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Role and importance of reservoirs in the canal system

David Prisk
Reservoir Asset Manager

18 November 2025

Agenda

- Introduction
- Canal Reservoirs
- Reservoir management
- Toddbrook
- Reservoir improvement works
- Discussion?

Canal Reservoirs

1

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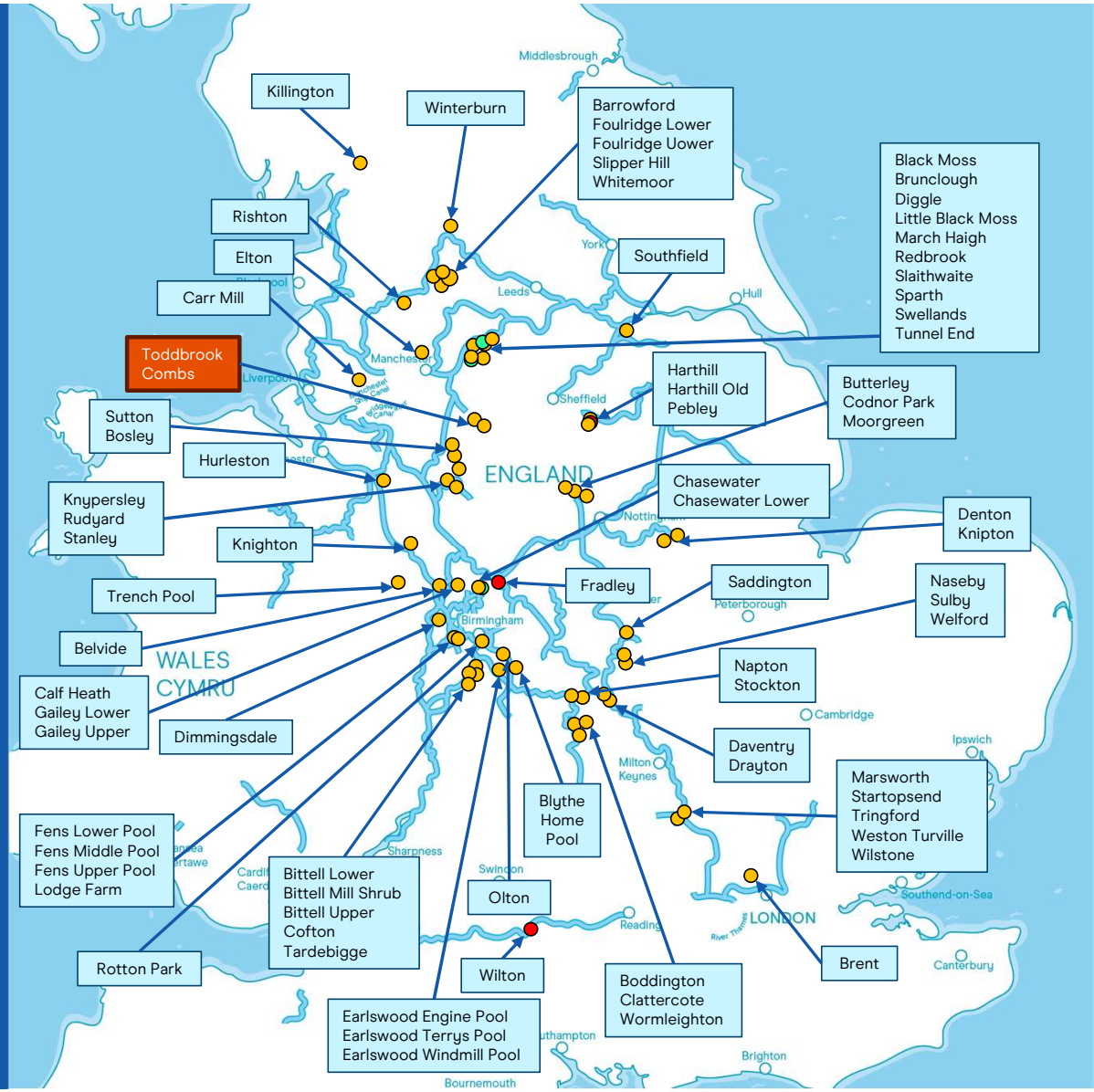
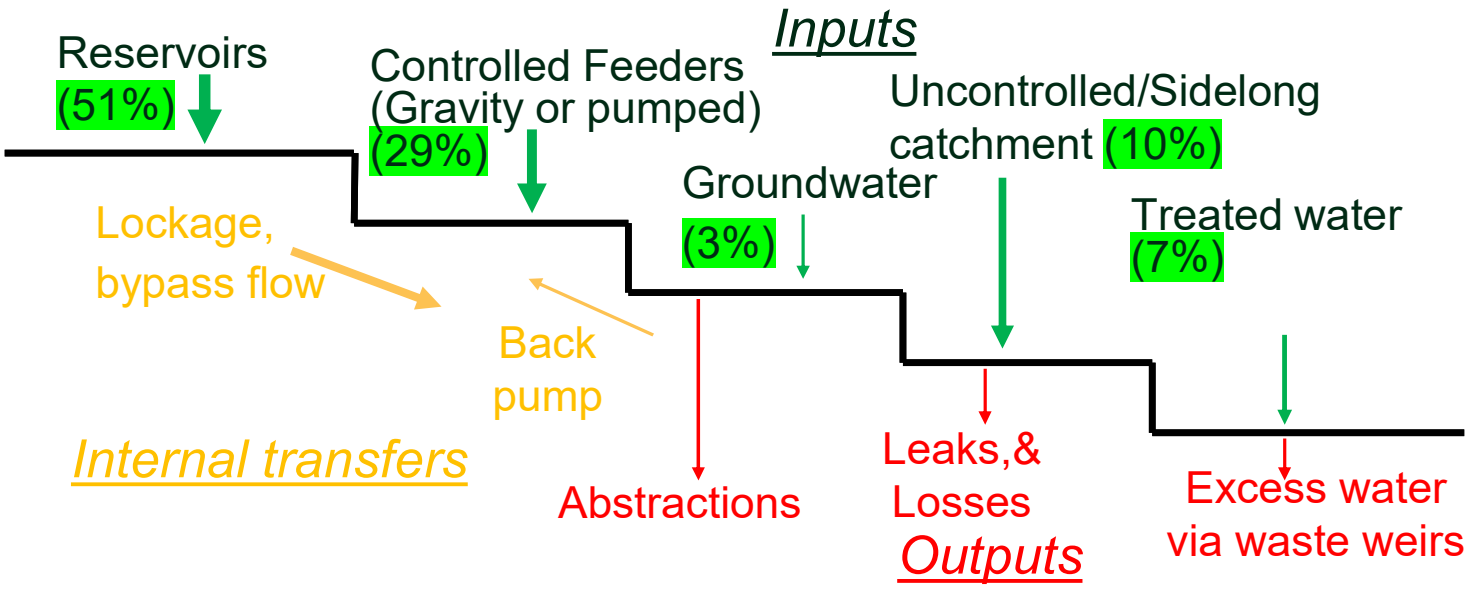
The Charity for canals & rivers (and reservoirs)

- 74 statutory reservoirs
- 2000 miles of canals
- 51% of network reservoir fed
- Remainder supplied by rivers or direct catchment

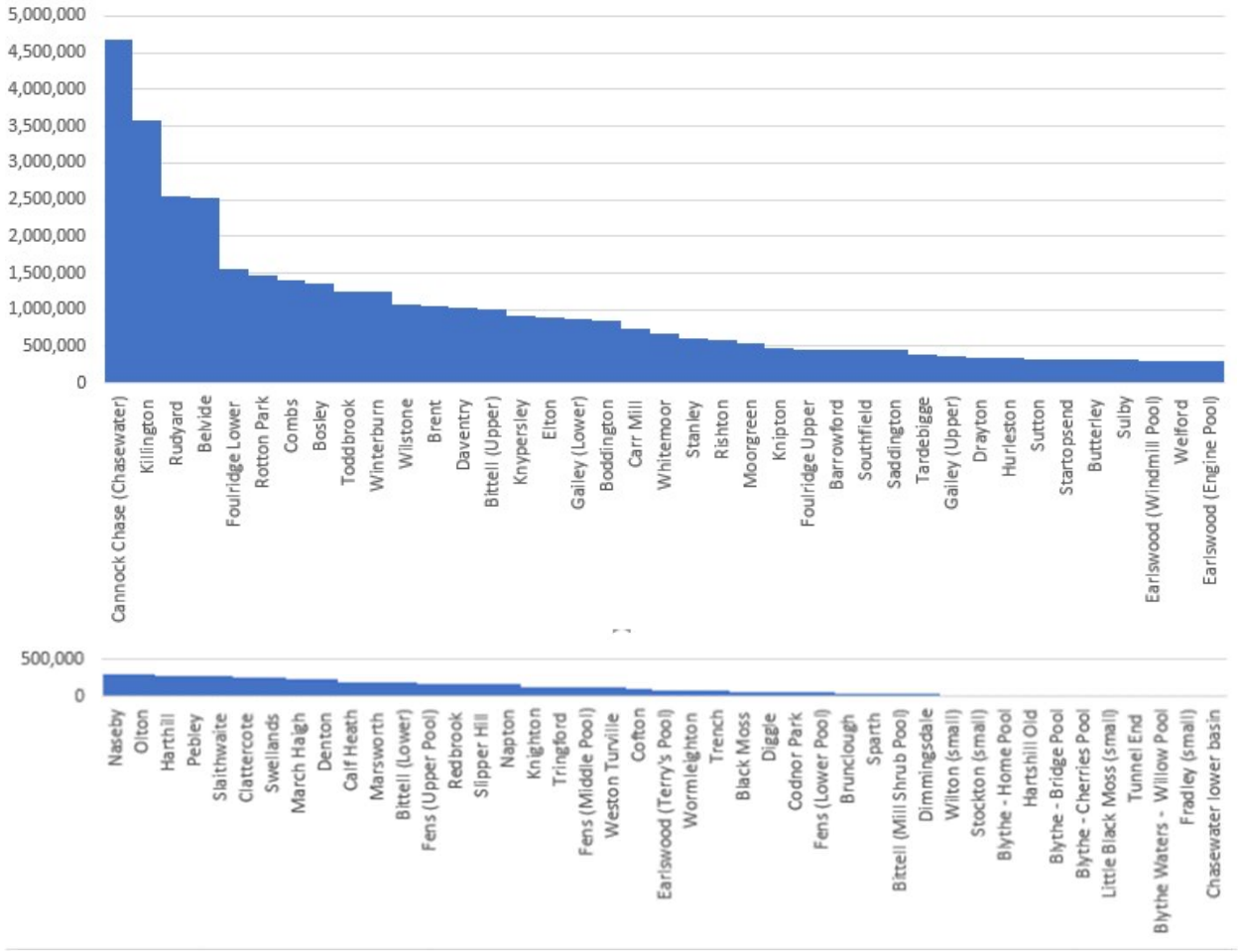


Why do we need reservoirs?



Water is the lifeblood of the inland waterway system;
without it, there is no Canal & River Trust.

Reservoirs by capacity



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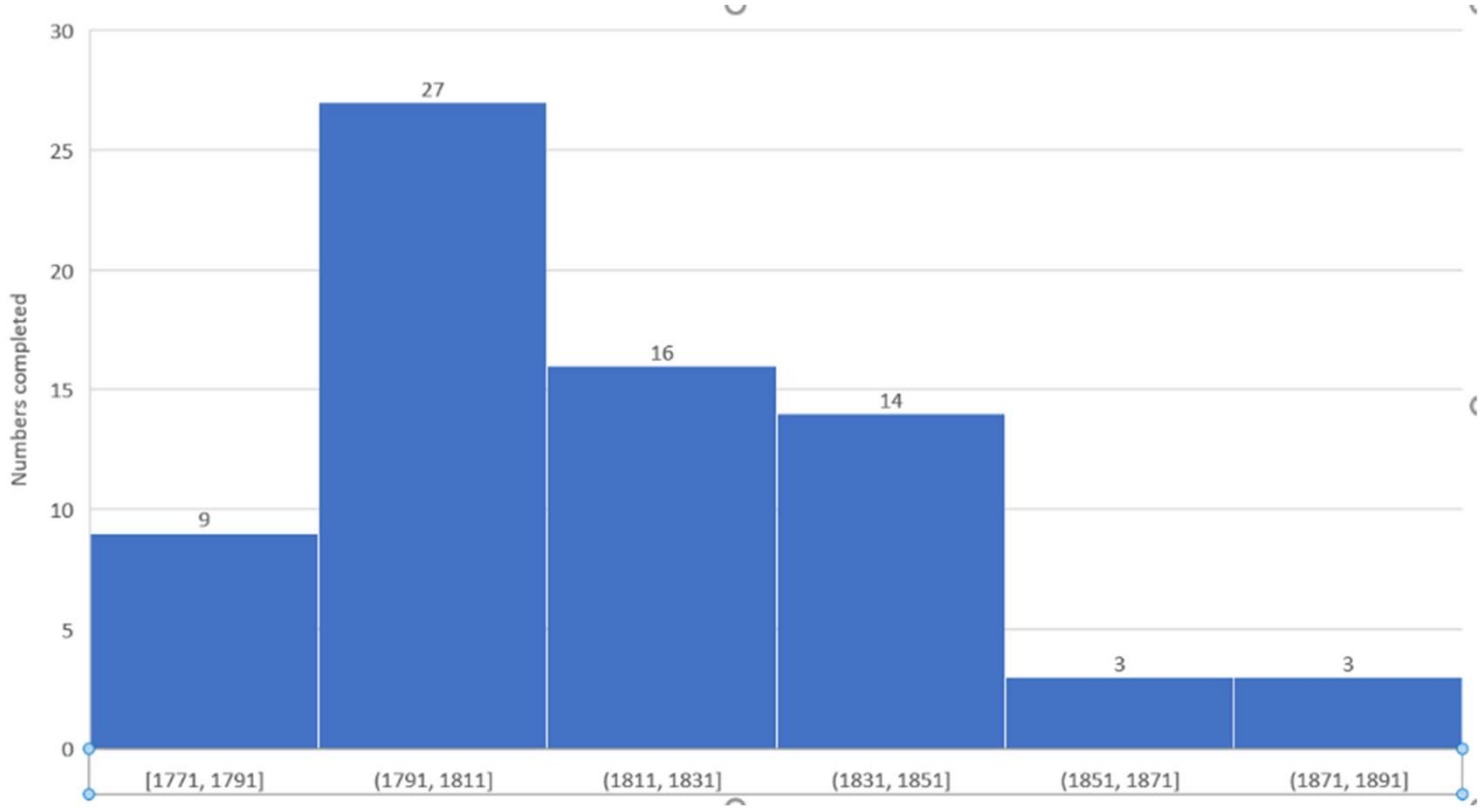
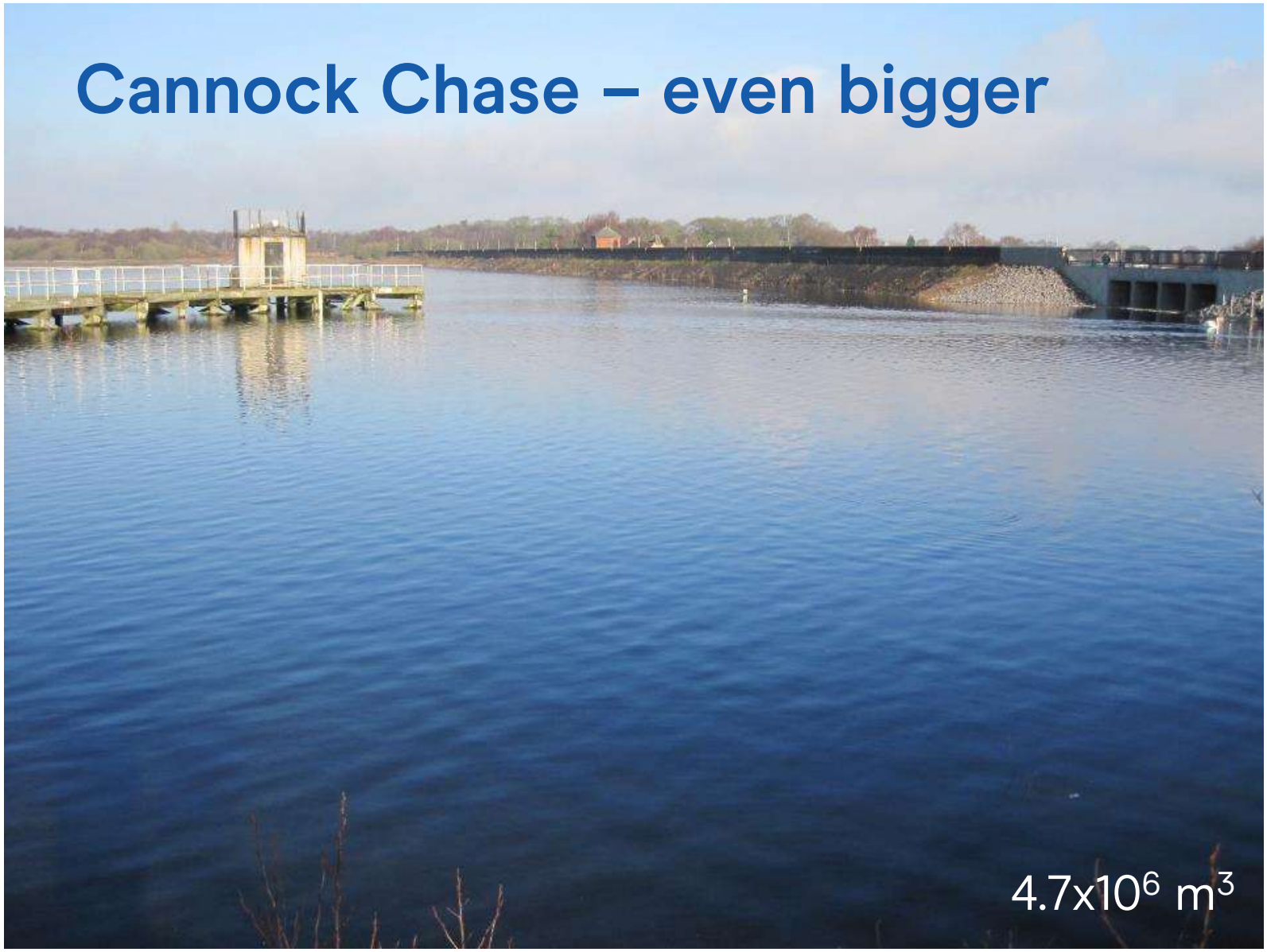
Reservoirs by age



Killington Reservoir - biggest

Cannock Chase – even bigger



Pebley Reservoir - oldest

Winterburn Reservoir – newest & tallest

Black Moss Reservoir – highest

Southfield Reservoir – longest dam

Brent Reservoir – most complex, siphonic spillway in central London

Reservoir management

2

Legislation

Reservoirs (Safety Provisions) Act 1930

- Large Raised Reservoirs
- Statutory Inspection
- Panel Engineers
- Works ‘in the interests of safety’
- Monitoring

Reservoirs Act 1975

- Register
- Enforcement Authorities
- Supervising Engineers

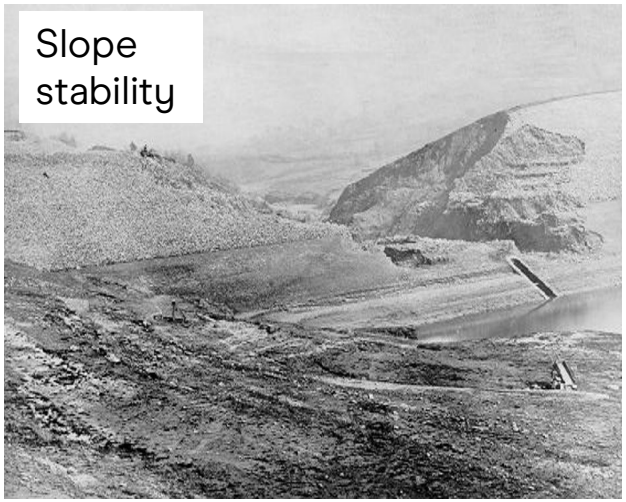
Flood & Water Management Act 2010
Reservoirs (Scotland) Act 2011

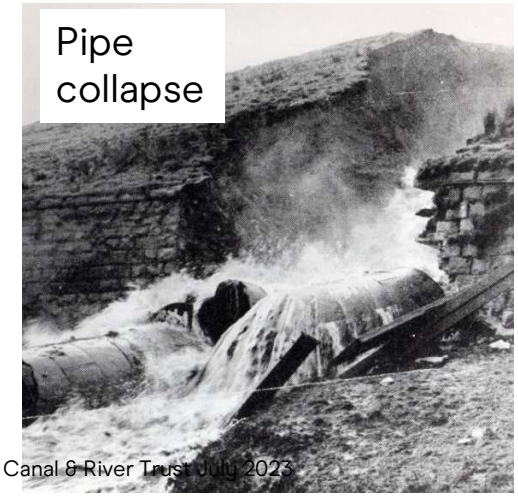
- Risk not volume
- Surveillance
- Maintenance

Toddbrook incident 2019

New legislation, regulation and guidance

Reservoir Safety - threats





The Trust's risk management

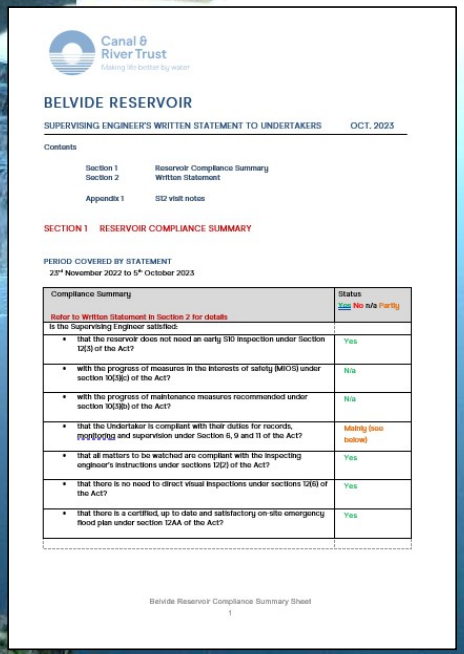
Inspection (Section 10)

- All Reservoirs Panel engineer
- 10 years (max)
- flood stability & seismic assessments
- measures 'in the interests of safety'
- sets monitoring & maintenance regimes

Brunclough 2015

Reservoir Supervising Engineer RSE

Supervision (Section 12)
- statutory, personal appointment
- Supervising Engineers' Panel
- annual statement to 'undertaker'
- 'Directions' and 'Advice'
- Emergency Plan certification
- can call an early inspection



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BELVIDE RESERVOIR

SUPERVISING ENGINEER'S WRITTEN STATEMENT TO UNDERTAKERS OCT. 2023

Contents

Section 1 Reservoir Compliance Summary
Section 2 Written Statement

Appendix 1 S12 visit notes

SECTION 1 RESERVOIR COMPLIANCE SUMMARY

PERIOD COVERED BY STATEMENT
23rd November 2022 to 5th October 2023

Compliance Summary Refer to Written Statement in Section 2 for details	Status Yes No n/a Partly
Is the Supervising Engineer satisfied:	
• that the reservoir does not need an early S10 inspection under Section 12(5) of the Act?	Yes
• with the progress of measures in the interests of safety (MIOS) under section 10(3)(c) of the Act?	N/a
• with the progress of maintenance measures recommended under section 10(3)(b) of the Act?	N/a
• that the Undertaker is compliant with their duties for records, monitoring and supervision under Section 6, 9 and 11 of the Act?	Mainly (see below)
• that all matters to be watched are compliant with the inspecting engineer's instructions under sections 12(2) of the Act?	Yes
• that there is no need to direct visual inspections under sections 12(6) of the Act?	Yes
• that there is a certified, up to date and satisfactory on-site emergency flood plan under section 12AA of the Act?	Yes

Belvide Reservoir Compliance Summary Sheet
1

Surveillance

Surveillance
- twice or 3 times weekly
- trained people
- (bi-monthly length inspection)

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Certificate of Competency for
Reservoir Surveillance Inspector

In accordance with the Mandatory Standard: Asset Inspection Procedures (AIP2017)
I hereby appoint

Name

As a competent person to carry out Reservoir Surveillance Inspections

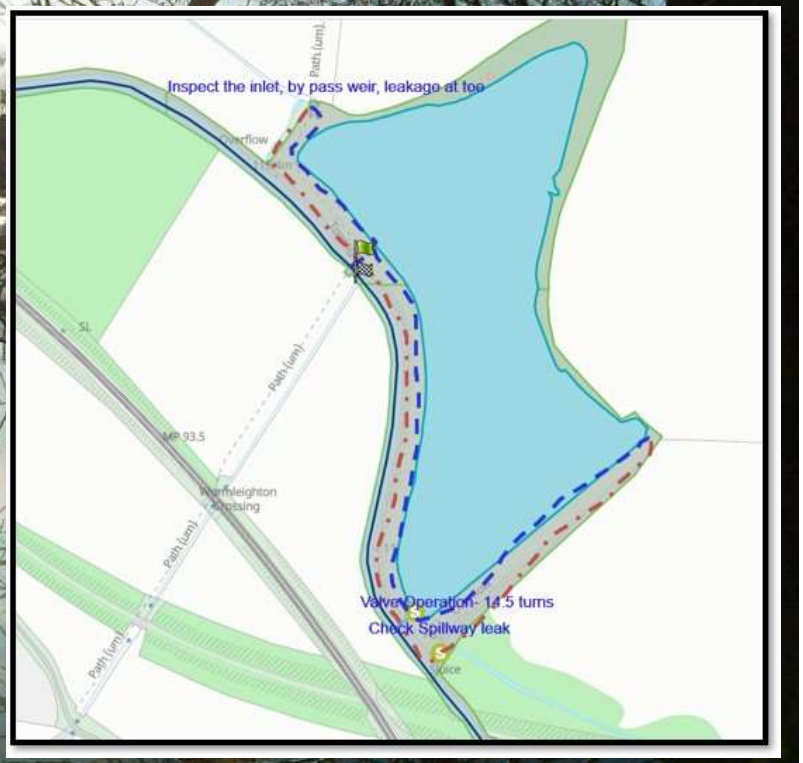
NOTE: This certificate of Competency expires 5 years after the date below

Nominated by .....Name..... Line Manager

Signed by ..... David Henthorn Brown, Reservoir Supervising Engineer

Date .... date

Note: On completion, a copy of this certificate must be forwarded to the Head of Asset Management for entry in the AIP2017 Certification Database



Earlswood

Emergency Exercises - Desktop

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Onsite Flood Plan – for reservoirs
Desk based annual test

Post-Discussion Report
Welford Reservoir

Date: 04/06/2024

Emergency Exercises - Full

Photo 5: Submersible pump lifted to moonpool

Photo 6: Pontoons manoeuvred to place.

to 6: Submersible pump and discharge hoses in place

Photo 8: Discharge into Goit

Redbrook June 2023 – new Contractor

Previous Pebley; Lower Foulridge

Reservoir Safety Toolbox Talks

- **What is "Reservoir Safety":**
  - Protecting the downstream population – reservoirs will flood large areas downstream and can : be fatal to large numbers of people, cause extensive property damage, trap disabled people in their homes, destroy power lines, pollute water treatment, prevent access to hospitals and other critical infrastructure
  - Construction activities can damage the dam and put life at risk if not planned carefully
  - Societal risk – where large numbers of people are at risk we take high precautions: the dam should protect to a 1 in 10,000 year storm (Cat A dams)
- **Key temporary works activities require Reservoir Engineer acceptance**
  - List all temporary works on the Temporary Works Register. Agree with the Reservoir Engineer which items require Reservoir Safety acceptance and which do not. The Reservoir Engineer will advise on Reservoir Safety
- **Watch for change:**
  - Flood path – a plan must be in place to enable a flood to pass safely at all times.
  - Weather – it may be sunny and dry, it could flood tonight, a reservoir can fill in a very short period of time.
  - Slope stability – do not dig into the slope without agreement: permit to dig, provide support, look for defects, do not damage the slope.
  - Pipework – can the reservoir be drawndown, will temporary works prevent the reservoir being emptied.
  - Quality is safety – the dam is 200 years old (on average), the dam will be there another 200 years, is our workmanship going to last, will a defect put life at risk, consider how long your work must last.
  - If in doubt ask the Reservoir Engineer.
- **Read the Flood Contingency Plan (FCP)**
  - This is the plan written by the Contractor explaining how you will alter the dam without putting the downstream population at risk.
  - Keep the plan up to date, own the plan, agree change with the Reservoir Engineer, explain the plan at Tool Box Talks. The plan is protecting the downstream population.

Reservoir Safety - terminology

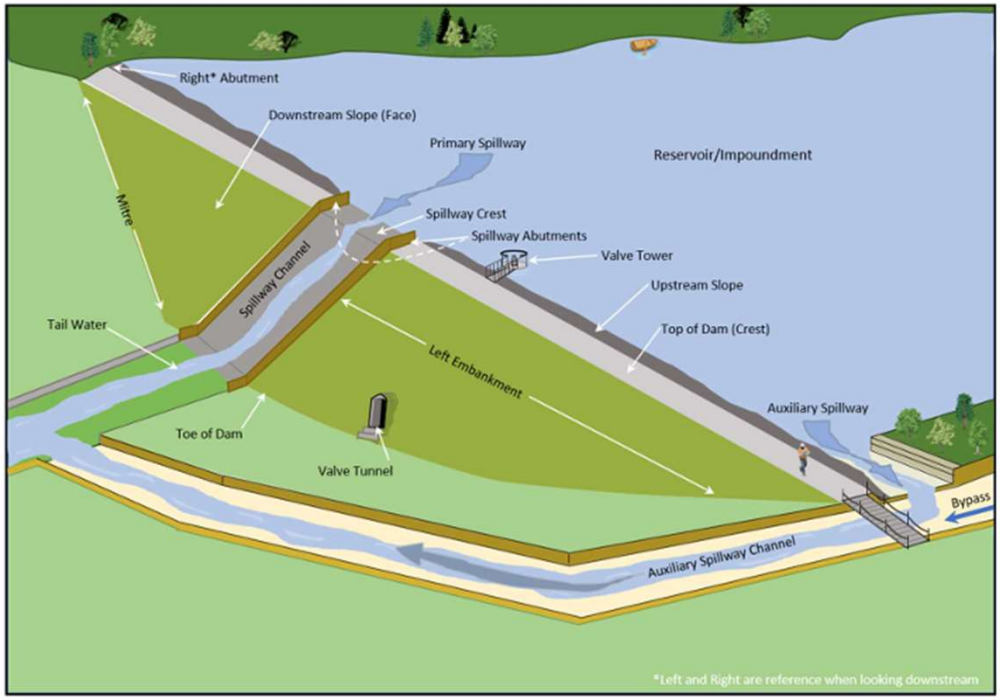

Figure 1 - Reservoir typical arrangement and terminology

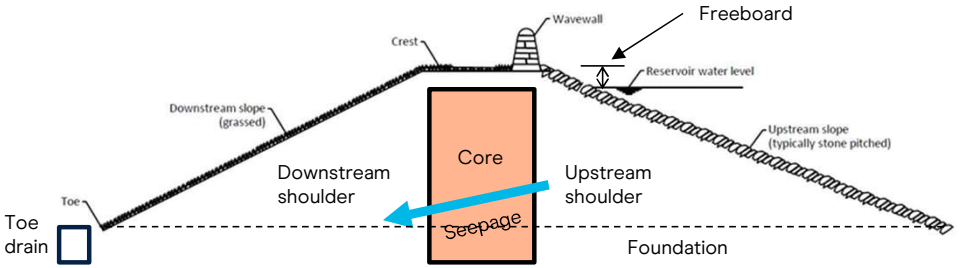

Figure 2 - Typical reservoir embankment cross section

- **Core** – this stops the water passing through the dam
- **Shoulder** – supports the core
- **Freeboard** – height for storm flood rise
- **Wave Wall** – stops wave over topping, prevents erosion
- **Spillway** – to allow a flood to pass safely
- **Bywash/bypass** – to allow water to pass if reservoir damaged
- **Valves/drawoff pipework** – to enable the reservoir to be emptied in an emergency (and to feed the canal)
- **Pitching** – prevents wave damage and erosion
- **Grassed downstream slope** – 50-150mm so defects are visible and grassed so it will not erode
- **Seepage** – water will pass through the dam, slowly eroding the dam
- **Foundation** – natural ground below the dam, may be cracked, may settle, may erode with time
- **Toe drain** – to identify if seepage is increasing

Toddbrook

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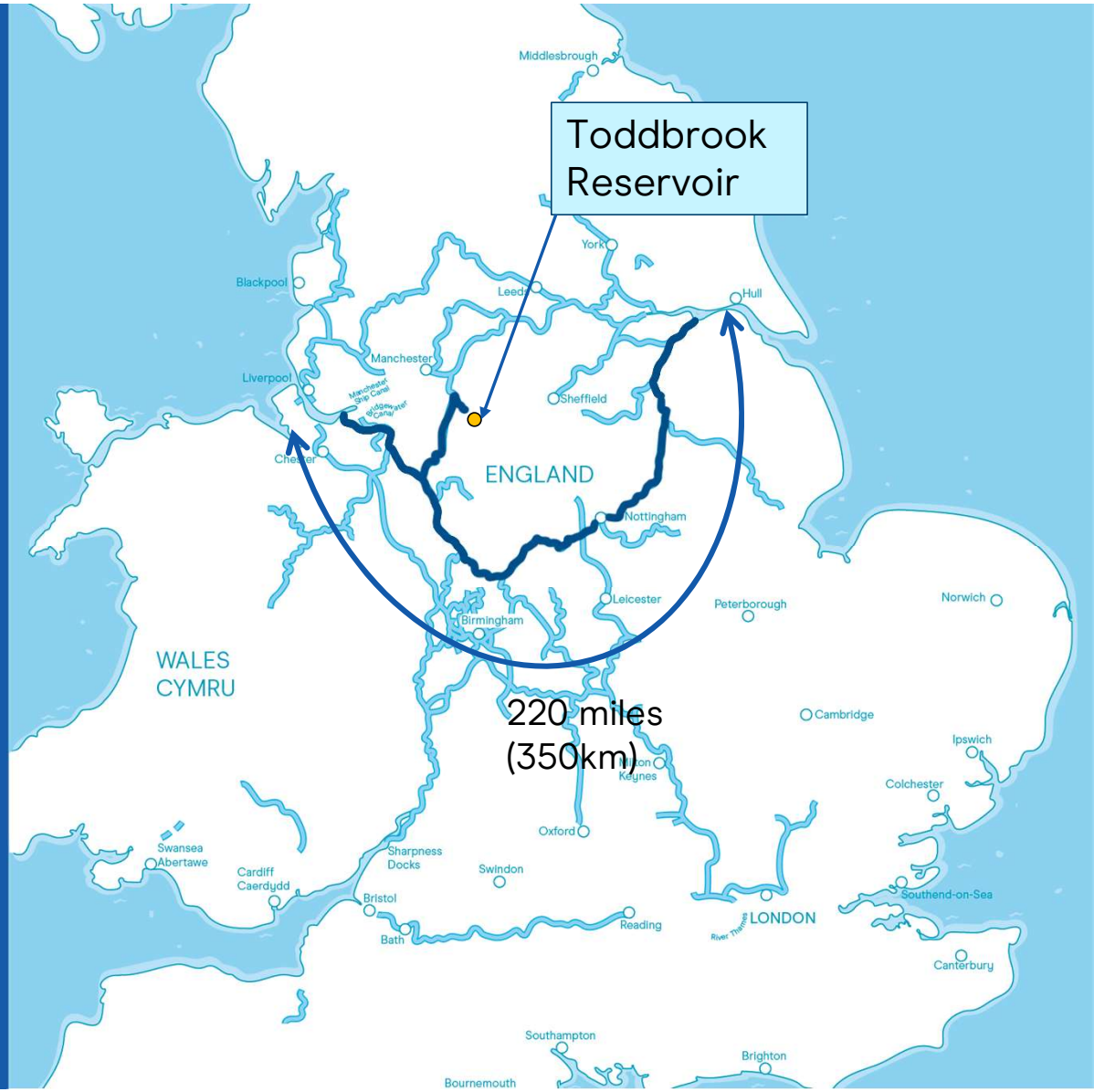
Toddbrook's primary purpose, canal supply

- Feeds over 220 miles of canals
- Filling locks to raise boats up/down lock flights
- Reaches the Mersey and the Humber, west and east coast
  - ➢ Peak Forest canal
  - ➢ Macclesfield Canal
  - ➢ Trent & Mersey Canal
  - ➢ Ashton Canal

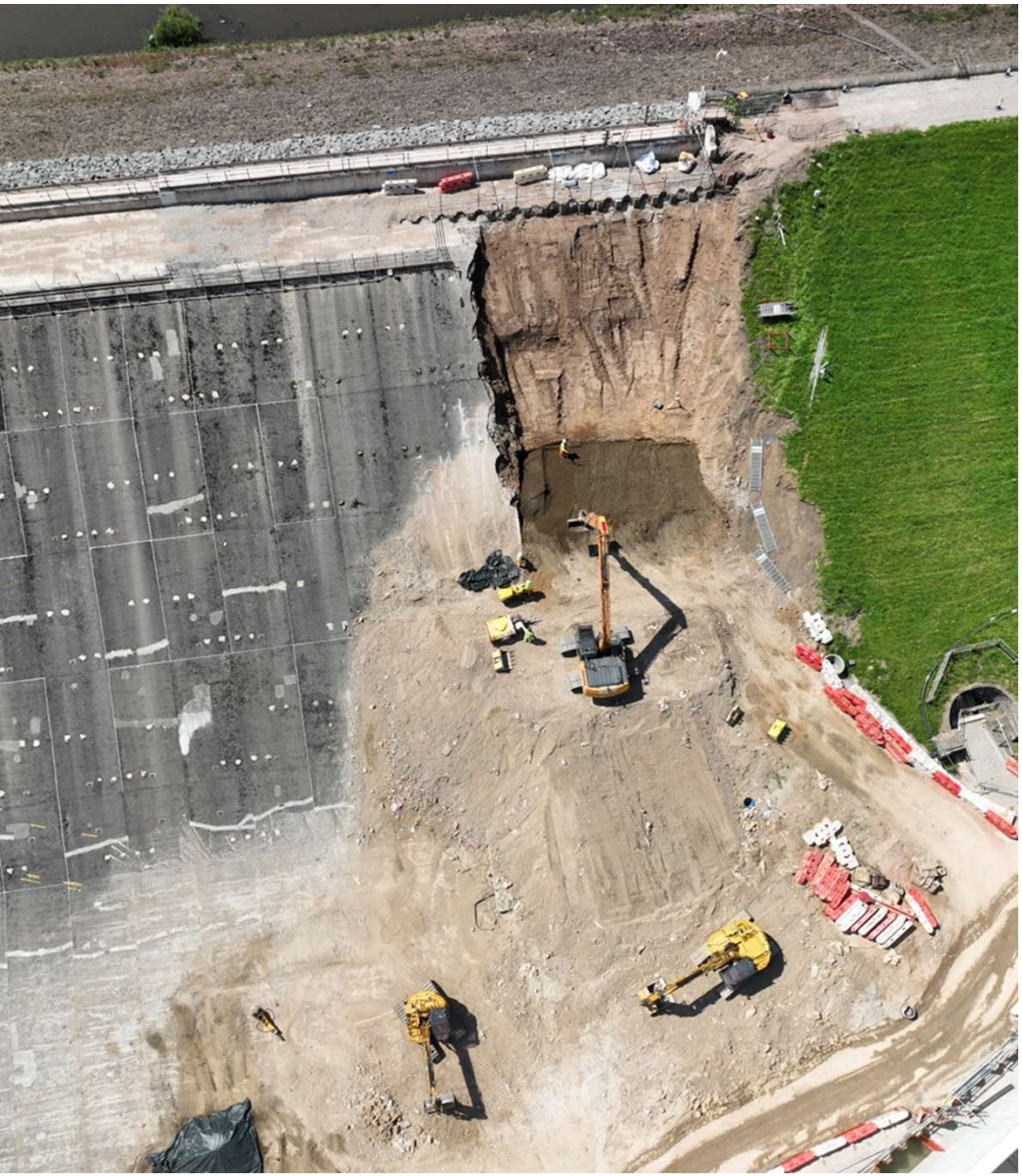


Toddbrook pre-incident

- Year construction complete 1840
- Height 23.8m
- Length 310m
- Puddled clay core 12” wide at crest
- Catchment 17.3km^2
- Impounded volume 1,238,200m^3
- Design flood, 10,000year 77.4m^3/s
- Safety Check Flood, PMF 186.2m^{3}s
- Primary spillway damaged 1964
- Auxiliary spillway 1970 (note 6 years!)

The incident

- Rainfall event on 30th & 31st July 2019
- Failure of the upper spillway chute on the 1st August



Reservoir Improvement Works

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Barrowford – lowering & drawoff

Bosley – drawoff lining & upstream control

Brent – drawoff re-painting

Carr Mill – valves and spillway

Earlswood – core raising

Harthill – new spillway

Knypersley – spillway refurbishment

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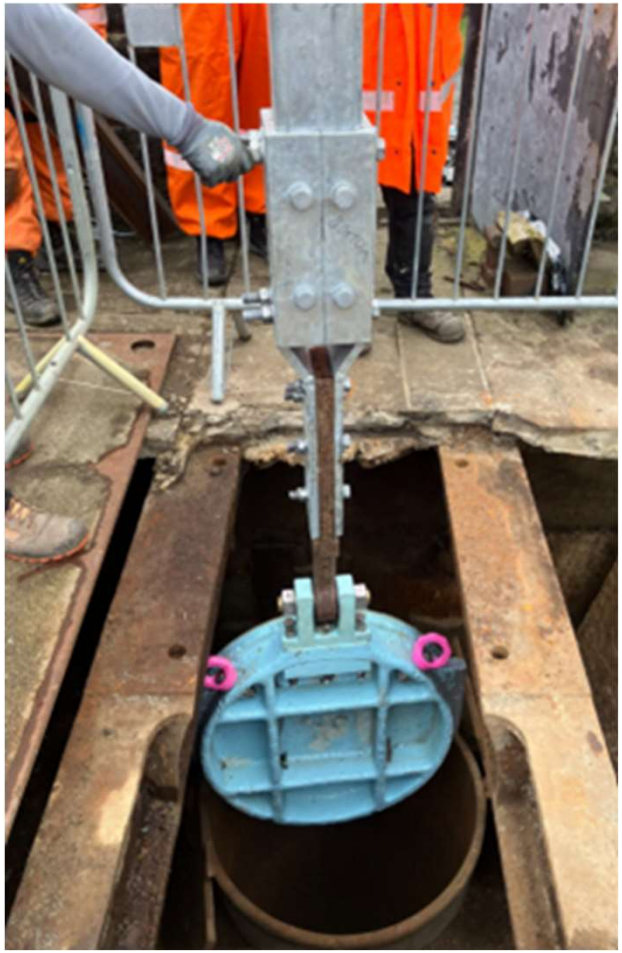
Rishton – new spillway

Startopsend – new spillway

Welford – temporary siphon

Wilstone – sheet piled core

Winterburn – valve repair



Future – look ahead

- Chasewater – new guard valve 2026
- Combs - new drawoff pipe 2027
- Diggle – move control valve out of tunnel 2028
- Elton - new spillway 2030
- Foulridge Lower - new spillway 2029
- Foulridge Upper – spillway improvements 2028
- Killington - upstream control valves 2028
- Rudyard – spillway refurbishment and increased drawdown 2027-29
- Startopsend - sheet pile core 2031
- Tardebigge – erosion protection 2029

Role and importance

To close:

- The reservoirs feed over half of the canal system
- Without reservoirs we do not have a canal system
- Reservoirs are nationally important public safety structures requiring significant investment
- Without this investment, we would not be able to keep the canals alive.

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Thank you and discussion!

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David Prisk
Reservoir Asset Manager

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