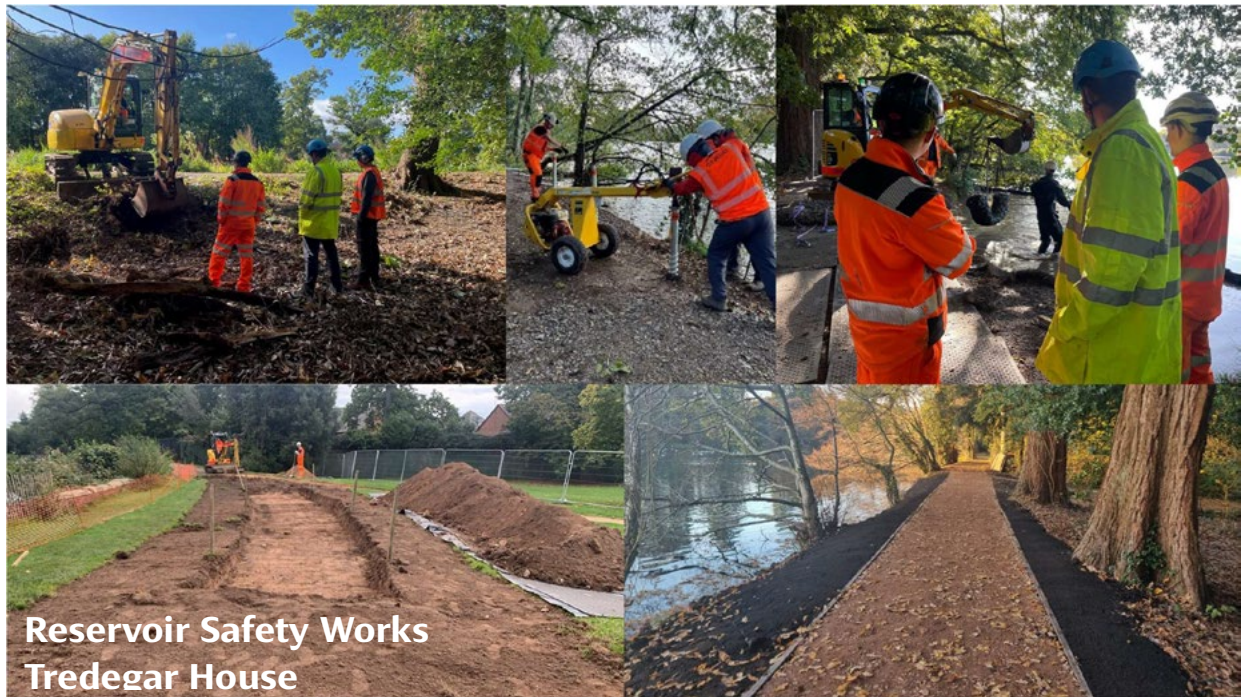
**Upper Carno**



**Llyn Celyn**



**Llyn Celyn** dam located in North Wales is a 46m high and 600m long embankment dam which provides regulation waters to the River Dee, one of the most regulated rivers in Europe. Significant work has recently been undertaken to replace pipework and valves in the dam tunnel and outlet structure – this is the first phase of a sequence of planned mechanical and civils upgrades. The work has been undertaken using divers and temporary/enabling works to ensure that flows to the river remained unaffected. The replacement of the V5 was installed using double isolation to ensure the safety of site personnel, this was provided from existing valves and the installation of an underwater temporary plate and bung arrangement accessed from a submerged divers shaft working with specialist contractors. Inside the tunnel, pipework and a new isolation valve was fitted to replace old redundant equipment. Further work include the installation of a 52" Fixed cone valve which was fitted in situ within very tight tolerances. The next phases of the work include the replacement of other critical valves and the construction of an auxiliary spillway on the dam.



## Reservoir Safety Works Tredegar House

**Edwards Diving Services Ltd. (EDS) was commissioned by The National Trust to carry out essential reservoir safety works at Tredegar House** to provide the required level of flood protection as set out in latest legislative guidance.

Located on the southwest edge of Newport, Tredegar House is one of the architectural wonders of Wales and one of the most significant late 17th-century houses in the whole of the British Isles. The reservoir within the parkland required safety works including raising the crest levels along sections of the northern and southern embankments, reinstating the profile of the upstream face with coir and rock rolls, extending the auxiliary spillway overflow weir and reprofiling the downstream embankment face.

With a large number of protected veteran trees (and their associated tree root systems) located in the works areas, a key consideration was developing a construction methodology that avoided any harm being sustained to the protected flora. Prior to proceeding with the main contracted works tree protection measures in the form of trunk protection and a cellular confinement system specifically designed and independently tested for tree root protection were installed in consultation with the appointed arboriculturist to all specified 'at risk' trees.

EDS adopted a no-dig solution to provide a fixed edge to the upstream face of the 300m long section of northern embankment which required raising

Screw piles were installed at minimum 2m spacings and at locations to avoid clashes with tree roots using non-mechanical plant, which minimised the potential impacts on the tree root systems. Recycled plastic timber boards were then connected to a stainless-steel U-shaped bracket fitted to the top of the piles to secure the upstream fixed edge to the required levels.

EDS collaborated with the QCE at the project outset and throughout the works to ensure that all works were completed in accordance with the design and specifications to enable certification under the Reservoirs Act 1975.

A dam safety management plan was developed to ensure that a clear procedure was in place to manage risks associated with any activities that had potential to affect the safety of the reservoir. This plan included activities such as the strict monitoring and control of the reservoir levels and the adoption of appropriate risk reduction and control measures which could be readily deployed in an emergency.

EDS has a track record of working with reservoir owners and operators to develop and deliver engineering solutions in challenging locations for a safer environment.

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[www.edwardsdivingservices.co.uk](http://www.edwardsdivingservices.co.uk)





# Creating a better place for people and wildlife



We regulate all large, raised reservoirs in England, ensuring they operate safely, without posing a risk to the public.

We are modernising how we regulate in response to the Independent Reservoir Safety Review Report, and to ensure we are ready for and resilient to climate change.

The Reservoir Safety Reform Programme will be delivered in a phased way over several years, by the Environment Agency and Defra.

To find out more about our Reservoir Safety Reform Programme please visit:

<https://consult.environment-agency.gov.uk/solent-and-south-downs/reservoir-safety-reform-programme/>



EXPECT...SOLUTIONS NOT ONLY PRODUCTS



## Increasing reservoir resilience using free discharge valves



Burnhope Reservoir is operated by Northumbrian Water. It is located in the North Pennines AONB (Area of Outstanding Natural Beauty).

Glenfield Invicta was tasked with specifying and designing valves to increase draw down at Burnhope.

### Specification

When water is discharged from a reservoir at high speed it possesses high kinetic energy. This kinetic energy can be dissipated safely using a free discharge valve.

The Glenfield Invicta engineering team specified a DN600 Series 857 free discharge valve which enables draw down rates to be finely controlled. A bespoke hood was also incorporated to limit the width of the discharge plume thereby safeguarding the structural integrity of the tailbay.

A DN800 Series 54 reservoir specification gate valve was also proposed to provide upstream isolation.

### Design

The design element of a free discharge valve is critical to enable the valve to achieve maximum discharge rates whilst ensuring hydraulic forces do not cause excessive vibration. Vibration is minimised through the use of multiple aerodynamic 'ribs' which are specially designed and connect the main body of the valve to the downstream cone section.

Sizing calculations are based on the required discharge through the valve at the corresponding available pressure head. At Burnhope, flow rates of up to  $4.5\text{m}^3/\text{s}$  had to be controlled by the discharge valve; this equates to 4.5 tonnes of water passing through the valve every second.



### Installation and commissioning

The input of the Glenfield Invicta engineering team was also integral to the installation and commissioning of the valves at Burnhope.

Greg Morris was the Glenfield Invicta lead on the Burnhope project:

*'This was a rewarding project to be a part of. The close collaboration across all stakeholders played a key role in the successful outcome.'*



SCAN TO VISIT  
OUR WEBSITE



### GREG MORRIS

BUSINESS DEVELOPMENT MANAGER  
DAMS, RESERVOIRS & HYDROPOWER

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Greenfisher Contracting (GFC) specialise in bulk earthworks, stabilisation and marina construction based in Northamptonshire. We have recently completed the installation of rowing pontoons and the creation of a wet dock on the River Thames for Headington School.



As part of an early contractor initiative GFC were appointed early in the scheme to undertake the design and build elements for the anchor piles and wet dock along with the preparation of the Environment Agency permits and liaison with the Environment Agency to facilitate the works.

The site was particularly challenging due to the logistics in accessing the site and the frequency in which it floods.

The project involved;

- installation of the sheet piles to form the wet dock
- excavation of the wet dock
- formation of the batters
- concrete slipway
- surface and foul drainage
- installation of the anchor piles & concrete caps

- Installation of the pontoons as well
- Construction of headwall for the surface/foul outfall.
- Installation of coir rolls and coir pallets as part of scour protection.
- Liaison with the EA to obtain the relevant permits



We can provide project support in the early stages using our extensive knowledge in bulk earthworks, marina/reservoir construction and soil stabilisation by carrying out;

- volumetric calculations
- cut and fill modelling
- topographical surveying
- design and build packages



GFC have over 25 years of experience in the industry and use our specialist skills to deliver those technically challenging projects, whilst keeping our environmental impact to a minimum.

Email: [estimating@gfcontracting.co.uk](mailto:estimating@gfcontracting.co.uk)

Telephone 01604 641110

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## HESSSELBERG HYDRO

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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.



*Wychall Flood Storage Dam, 2022*

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. Upstream faces comprising stone pitching, rip-rap, concrete blocks, grasscrete and concrete slabs have all been strengthened using OSA.

In 2023 the company has focussed on a large coastal defence project on Canvey Island in Essex but has also installed OSA erosion protection to the spillway at Gorpel Lower Reservoir in Yorkshire







From satellite observation to terrestrial monitoring, sedimentation, and breach modelling, HR Wallingford supports dam owners and operators every step of the way.



Our independent experts have global experience in the design, operation and management of reservoirs and dams. Our engineers, asset management specialists, dam break and sedimentation modellers develop integrated solutions to the most complex dam and reservoir-related challenges.

We are the global leaders and independent experts in how to live and work sustainably with water.


Contact Craig Goff to discuss your needs.

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visit our website



**Allied Exploration and Geotechnics, now trading as Igne, was established in 1988.** It is a leading provider of site investigation services for dam assets and related water supply and water treatment infrastructure.

The company has an excellent track record of successfully completing projects and it has built a solid reputation for competence among its clients, including United Utilities, Northumbrian Water, Scottish Water and Essex & Suffolk Water. In March 2022, Allied Exploration and Geotechnics joined fellow organisations in unexploded ordnance risk mitigation, water well and geothermal drilling, geotechnical and material testing to synergistically form Igne. Our expertise includes:

- Bespoke solutions to challenging ground investigation problems.
- Difficult access where we adapt our approach to address site constraint limitations and barriers.
- The utilisation of Igne's experienced practitioners to utilise specialist plant and equipment to deliver accurate, quality-driven, and responsible ground investigation outcomes.
- A commitment to meeting the technical demands, service delivery, and client expectations of every project, regardless of size or complexity.

With 350 years of combined history, Igne delivers an enhanced, competitive and comprehensive UK wide service that provides the highest standards in UXO risk detection and mitigation, geotechnical and environmental investigation, water well and geo-thermal installation, laboratory and consultancy services. It is fully resourced to undertake contracts nationwide and has the depth of knowledge to economically and methodically yield results, all in accordance with recognised ISO and industry compliant third-party accredited management systems.

Igne enables a clear understanding of the site environment by acquiring dependable and accurate ground information. The depth of detail delivered enhances the ability to address sub-surface conditions, assess where hazards pose plausible risks and promote optimised designed engineering solutions

**[www.igne.com](http://www.igne.com) / [hello@igne.com](mailto:hello@igne.com) / 0371 789 1000**







# Jacobs

Challenging today.  
Reinventing tomorrow.

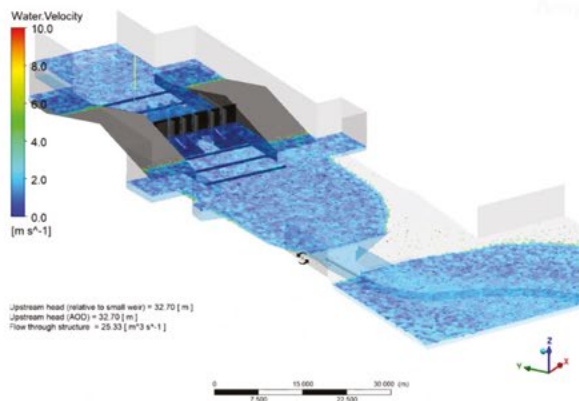
## PROJECT SHOWCASE

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, with two examples given below.

## Computational Fluid Dynamics to design double baffle flow control

Shonks Mill Flood Storage Reservoir will attenuate floods on the River Roding, to protect the Woodford and Ilford areas of Greater London. The 1,440MI reservoir will be formed by a 580m long embankment dam up to 6m high with a sheet pile cut-off and a double baffle flow control structure to limit flows to  $62\text{m}^3/\text{s}$ . This type of passive flow control structure is only the second of its type in England and will minimise premature filling of the reservoir to provide optimal flood storage.

Computational fluid dynamics (CFD) was utilised extensively in tandem with [Jacobs Flood Modeller](#) software to design and optimise the control structure. The design incorporates a natural bed and low flow channel to mitigate ecological and geomorphological impacts and a combination of bay widths and stoplog options to provide adjustment in future for climate change.



## Littleborough Flood Detention Reservoir advanced works

The Gale Reservoir will form part of the Littleborough and Rochdale Flood Alleviation Scheme, protecting 337 properties from flooding in this area of Greater Manchester. The 75MI reservoir will be retained by a combination of earth embankments up to 4.5m high and a 300m length of sheet pile walling to separate the reservoir from the mainline railway embankment which dissects the complex site. The two reservoir compartments either side of the railway line are connected by a 60m long, 2.1m high by 6m wide precast concrete culvert under the railway. Due to the interface with the railway, the works were phased, with the first, advanced phase, including the culvert, being successfully completed during a railway possession over Christmas 2021/2022. This phase also included construction of a temporary access ramp and site compound for the main works which are due to commence in 2024. The watertight joints between the precast culvert units are designed to accommodate predicted differential settlements associated with soft and variable ground conditions (deep glacial outwash channel). The culvert includes facilities for mammal passage and CCTV inspection, a flow control structure and trash and security screens.

## 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.

### Contact

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**MMB** MOTT MACDONALD  
BENTLEY

## Reservoir safety improvements at Upper Carno

Upper Carno reservoir is an earth embankment dam 15m high and 280m long, impounding the Ebbw River. The reservoir dates from around 1875 and currently impounds 0.34 million cubic meters of water and is the first in a cascade of two. The reservoir has a history of remedial and improvement works; most notably, the spillway was improved and a short section of the toe of the dam stabilised in 1986.

Following statutory inspection, a number of MITIOS recommendations were made with a regulatory date of September 2023. The project has been delivered over a 2-year programme on site and was designed and built by Mott MacDonald Bentley (MMB).

The eight MITIOS and four MITIOM recommendations completed included:

- Replacing of the 180m long spillway to safely convey PMF (~48m<sup>3</sup>/s).
- Stabilising 280m wide 15m high dam to acceptable factors of safety, including designed filters and toe drainage.
- Infilling the historic tunnel route under the dam toe.
- Increasing drawdown capacity and re-route draw-off system from under the dam to receiving watercourse in line with latest UK guidance.
- Converting wet/dry valve shaft into fully dry, draw off tower.
- Installing new reinforced concrete plug within the upstream tunnel.
- Relocating service reservoir access road and associated potable water main.
- Improving 2km access road including strengthening of two bridges.

**The project was completed in the summer of 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 Upper Carno, 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, embankment 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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## Hampton Distribution Reservoir, London

**H**ampton Distribution Reservoir is a non-impounding reservoir built in 1902. Leakage was identified between a section of the existing embankment based on a 'Willowstick' geophysical survey undertaken in 2020. TWUL commissioned MWH Treatment to implement leakage remediation works. Subsequently MWH Treatment commissioned Atkins to manage the GI, feasibility studies and identify the appropriate solution. The embankment shoulders are composed of granular materials. The embankment has a central puddle clay core that passes in a trench through the Kempton Park gravels into the underlying London Clay.

Keller were contracted by MWH Treatment to undertake the permeation grouting works to reduce the permeability of the affected soils within the leakage zone.

The works needed to be carried out with extreme care and planning at the edge of the reservoir from a narrow path



### Hampton Distribution Reservoir Leakage Remediation Works

**Client:** Thames Water Utilities Limited

**Main Contractor:** MWH Treatment

**Consulting Engineer:** Atkins Global

running along the top of the embankment.

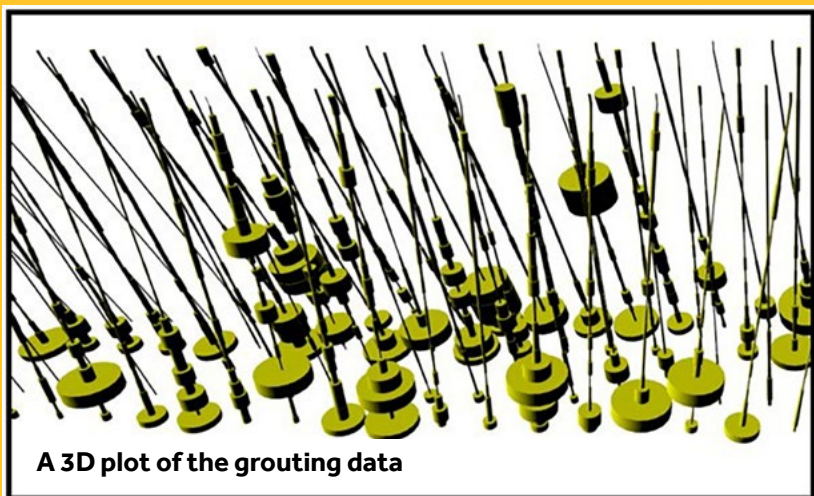
The remediation works solution comprised of two rows of Tube à Manchette (TaM) grouting on the upstream side of the dam core and two rows on the downstream side.

Microfine cement grout was injected at low pressure via the non-return sleeve ports,

on the TaM pipes. This method allowed carefully controlled grout placement at defined elevations and the option to return to locations where significant grout volumes had flowed easily into the soil.

The initial grout injections were used to verify zones of higher permeability and therefore the principle flow paths. This information along with geophysical data from the 'Willowstick' survey was then used to target the subsequent grout injections.

Modelling of the grouting data throughout the project allowed the work to be focused on the problem areas. The data review aided the positioning of the later stages of grout injection and grout re-injections, to verify that further grouting was not practical or required. Verification of the works was conducted using the grouting data along with pre and post treatment 'Willowstick' geophysical surveys.



A 3D plot of the grouting data

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## Your Partners in Engineering Excellence



### Kariba Dam, Zambezi River (Zambia/Zimbabwe)

Kariba Dam in the Kariba Gorge of the Zambezi river basin between Zambia and Zimbabwe stands at 128m tall and 579m long. The dam forms Lake Kariba, which extends for 280km and holds 185km<sup>3</sup> of water.

The dam structure is suffering from Alkali-Aggregate Reaction (AAR) and, being a double curvature concrete dam with a submerged central spillway, the spillway piers and associated gates were changing position and orientation, causing gate and stoplog guides to misalign and fracture, with the increased risk of a spillway gate becoming jammed open, and the inability to deploy stoplogs. **KGAL Consulting Engineers Ltd** was retained by **Stucky** to design a means of isolating the spillway openings in order to enable remedial works to be undertaken to restore the spillway gates.

We designed a novel finger pile Cofferdam System that was capable of being deployed on the upstream face of each of the spillway openings in turn. One spillway opening has already been successfully remediated and another is in the process of remediation.

Photos courtesy of Zambezi River Authority (ZRA)

In addition, **KGAL** prepared the detailed designs for an Emergency Wheel Gate, Stoplogs and Multipurpose Guides.

- **Cofferdam** - 2 sets at 10m span x 35m high x 32m head. Each set comprising 11 vertical articulating fingers x 32 tonnes each. Total mass 350 tonnes/set.
- **Emergency Wheel Gate** - 1 gate at 10m span x 14m high x 32m head. Gate mass 146 tonnes.
- **Stoplogs** - 2 sets at 10m span x 33.4m high x 32m head.

#### Contact

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### About Us

We are specialists in commercial diving, confined space entry and remotely operated vehicle surveys. Our services have been developed to address the broad range of challenges faced by our clients within the UK water industry. Our team of professionals and access to bespoke built equipment make us a one stop shop for our client base.

We are able to work under almost all site conditions, our approach to underwater engineering means we are equipped with cutting-edge equipment that ensures we can fulfil your requirements in the most arduous of circumstances. Sewage treatment works, power stations, tunnels and reservoirs. We've got it covered.

### Services

- Commercial Diving Operations
- Confined Space Operations
- ROV Surveys Including LiDAR 3D Mapping
- Reservoir Mapping
- Safety Boat Supply
- Fabrication Department
- Secondary Isolation Plate Design and Installation

*"Working with the team from MMP Marine was a pleasure from start to finish. Very professional and knowledgeable throughout the project from planning to delivery. The work was completed on time without ever compromising on safety."*

### Recent Projects – August 2023

MMP were commissioned to remove and replace two 3.5 tonne gate valves at one of the UK's largest inland reservoirs. This project required meticulous planning as the valve tower is centrally located in the reservoir with the deepest valve sitting at 25 metres.

After a detailed dive survey, MMP's dive team were able to carry out the phased removal of the valves by formulating a step-by-step approach via our detailed 3D modelled reporting. This enabled all parties involved in the project to visualise the task at hand and collaboratively establish the best course of action.

All lifting equipment, plant and diving equipment was mobilised on to our bespoke diving platforms. This streamlined the process as we were able to conduct all lifting and transport operations independently of the diving platform.

Each section of the valve including the debris screen was carefully removed, lifted to the surface and towed to the reservoir bank for removal.

The removal phase of the project was carried out on budget and ahead of schedule. The team will benefit from lessons learnt when carrying out this uniquely challenging project and apply these to the next phase.





Minova is an industry leader of ground support and geotechnical solutions for mining, tunnelling and surface ground engineering projects. We are known for our high-quality products, technical expertise and customer problem-solving. Our 140-year track record of developing and delivering innovative ground support solutions is a heritage we are proud of.

# TAPIA DE CASARIEGO PORT CONSOLIDATION INJECTIONS

## CHALLENGE

Minova's technicians visited the port of Tapia de Casariego to analyze the problems associated with the appearance of cracks, breaks of pavements and lack of flatness on the surface of the dike. Minova got called for an emergency job, in which it was mandatory to propose a solution to be done in a few days. As the Tapia de Casariego Port is classified as a Historical Monument protected by heritage laws, the intervention needed to be less invasive as possible.



## PROPOSED TREATMENT

MINOVA proposed a treatment based on the injection of Polyurethane Resin Carbopur WFA through drillings from the surface to achieve consolidation of the core by filling the voids and cracks.

## WHY CARBOPUR WFA?

Carbopur WFA was chosen because the mechanical properties and the type of reaction are more suitable for this application than organomineral resins due to their very low viscosity. Carbopur WFA gave the technician (on site) the possibility to adapt the expansion rate to the underground conditions by adding water previously to the components mixing and injection.

## SOLUTION

The drilling locations were decided in relation to the areas where the divers detected the most cracks and block falls, leading to 3 lines of drillings, two outside walls and one in the centre. The south line was protected by the dock, whilst the north line on the open sea side faced waves with water energy pushing into the dock through cracks and voids. The middle line had resin injected into the core confined by both curtains, filling cracks and cavities efficiently.

For each drilling, we installed injection points using extendable injection pipes and/or injection hoses of different lengths. The vertical separation of each injection point will be 2.5m from the bottom of the drilling, including four independent points for injection. Once the injection points were installed, the injection of Carbopur WFA began from the deepest point, injecting the proper amount depending on the detention criterion.

After the injections were complete, it was necessary to fill the holes with dry sand.



[www.minovaglobal.com](http://www.minovaglobal.com)



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M

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MOTT  
MACDONALD

## Leading the way in a new age of UK dam construction

Mott MacDonald has over 100 years' experience in all aspects of dams and reservoirs engineering, with dedicated teams having delivered projects in more than 30 countries worldwide. Priding ourselves on our technical excellence and drive, we provide exciting opportunities for our people to engage in diverse global projects and deliver a wide range of services to our clients, including:

- Panel engineer services
- Hydrology, hydraulic modelling and computational fluid dynamics
- Geotechnical assessment and advice, including construction supervision support
- Feasibility studies and detailed design services
- Environmental and ecological scoping and assessments
- Mechanical, Electrical, Interface, Control and Automation services

New reservoirs are considered a central part of planning for England's future water resilience which, together with transfer solutions, could keep the taps flowing during months of drought. Mott MacDonald is developing the reservoir designs for Anglian Water and Thames Water including geotechnical investigations, delivery and supply of water, dam design, outlet works, emergency drawdown proposals, overflow and spillway arrangements and facilities such as visitor centres and biodiversity improvements. We are excited to be leading the way as the UK enters a new age of dam and reservoir construction.

### Thames Water South East Strategic Reservoir Option (SESRO)

SESRO is a proposed storage reservoir that will supply water for Affinity Water, Southern Water and Thames Water customers with a reservoir to be built in Oxfordshire to provide a minimum storage of 100 million m<sup>3</sup> of water. The aim is to ensure water would be available from 2040 to help protect supplies and manage future water quality issues created by a changing climate.



### Anglian Water New Large Raw Water Reservoirs – Lincs and Fens

Two new large raw water reservoirs, each covering approximately 5km<sup>2</sup> and holding 50 million m<sup>3</sup> of water, are being planned for the East of England, one in Lincolnshire, and one in the Fens (in partnership with Cambridge Water). The aim is for these projects to be construction-ready in the late-2020s, providing water for supply from the mid-2030s.

As well as securing water supply, these projects provide a once-in-a-lifetime opportunity to deliver lasting benefits for the region. They could support economic growth and strengthen placemaking opportunities for the local areas, creating attractive destinations with recreational activities and diverse opportunities for local businesses.

As part of our well-established mentoring process, these projects present fantastic opportunities to develop our current and future reservoir engineers, helping them to progress towards membership of the Supervising Engineer panel and All-Reservoirs panel. One such engineer is Ryan McHugh, a member of our Scotland team since graduating in 2017.

*"Mott MacDonald has supported my career, providing opportunities and support to become chartered 4 years after graduating. Now, as I work towards appointment to the Supervising Engineers panel, I have the support of several appointees to the panels at both Supervising and All Reservoirs Level. I have been involved in numerous projects from siphons and spillways to discontinuance and have had the opportunity to provide construction supervision for the new Calverley Flood Storage Reservoir and also to attend and present at several conferences and forums including the BDS conference and ICOLD."*

## Enabling the sustainable hydropower projects of tomorrow



### *Independent Engineer for 720 MW Karot Hydropower Project*

With over 100 years of experience worldwide, Multiconsult offers full engineering and construction supervision services in the hydropower and dams sector with the capability to support every stage of the project life cycle – from inception through to design, construction, operation and decommissioning.

A highly respected team of specialists deliver expertise in dam safety, dam breach modelling, reservoir sedimentation, flood alleviation, irrigation and hydropower projects. We develop and apply innovative technology to deliver sustainable & cost-effective solutions for dams & reservoirs optimising the potential of your project and minimising environmental and social consequences.

Our long history, extensive knowledge and experience in executing projects worldwide provides confidence in the ability of Multiconsult to successfully undertake any role.

#### **Contact:**

Email: [hydro-uk@multiconsultgroup.com](mailto:hydro-uk@multiconsultgroup.com) |

Tel: 01233 754485 |

Website: [www.multiconsultgroup.com](http://www.multiconsultgroup.com)

**Multiconsult**





**Cyfoeth  
Naturiol  
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Natural  
Resources  
Wales**



**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:**

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[naturalresources.wales/reservoirsafety](https://naturalresources.wales/reservoirsafety)

**Nature and People Thriving Together**

**SEVERN  
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DYFRDWY**

**severn dee**

**CONTACT: Ian Hope BSc MA CEng FICE** [ian.hope@severntrent.co.uk](mailto:ian.hope@severntrent.co.uk) 07774 336 430

Severn Trent is a FTSE100 water company, serving more than 8 million customers across a region stretching from mid-Wales to Rutland, and the Bristol Channel to the Humber. We manage a captivating collection of 80 statutory reservoirs in England and Wales, regulated by the EA and NRW respectively.

Our goal is to 'be recognised as the best in the country at reservoir safety', to deliver this aspiration, we have a team of five empanelled and five trainee Supervising Engineers, four Reservoir Technicians and four specialist Reservoir Surveyors. We oversee all statutory aspects of reservoir ownership, together with advising and assisting colleagues in the capital and operational elements of our businesses to safety and effectively continually improve our reservoir estate. Our Reservoir Safety surveillance training manual is available on the BDS website. Some examples of this year's exciting projects are detailed below.



New weir penstocks to improve drawdown capacity, Cropston



Construction of a Dycell overflow at Marchwiel reservoir, Wrexham



Outline design and preliminary environmental preparations for discontinuance at Pen y Gwely.



Construction of drawdown siphons At Draycote Water

Members of our team are actively involved with BDS, including two on related committees, and can regularly be seen at BDS events and conferences.





**This has been another busy year for Stillwater Associates with the company working on several interesting design and construction projects in the UK and overseas. A selection of these projects is detailed below.**

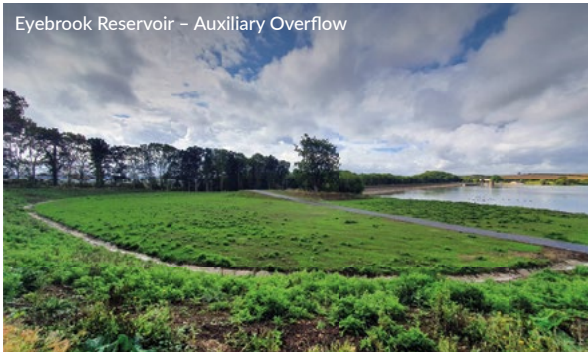
#### **Eyebrook Reservoir**

Stillwater Associates have recently designed and overseen the completion of major reservoir safety upgrade works at Eyebrook Reservoir for Tata Steel. Following a Section 10 Inspection in 2016, Stillwater Associates were commissioned to undertake a feasibility study to provide options for increasing the discharge capacity of the reservoir in order that it could safely pass the PMF event with a peak inflow of 282m<sup>3</sup>/s. The preferred option was to construct a 50m-wide grass-lined auxiliary overflow on the left abutment. Other safety works involved the construction of a new toe drainage system and repairs to the 4m-diameter outlet culvert from the main overflow.

#### **Chard Reservoir**

We are currently working with Somerset Council on a major reservoir safety upgrade at Chard Reservoir. A recent flood study followed by physical modelling identified several areas of concern with passing the design floods at this reservoir. An ALARP assessment carried out by Stillwater Associates has assisted with the selection of the remedial works design. The scheme is now in the detailed design stage with the completion of the works programme scheduled for the end of 2024. The remedial works will include embankment crest raising, the construction of a new wave wall, remodelling of the stilling basin and the protection of the embankment downstream face.

Eyebrook Reservoir – Auxiliary Overflow



Cilcain No. 1  
& No. 2 Reservoirs

#### **Cilcain Reservoirs No. 1 & No. 2 Discontinuance**

This year saw Stillwater Associates continue to assist Dŵr Cymru Welsh Water with reservoir discontinuance schemes in North Wales. The discontinuance works at Cilcain No. 1 and No. 2 Reservoirs commenced in March 2023 with the drawdown of the reservoirs and the site works were successfully completed in September 2023.

Cilcain Reservoirs No. 1 and No. 2 were constructed in 1896 as water supply reservoirs. The reservoirs were formed by constructing two embankments in cascade across the Nant Gain valley, just to the west and upstream of the village of Cilcain. Both embankment dams were of earthfill construction with puddle clay cores. The project involved the complete removal of Cilcain No. 1 dam and the partial removal of Cilcain No. 2 dam, with the fill material relocated within the naturalised reservoir basins. Stillwater Associates were responsible for the feasibility and planning stages, outline design, detailed design and construction supervision.

#### **Stillwater Associates**

Stillwater Associates is a UK-owned specialist reservoir safety consultancy serving a full range of clients from water companies to small private estates whilst assisting larger consultancies to meet their reservoir safety requirements. Stillwater Associates now provides reservoir safety services to **over 350 reservoirs** from our head office in Reigate, Surrey, and an extensive network of panel engineers across the UK. Our unique position in the reservoir safety industry allows us to offer amazing opportunities to engineers wishing to develop their careers in this field.

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[in](https://www.linkedin.com/company/stillwater-associates-uk) stillwater-associates-uk



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.

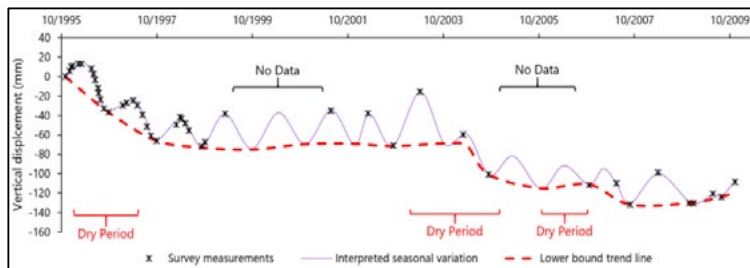
Jon C Green – Head of Reservoir Safety and Asset Condition  
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## Maiden Lane Service Reservoir – Embankment Stabilisation Project

Maiden Lane Service Reservoir, a Victorian-era brick-built structure built on London Clay in 1855, relies on its embankments for support, creating challenges due to high-plasticity clay fills prone to seasonal moisture fluctuations, landslips, and downslope creep. The south slope was remediated in 2012, but the east slope's recent movements raised concerns.



A monitoring regime tracking ground movements has spanned more than 30 years since 1991, revealing seasonal variations in moisture content affecting the embankment clay fill. By 2010, the south slope showed settling, leading to a review of the data and subsequent remedial works. The eastern slope, though less critical, continued to be monitored, revealing downslope movements and shallow slips by 2018-2020.



Various movements were identified, including surface slips, deeper slips near a retaining wall, and an incipient slip. Causes included embankment gradients nearing limiting angles, seasonal moisture fluctuations, and strain-softening effects in over-consolidated clays.

Despite existing geotechnical data, a supplementary investigation in 2021 confirmed the stratigraphy and verified post-peak behaviour, addressing uncertainties in shear strength parameters.

Remedial options considered in 2010 included a toe berm, soil nails, and sheet pile walls. The 2012 solution involved contiguous bored piles and a capillary break layer. The 2020 revisit for the east slope led to a similar solution but with key adjustments. The adopted solution incorporated bored piles for lateral support, slope regrading, and drainage works to reduce moisture content fluctuations. The pile design involved the Morgenstern-Price method, and a capillary break layer was added to mitigate seasonal effects.

Construction began in August 2021, with careful planning due to space constraints. The sectional continuous flight auger method was used for piling. Challenges included uncharted buried obstructions, such as a disused overflow drain, requiring realignment of piles.

Construction was successfully completed in July 2022 with the adopted solution expected to stabilise the reservoir embankment and enhance its resilience to climate change. The project has shown the importance of the long-term monitoring of ground movements of clay embankments and its benefit in understanding the mechanisms of slope movement.







## Project Reviews 2023

### Reservoir Upgrades

#### Stocks Weir Project

Originally constructed by the Fylde Water Board, Stocks Reservoir is now owned and operated by United Utilities. It was completed in 1932 where the Engineer to the Board was Mr G R Atkinson. Stocks Reservoir, located within the County of Lancashire, has recently had its storage capacity increased through raising the weir level using precast concrete blocks laid on top of the original weir that was previously lowered in the late 1990's.



Following results from a recent Flood Study, the latest Section 10 inspection included a measure in the interest of safety to raise the level of the waterproof element to contain the safety check flood (PMF) still water level. The height of the wave wall has also been increased, keying into the existing wave wall and continuing the masonry above to ensure there is adequate freeboard in flood conditions. In addition the concrete core was raised to PMF SWFL + 100mm to allow for future settlement. Going forward, the plan is to improve the drawdown capacity by installing high level penstocks through the weir to accelerate the time taken to drawdown the top 2 metres to comply with the EA guidance over the top third of the dam.

### SupE Training

#### Graduates Chartership plans

Over the last 5 years United Utilities has invested time and SupE training opportunities for prospective engineers from within our Catchment, Ground Engineering and Reservoirs Teams. This provides a pathway to complete ICE training with a fantastic support system of already qualified engineers to learn from and be inspired by. Our current cohort of Graduate Engineers are working hard to achieve their attributes and gain invaluable experiences in the hope



of becoming chartered in the near future, and then progressing to become Supervising Engineers.

### Mitchell's House

#### NDT & DT Pipe condition assessment

Mitchell's House Reservoir is situated near Accrington, Lancashire. The dam was completed in 1892 by the Accrington Gas and Waterworks Company for municipal water supply. A recent Section 10 inspection safety measure directed United Utilities to investigate the condition of the single outlet pipe and if there is any doubt over its integrity, remedial measures must be taken.



To prove the condition of the pipe, we firstly used an NDT (Non-Destructive Testing) approach, collaborating with contractors AES who specialise in Magnetic Flux Leakage Testing. This test creates a magnetic field within the pipe to be able to see potential areas of corrosion inside. To further satisfy the safety measure, we also used a DT (Destructive Testing) method which included taking a coupon sample of the pipe to lab test its strength properties. The pipe then had to have an encapsulation saddle fitted to the small coupon hole which was made. Overall, this was an effective and innovative technique which will be used in similar investigations going forward.

### 2023 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](mailto:ian.scholefield@uuplc.co.uk) for more information.

## Aecom



Aecom, formerly Faber Maunsell, is an international, multidisciplinary consultancy with a long history of dam engineering. In addition to involvement in over 300 dams in the UK, we also have extensive experience overseas, with dam projects in Hong Kong, the Middle East, south-east Asia and the Far East. We provide a full range of services relating to the design, construction, statutory inspection and remediation of dams and reservoirs for water supply, flood alleviation and hydropower.

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## Aqua-Media International Ltd



Aqua-Media International Ltd, publisher of the bi-monthly journal Hydropower & Dams, aims to provide reliable data and a balanced view on the role and benefits of water storage and hydro plants, for its readership worldwide. Papers focus on technical, financial, economic and environmental issues. Special issues are produced for the annual ICOLD events, and previews and reports are published of BDS conferences. The company also brings together world experts at its own international events, working closely with ICOLD, IEA, ICID and ESHA. Biennial African conferences are organised in partnership with ICOLD.

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Stwlan Dam - Malcolm Wearing

## Bristol Water plc



Bristol Water plc, founded in 1846, supplies water to over one million people and businesses in an area of almost 2400 km<sup>2</sup> centred on Bristol. It is a subsidiary of Sociedad General de Aguas de Barcelona S.A. (Agbar). The Agbar Group has subsidiaries in 19 countries, and provides services to more than 37 million people around the world.

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## CDMS Sub-Surface Engineering Ltd



CDMS Sub-Surface Engineering Ltd has a long, robust history, which began initially with the formation of Commercial Diving and Marine Services in early 1971. Since then, the company's name has changed, but the retention of the founding spirit has remained, resulting in innovation dedication and reliability. Now after 47 years in the diving industry, the company can call on a wealth of experience gained over literally thousands of projects that have been successfully completed with a 100% safety track record. Over the years professional association with new clients and other organisations have further strengthened the company's versatility, exposure, and commitment to deliver the best services available.

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## Duglas Alliance Ltd



Duglas Alliance Ltd is a British company specialising in hydropower and industrial projects construction. The Company is able to join the project at any stage of construction and further operation - as an external project management office or providing services as a subcontractor.

Duglas Alliance Ltd employees participated in construction of major industrial and power facilities all over the world - in Africa, Iran, India, Ukraine, Russia and other countries. The largest project of the company is the construction of Sendje Hydropower Plant in the Republic of Equatorial Guinea.

The network of Duglas Alliance Ltd's partners and suppliers comprises more than a hundred companies around the world - ranging from small, but reliable suppliers of consumables for the life support of the construction site to large energy companies, such as General Electrics. Equipment fleet of the Company has 270 units of construction and elevation machinery and specialised construction equipment from leading manufacturers.

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Scar House Dam – Newman Booth

## Stonbury

**stonbury**

Stonbury are specialist contractors to the Water Industry, maintaining framework agreements with over 14 of the UK's leading Water Companies for the repair, refurbishment and maintenance of water retaining assets, including service reservoir, water towers and associated structures.

Our specialist services are applied to a range of assets, from raw to treated water storage points.

Utilising extensive and practical knowledge in both civil engineering and high-performance repair, waterproofing and coating systems, Stonbury are proud to have completed the build of their first service reservoir in 2017. Stonbury's in-house expertise and directly employed teams offer cost-effective and reliable solutions for a range of civils and new build scheme.

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## Yorkshire Water



Yorkshire Water is responsible for providing clean and waste water services to over five million customers and businesses within Yorkshire, and the efficient management of the local water supply network from source to tap. We are responsible for 134 large raised reservoirs under the ambit of the Reservoirs Act 1975, ensuring their continued safety and availability for water supply and amenity within local communities.

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## Vice Chair closing remarks



We trust that you have found this year's Yearbook informative. It has showcased the wide range of activities run by and for our membership. Our programme for 2024 is shaping up to be another fantastic year for knowledge sharing.

April will see two key opportunities for our membership. We will be holding the first Young Professionals' Forum which will enable our YPs from across the country to come together for a day of learning and networking. It is something that our younger members have requested to support their development and we encourage all employers to support this event. On the same day will be our AGM and our biennial International Lecture which will be given by Michael Rogers of Stantec. He was ICOLD President from 2019 to 2022 and is travelling from the US to the UK to contribute to our YP Forum and deliver the International Lecture.

The 22nd Biennial Conference will be held at Keele University in September. We are expecting over 250 members to come together for three days of technical sessions, workshops, site visits and social events.

The success of our conferences is very much due to the inputs from the membership. Through volunteering on the organising committee, to submitting papers, giving presentations and contributing to workshops. There will be requests made over the coming months for papers and support, and we encourage you all to be as involved as you can to get the most out of the event.

The 92nd Annual ICOLD Meeting and International Symposium will be held in New Delhi in October. We have had great attendance by UK representatives at recent ICOLD meetings and would like to see as many of our membership 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 YPs to travel to the meeting with the BDS Bursary scheme. Details of that will be available in the New Year.

As 2023 comes to a close we would like to thank all of our members for their support. We wish you all the best for 2024.

**Dr Darren Shaw**  
BDS Vice Chair



Ben Lawers Dam – Jack Bradshaw





## BDS Photography Competition 2023



Jack Lewis-Roberts

**Llyn Llywelyn Reservoir works with Eryri (Snowdon) in the background**

1st



Thomas Creed

**Scar House Reservoir,  
North Yorkshire**

2nd



Barry Dooley

**Selset Reservoir, Barnard Castle**

3rd





Claerwen Dam, Elan Valley, Rhayader – Joanna Parkinson