UK: Major flooding narrowly averted after Toddbrook dam collapse

Harvey Thompson
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Around 1,500 residents of Whaley Bridge returned to their homes Tuesday and Wednesday after being evacuated for almost a week due to the partial collapse of a reservoir wall.

Whaley Bridge is a small town in England's Peak District national park that lies just below a dam that supports up to 1.2 million tons of water constituting the 0.5km long Toddbrook reservoir.

It only became known that the dam was in danger of collapse on August 1, following several days of heavy rain. A Canal & River Trust (CRT) employee working alone noticed the force of the water cascading over a section of the concrete spillway had led to cracks and a partial break away.

Barry Rudd, a trust volunteer, said he arrived at the dam at midday to find the employee "desperately trying to reduce the levels by opening the valves. He was running up and down the reservoir with a rake clearing debris and adjusting and tracking the valves, but there was just so much water coming over the top it began to wash away the clay wall."

Once the danger was apparent, up to 6,500 residents were evacuated from the town and nearby Furness Vale and New Mills. The entire area was cut off for days.

The Peak District lies between Manchester and Sheffield and the heavy rainfall and flooding resulted in the only rail line between the two cities being closed for five days after being declared unsafe.

A huge logistical operation involved workers labouring around the clock to prevent the dam bursting, which saved Whaley Bridge from severe flooding as well as other towns and villages further downstream. Part of the operation required fire and rescue workers to pump vast amounts of water out of the reservoir into the River Goyt. The operation was hindered due to some of the huge infrastructure cuts imposed over the last decade. In the first critical hours, only one industrial pump was available. Eventually more were secured, enabling around one billion litres of water to be pumped out in four days.

A Royal Air Force helicopter was deployed to drop over 1,000 sandbags and 600 bags of aggregate to plug the gap in the dam's defences, after which construction workers poured in concrete to create a temporary seal.

A catastrophe was only narrowly averted. Speaking four days after the evacuation, Gavin Tomlinson, the fire incident commander, said, "On Thursday night it [the dam] very nearly went. It was leaking and we were in a situation where we had five times as much water going in than we could take out. We absolutely thought it could fail. It was a very, very tense night."

Whaley Bridge's population and those in the wider area now live in the shadow of a dam in need of extensive repair, with authorities giving no concrete information as to when work will be completed.

It emerged that residents had previously raised serious doubts as to whether the dam and reservoir were being adequately maintained. Drone footage taken in 2016 showed numerous plants growing in gaps between concrete panels on the dam spillway. One resident took photographs of the spillway in 2016 and 2017 saying there was "vegetation growing out of it." He sent the photos to the BBC, which asked several experts to analyse them.

Construction engineer Roger Meredith worked on the earth-filled Tarbela dam in Pakistan, which is much larger but of a similar design to Toddbrook. He told the BBC the presence of vegetation on the spillway was a danger "because whatever vegetation is there, its roots are going through the joint of the slabs or where the slabs are cracked. There has to be some sort of ingress of water there somehow."

Concrete slabs on water-retaining structures should have “water bars” in between the joints to prevent water penetrating. But these bars were not in evidence in pictures of the collapsed spillway. “It looks like the slabs are not reinforced with steel,” Meredith said. “There has been ingress of water either through cracks or through the joints between the slabs. Somehow water has got in under the slabs and popped the slabs off.”

Meredith pointed to what he believed is a flaw in the spillway design. “When you look at the spillway the side kicks in, it’s not straight. So, you are increasing the amount of water trying to get down that side.” This is the same side that collapsed and where town residents regularly saw water flowing down and collecting in the past.

Toddbrook is an “embankment” dam constructed nearly 180 years ago in 1840. Much of the UK’s dam and waterways system is similarly dangerously antiquated. According to the Dam Society, there are over 3,000 such dams with an average age of over 100 years. The concrete spillway that disintegrated is now 50 years old.

The University of Strathclyde’s Dr. Panagiotis Michalis, who has researched dams since 2010, told the BBC that some were a “ticking bomb” because of their ageing infrastructure and predicted that incidents such as Whaley Bridge would be more common. “In the UK, the majority of the dams are more than 100 years old. That means they’ve exceeded their design lifespan,” he said. “Back then their design standards didn’t take into account future climatic conditions that are happening now, so they have an outdated design.”

Whatever the immediate cause of the collapse of the dam, there is no doubt it was poorly maintained with massive central government austerity cuts and privatization playing a critical role.

From 2010/11 to 2015, some £107 million was cut in real terms (20 percent) from the national flood defence budget. The budget of the Department for Environment, Food and Rural Affairs, responsible for environmental protection including flood risk and management has been gutted. In 2008, its budget was £3.1 billion and by 2017 this was down to £1.6 billion. In the two years to 2020, this falls to just £1.5 billion.

The Canal and River Trust, which is responsible for the dam, said it adhered to regulations requiring reservoirs to be supervised, inspected and maintained by specialist engineers. The 72 reservoirs it maintains are “rigorously inspected” twice each year. Major inspections are only required once every 10 years, with Toddbrook’s taking place last November.

The CRT is responsible for around 2,000 miles of canals and rivers, together with reservoirs and a wide range of heritage buildings and structures in England and Wales. Yet it is run on a shoestring. Created in 2012 by the Environment Agency (EA), the CRT took over the role of the state-owned British Waterways. Despite having major responsibilities affecting the safety of millions of people, the CRT is relegated to the status of a non-governmental organisation and run as a charitable trust. It employs just 1,500 people and is heavily reliant on the vigilance of its 2,000 volunteers.

The EA, a non-departmental public body established in 1995, is the principal flood risk management operating authority. It has the power, but not the legal obligation, to manage flood risk from designated main rivers and the sea. Over the last decade, the EA has been devastated by huge budget cuts and job losses. Its workforce was slashed by nearly a quarter in the five years following the worst floods since World War II, in 2007. These left 13 people dead and 44,600 homes flooded. By 2018, the equivalent of more than 2,500 full-time jobs had gone since 2013 (20 percent of its workforce). In two years to 2014/15, the jobs of 1,663 water and flood risk special staff (15 percent) were axed.