Basic Details

Publish Date

19 November 2026

Case ID#

3375

Title

Sinkhole on downstream face of embankment from internal seepage

Nation

England

Regulator Reference No.

546

Legal Status

Statutory

Reservoir Type

Impounding

Reservoir Capacity

100,000 - 499,999m3

Year of Construction

< 1800

Main Construction Type

Earth fill embankment

Dam Height

10 - 14.99 metres

Dam Flood Category

A

Hazard Class

High-risk reservoir

Reservoir Use

- Conservation (ornamental / heritage)

Owner Type

Registered charity

Incident Details

Date & Time of Incident

01 July 2025 - 12:00

Date Incident Closed

18 May 2026

Observations that Caused the Incident to be Declared

- Deformation or instability of embankment or dam wall (slumps, cracks, depressions, etc.)

Describe the Incident

A new sink hole was identified by a member of staff whilst undertaking inspections of the embankment. The sink hole is located on the downstream face of the dam wall. Clear running water has been observed within the base of the sink hole. There appears to be a connection between the water running in the sink hole and seepage seen at a location downstream of the toe of the embankment (after dye tracing). Seepage at the toe of the embankment has been observed for some time and is subject to MIOS works.

The QCE involved in the MIOS project was called immediately. Photos and videos were taken and sent to the QCE on the 1st July.

A Geotechnical Engineer attended site on 2/07/2025 and assessed the sink hole. The supervising engineer was informed. Following advice from the engineers investigations were made to determine the mechanism of the sink hole. Investigations included dye tracing and taking measurements of water temperature in the reservoir, the sink hole and the seepage area.

The water level in the lake was lowered to a point at which the flow of water in the base of the sink hole stopped.

Undertaker staff increased monitoring of the the sink hole and area of seepage, checking for any further changes to the embankment or clarity of water, as well as recording reservoir water levels daily.

The Section 10 report had already identified the potential for the seepage to increase, so a Measure in the Interest of Safety had been set to re-puddle the clay core of the embankment to prevent further deterioration.

The sinkhole appeared in the embankment before the MIOS works had commenced, indicating erosion was worsening. Therefore emergency works were undertaken to expedite the works.

Supporting Photos

No images provided.

Causes and Impacts

Natural Processes which Initiated or Contributed to the Incident

- None

Main Contributing Factors to the Incident Occurring

Dam Factors

- Deterioration of materials

External Factors

- Not provided

Shortcomings

- Construction shortcoming

Root Cause of the Incident

Seepage in the embankment had been present for some time because of the historical nature of the structure and the suspected deterioration of its clay core over time.

Impacts on the Reservoir

- Internal erosion (fill deterioration)

Supporting Photos

No images provided.

Supporting Contributions and Studies

Human Factors which Influenced the Incident

Staff undertaking regular surveillance identified the sink hole and this was reported immediately to the QCE involved in the MIOS works. The QCE advised staff to gather information such as the size, location, photos and videos of the sinkhole. A decision was taken on Day 1 to commence the lowering of the lake level. The QCE attended site the following day. On subsequent days, observations were made by staff of the water temperature in the lake, sinkhole and at the 'spring' exit point, to determine the source (e.g. lake or groundwater), as well as monitoring lake levels and any changes to flow or appearance of water in the sink hole. The lake continued to be lowered until the flow in the sinkhole stopped.

The regular inspection by staff meant early detection of the problem and that steps could be taken to prevent the seepage and erosion from worsening by lowering the lake level.

Instrumentation at the Reservoir

Not applicable - no instrumentation related to this incident

Was Instrumentation Effective?

Not Applicable

Assistance by External Parties and Impacts on Downstream Population

None

Summary of Studies or Investigations Undertaken

On the day that the sinkhole was spotted, staff put dye into the sinkhole to determine where the water was flowing to. The dye was seen in less than 10 minutes within the “spring” below the downstream toe of the embankment suggesting a hydraulic connection.

Remedial works involved the installation of a 55m linear run of steel sheet piles running along the embankment line and excavation and repair of all weak spots along the embankment using class 2A cohesive fill, undertaken in line with specification for layering and compaction.

Remedial design was already underway in response to the MIOS before the defect arose. These works were expedited following identification of the defect, but no additional investigations were required.

Supporting Photos

No images provided.

Lessons Learnt

Lesson 1

- Surveillance and Monitoring

The importance of making regular observations of the reservoir and by someone who is very familiar with the structure's appearance and therefore being able to spot very small / subtle changes that can indicate a problem. In this case, there had been seepage in the embankment and there was a change to the appearance of the seepage area. The very subtle change in appearance was picked up because of experienced staff who knew the reservoir well.

Lesson 2

- Surveillance and Monitoring

Although in this case the issue was picked up by visual inspection, the subtle change may have been detected even earlier though leakage measurement via instrumentation. A V notch will be installed in order to monitor leakage into the future.

Lesson 3

- Emergency response

On the day that the sinkhole was spotted, staff put dye into the sinkhole to determine where the water was flowing to. This was very useful in determining next steps. It would therefore be useful at other reservoir locations to have dye available for staff to use to help diagnose problems such as determining flow direction, when it is not obvious.

Lesson 4

- Long term seepage
- Operation and maintenance
- Surveillance and Monitoring

The reservoir had an existing MIOS relating to the seepage. It is important to ensure that risk mitigation while waiting for MIOS to be completed are being implemented.

Closing Comments

Supporting Photos

No images provided.

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.