Basic Details

Publish Date

28 October 2025

Case ID#

3345

Title

Partial failure of outlet pipe leading to internal erosion in flood storage reservoir, exacerbated by a blocked debris screen

Nation

England

Regulator Reference No.

533

Legal Status

Statutory

Reservoir Type

Impounding

Reservoir Capacity

100,000 - 499,999m3

Year of Construction

1970 - 1989

Main Construction Type

Earth fill embankment

Dam Height

5 - 9.99 metres

Dam Flood Category

A

Hazard Class

High-risk reservoir

Reservoir Use

- Flood risk management

Owner Type

Limited company

Incident Details

Date & Time of Incident

14 October 2024 - 12:00

Date Incident Closed

14 October 2024

Observations that Caused the Incident to be Declared

- Slope or face deformation (slippage, cracking, slumps, mounds, depressions)

Describe the Incident

Following a significant rainfall event, the flood storage reservoir impounded higher than is usual and remained impounded longer than would be expected. Although the flood storage reservoir operated as it was designed, a significant amount of grass cuttings had been washed down the system and had subsequently reduced the capacity of the outlet pipe by approx. 50%. Although not a dam safety requirement at the time, the undertaker operations team proceeded to install simple siphons to help reduce the water level. On reducing the water level, the staff observed a sink hole approx. 3m W x 3m L x 1m D located above the alignment of the outlet pipe and on the upstream face. Additional rainfall was forecast and the previous inspecting engineer could not attend so a more local ARPE attended site on 14th October 2024 pm (now appointed as QCE). Visual assessment was conducted by ARPE and Supervising Engineer on 14th October 2024 with recommendations to lower reservoir levels immediately, carry out a CCTV of the outlet, clear inlet screen from vegetation/grass using divers to allow full flow of the outlet conduit. Continuous assessment of the weather forecast was also advised. The Emergency resilience team of the undertaker were advised of the need to declare an incident and move the status of the incident to standby (or alert) status. As per the onsite plan requirements at standby alert status, a member of the supervising engineers panel advised following visual inspection there was no need to move the incident alert status to advisory. Observations at the site are being made daily. Any changes in the embankments condition will be bought immediately to the Reservoir Safety Teams attention for any further actions required.

Supporting Photos





Causes and Impacts

Natural Processes which Initiated or Contributed to the Incident

- Flood - within dam design capability
- Heavy/persistent rain (no flood)

Main Contributing Factors to the Incident Occurring

Dam Factors

- Deterioration of materials
- Failure or damage to pipes or culverts

External Factors

- Damage by floating debris

Shortcomings

- Construction shortcoming
- Design shortcoming
- Surveillance shortcoming

Root Cause of the Incident

A previously unknown failure of the outlet pipe caused internal erosion, where fines were washed down causing a sinkhole on the upstream face of the dam. A blocked debris screen from grass cuttings on the outlet meant the flood storage reservoir was held at a higher level than normal. This triggered investigation of the condition of the outlet pipe and identification of the partial failure of the pipe.

Impacts on the Reservoir

- Failure or damage to tunnel or culvert
- Internal erosion (adjacent to structures)

Supporting Photos

No images provided.

Supporting Contributions and Studies

Human Factors which Influenced the Incident

Staff who maintain the parks (not the reservoir undertaker) had cut the grass upstream and not removed the cuttings from the catchment of the lake. the grass cuttings blocked the outlet grille resulting in the increase of water level to such that it spilled over the overflow. However, the lake remained impounded longer than expected but was within the design capabilities of the flood storage reservoir.

The installation of siphons (5 No. 100mm rigidrain pipes manually primed over and into the overflow) helped reduce the water level until sink hole was observed, and then pumps were installed to reduce levels quicker.

Once water levels had reduced, divers were employed to clear the outlet grill.

Instrumentation at the Reservoir

No instrumentation present but the crest is levelled annually but no noticeable changes to the crest level was observed. CCTV of the outlet would have been more useful monitoring to have been aware of the vulnerability in the outlet pipe.

Was Instrumentation Effective?

Not Applicable

Assistance by External Parties and Impacts on Downstream Population

Summary of Studies or Investigations Undertaken

Increase monitoring by undertaker operations team

CCTV survey carried out to identify failure point.

Supporting Photos

No images provided.

Lessons Learnt

Lesson 1

- General design and construction

It is important to understand the design of structures such as debris screens to ensure they are adequate. Older screens should be assessed with consideration of the local catchment.

It is important to regularly inspect outlet pipes using CCTV to understand their condition when it is not always visible.

Lesson 2

- Surveillance and Monitoring

Infrequently impounded flood storage and other reservoirs may show problems when filled, because they can't be monitored continuously and effectively under hydraulic loading conditions, like normally impounded reservoirs can. When impounded, there is an extra opportunity for the reservoir undertaker and supervising engineer to monitor for leakage, movement, and other potential consequential reservoir behaviours.

Lesson 3

- Operation and maintenance

Ensure all staff working on the site understand the implications of their daily tasks on the wider reservoir system.

Lesson 4

- Emergency response

This highlights the value in using your onsite flood plan, and reviewing how effective it was after an incident to improve it for next time.

Handmade (numerous cut pipe sections) and primed siphons can be effective water lowering tools where suitable conditions exist.

Closing Comments

Supporting Photos



Information provided has been sent from reservoir owners and engineers, and cleansed of personal information by the enforcement authority. We cannot guarantee the accuracy of the data, but if you find an error please contact the relevant enforcement authority.