# BRIDGE 37- CALDON CANAL

DESIGN AND ACCESS STATEMENT



# TYPE OF APPLICATION

This heritage statement accompanies the listed building consent application for the partial demolition of bridge 37.

# LOCATION

The bridge is in Hazlehurst, east of the village of Endon in Staffordshire and allows access for farmers/residents to access fields and long-term moorings over the Caldon Canal. Vehicle access can only be gained via a track off Leek Old Road (off A53) which is approx. 500m north of the bridge.

The bridge is a grade II listed structure. A copy of the listing description being shown in appendix 1. It is also located in Caldon Canal Conservation Area.

# DESCRIPTION OF PROPOSED DEVELOPMENT

The listed building application concerns the partial demolition of a grade II listed brick arch bridge.

The National Planning Policy Framework (NPPF) 2012 provides the Government's national planning policy of the conservation of the historic environment, in respect of information requirements it sets out that:

*'In determining applications, local planning authorities should require an applicant to describe the significance of any assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance'*

It is therefore accepted that for the LPA to consider this application it is necessary for the applicant to provide a detailed justification for the demolition.

# DATE OF PREPARATION

June 2020

# APPLICANT

Canal & River Trust

# STATEMENT PREPARED BY

Prepared by:

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# CONTEXT

The listed building application concerns the partial demolition of a grade II listed brick arch bridge. The following is an engineering statement written by Sally Boddy, Regional Engineer for the Trust.

## CONDITION OF BRIDGE PRIOR TO FAILURE

**Bridge 37 on the Caldon Canal is a Grade II Listed structure. At its last Principal Inspection in 2011, it was described as in "Good Condition" and assessed as being capable of carrying 18 tonnes gross.**

**Since the Principal Inspection, the bridge has been inspected on a bi-monthly basis in accordance with the Trust's Asset Inspection Procedures and no significant changes were recorded. Prior to the failure the Trust had no concerns about the condition of the bridge.**

## DESCRIPTION OF FAILURE

**On Sunday, 1st March 2020, the Trust received a call from residents, concerned about the condition of the bridge. Upon arrival on site, the condition of the bridge was a concern and with the resulting risk to public safety, Trust personnel, in conjunction with the police, closed off all accesses to the bridge.**

**The bridge suffered major subsidence of the south eastern corner of the bridge, which caused severe distortion and full depth cracking of the arch barrel, settlement and cracking in the south east wingwall, deep depressions and cracking in the road surface. Other significant cracking appeared at midspan in the eastern elevation. This cracking extended through the full height of the parapet and continued as a hairline crack around the north eastern face of the arch. In addition, cracks continued to open up throughout the whole of the structure and once the canal was re-watered movement of the structure continued.**

**The most catastrophic defects were two diagonal, full depth, radial cracks in the arch barrel, which were estimated as being up to 100mm wide and were increasing (see figure 3). They ran from the western, offside springing point (top of the abutment/start of arch barrel) right through the arch to the eastern, towpath side quarter point. Deck fill regularly dropped through the cracks, indicating that the bridge continued to move. The two cracks were clear indications that the structural integrity of the arch was severely compromised.**

**The crack formations in the bridge and the settlement of the road surface were clear indicators that the wet abutment foundations and arch had failed and that there had been a substantial loss of material from behind the abutments of the bridge, leaving the bridge in an unstable and dangerous condition.**

## HOW THE FAILURE OCCURRED

**The investigation into the cause of the failure of the bridge found that severe undermining and erosion of the south east abutment was caused by the dewatering of the upstream side of the bridge, which had been necessary to facilitate repair works at the adjacent lock (lock 12). This type of failure of a bridge is believed to be unprecedented and, given the known condition of the bridge, was not considered to be reasonably foreseeable.**

**A fabric dam had been installed by specialist contractors on Thursday 27th February and signed off as being safe to work behind on Friday 28th February. The dam was visually inspected on Saturday and found to be in good condition. It appears that on Saturday evening /Sunday morning, canal water managed to track behind the sheeting, which forms the seal to the dam, and that the resulting differential head across the abutment, was sufficient to**

**mobilise material from both behind and beneath the bridge foundations, leading to the failure of the bridge.**

## DECISION

**The first engineering inspection of the bridge was on Monday 2nd March. This inspection was undertaken by Rob Malpass, a Senior Engineer with the Canal & River Trust. He has a BSc(Hons) Degree in Construction Management and is an Incorporated Member of the Chartered Institute of Building, with 14 years' experience of inspecting and maintaining historic canal structures.**

**Rob's initial assessment of the bridge was that it was unlikely to be recoverable and would possibly collapse on its own.**

**Later that day (2nd March) the bridge was Inspected by Simon Hughes – Principal Engineer. Simon is a Chartered Civil Engineer who leads a Design & Development Team within the Trust. Simon has worked for the Trust/British Waterways for 21 years and was Chartered in 2004.**

**Simon's assessment was similar to Rob's, in that it would not be safe to salvage the situation and he recommended that the bridge be demolished as soon as possible for safety reasons.**

**On Wednesday 4th March Sally Boddy – Regional Engineer visited the bridge to start an investigation into the cause of the failure. Sally as Regional Engineer would ultimately have to make the final decision as whether to demolish the bridge. Sally has been a Chartered Civil Engineer, for over 25 years and has worked for the Trust for 26 years. She has a PG Dip in Building Conservation and has expertise in the care and management of historic canal structures.**

**Sally was also joined by Mark Durham, a Principal Engineer, who is also a Chartered Civil Engineer and Peter Simpson, a Trust Senior Bridge Engineer, a specialist in brick arched bridges. All agreed that the mode and extent of failure within the bridge was such, that it was unstable and that it would not be practicable to stabilise and repair the bridge safely.**




FIGURE 1: THE DAMAGE AT BRIDGE 37.




FIGURE 2: THE UNDERMINED ABUTMENT AT BRIDGE 37.




FIGURE 3: CATASTROPHIC CRACKS IN THE ARCH BARREL.

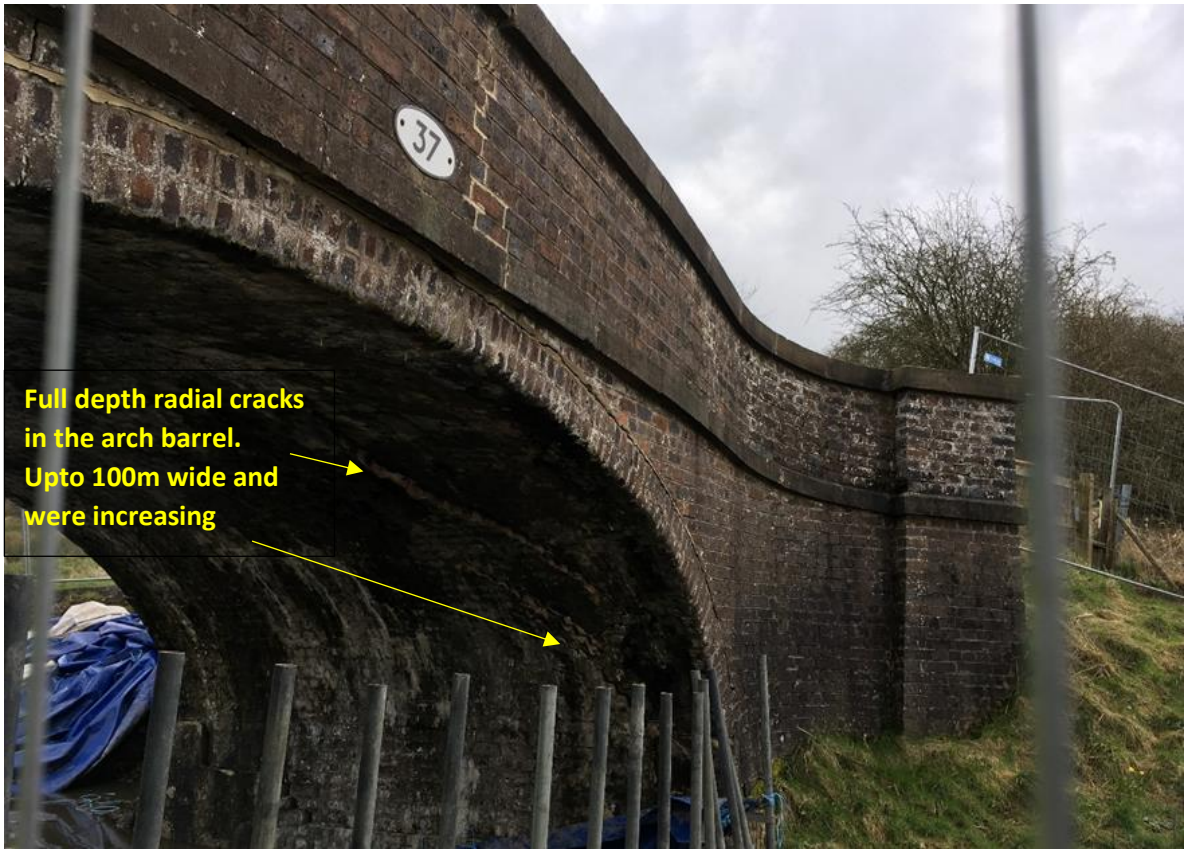


FIGURE 4: FULL DEPTH CRACKS ON THE BARREL ARCH.




FIGURE 5: DECK FILL CONTINUED TO FALL THROUGH THE CRACKS.

# PHILOSOPHY OF PROPOSED WORKS

A site meeting was held between representatives of Canal & River Trust and Staffordshire Moorlands District Council on the 4th of March where it was agreed that bridge 37 had sustained catastrophic damage and it was deemed therefore that regretfully emergency works were required to take down dangerous parts of the structure due to fear of collapse (see appendix 1 for timeline). The take down was carried out using a long reach, tracked excavator working from a distance. Where possible and safe to do so, the copings and pilaster caps were salvaged.

## OPTIONS APPRAISAL

Options to save the bridge were considered, but due to the risk of collapse and the fact that the bridge was still moving it was deemed to be unsafe to action any of the options which would have resulted in less harm to the significance of the asset but involved accessing the underside of the bridge (2 and 3). Option 1, do nothing, was not viable. Option 4 was discounted because it was not logistically possible at that moment in time due to canal closures and the urgency of the situation – though this option would still have involved a controlled take down. Number 5 was the only option left which could be executed safely, though this option was to have a high impact on the heritage significance of the bridge (which is discussed in the heritage statement).

| Options for bridge 37 repair | |
|---|---|
| **1. Do nothing** | |
| **Operational issues**<br>Not practical. It was too dangerous to leave as it would have collapsed in an uncontrolled manner with a high risk to human life. This would have resulted in a costly clear out of the rubble from the canal. Loss of opportunity to record the bridge and salvage materials. | **Impact on heritage significance**<br>High. Loss of original fabric which would have fallen into the canal. Stone block work may have fractured. Loss of the form of the structure, including aesthetic, historic and evidential values. |
| **2. Insert props under the arch to facilitate repair.** | |
| **Operational issues**<br>Too dangerous to implement as the bridge was still moving so it was not possible to gain access under the arch. It is also likely that props would not have been effective in supporting the bridge while repairs were carried out. | **Impact on heritage significance**<br>Medium. Large parts of the structure could have been saved but the arch was unsavable. Loss of the form of the structure but the option of repair maintained. |
| **3. Seek to retain the bridge by placing stone filled tonne bags below the arch to provide temporary support to allow safe access for re-construction/ repair.** | |
| **Operational issues**<br>Not safe to gain access under the bridge to implement as the bridge could have collapsed in an uncontrolled manner without warning. | **Impact on heritage significance**<br>Medium. Large parts of the structure could have been saved but the arch was unsavable. Loss of the form of the structure but the option of repair maintained. Historic value would have been protected with the ability to save more of the original fabric. Aesthetic and evidential values would have been protected to some degree with the potential to save some of the structure. |
| **4. Float a pontoon under the arch to catch rubble during the controlled take down.** | |
| **Operational issues**<br>Due to the drained canal it was not possible to float the pontoon into position. This was also not possible due to the limited time available to make the bridge safe. | **Impact on heritage significance**<br>Medium. Some material could have been caught by the pontoon but much of the arch would be lost, resulting in the loss of some aesthetic value. Loss of the form of the structure. Historic value would have been protected with the ability to save more of the original fabric. |
| **5. Controlled take down of dangerous elements using a long reach, tracked excavator.** | |
| **Operational issues**<br>This was the safe option as it does not require access to the underside of the bridge. A long reach excavator meant that works could be undertaken from a safe distance. | **Impact on heritage significance**<br>High. Resulting in the loss of the arch, parapet, towpath wingwalls (for access) and offside wingwalls. Parapets were knocked inwards allowing the stonework and bricks to be scraped back by the excavator so as much of the original fabric could be saved as possible. Loss of form and loss of historic fabric. Resulting in harm to historic, aesthetic, evidential values. Harm to the conservation area and setting of nearby designated listed assets. |

## CONSERVING AND ENHANCING THE HISTORIC ENVIRONMENT

Canal & River Trust is very conscious of its role as a leading custodian of heritage assets to protect for the public interest. The Trust has a Mandatory Standard for heritage and aims to deliver conservation best practice, taking a long term and strategic view that assumes a presumption in favour of preserving the waterway heritage. The document is available here: https://canalrivertrust.org.uk/media/library/3782.pdf

The approach of this application was taken based on the following guidance as set out in National Planning Policy Framework, Part 12, paragraphs 132 and 133.

**Paragraph: 132.**

*When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification. Substantial harm to or loss of a grade II listed building, park or garden should be exceptional.*

Bridge 37 suffered extreme damage from the de-watering of the canal. The loss of the bridge is sadly unavoidable, and it cannot be conserved. This equates to **substantial harm** as set out above.

**Paragraph: 133**.

*Where a proposed development will lead to substantial harm to or total loss of significance of a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:*

- *the nature of the heritage asset prevents all reasonable uses of the site; and*
- *no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and*
- *conservation by grant-funding or some form of charitable or public ownership is demonstrably not possible; and*
- *the harm or loss is outweighed by the benefit of bringing the site back into use.*

The justification for the loss of the grade 2 asset is that the damage which was sustained meant that the bridge was no longer fit for purpose, it was too dangerous to allow any form of access- neither pedestrian nor vehicle over the arch. Equally it would have been too dangerous to allow boat traffic or towpath users under the bridge. Due to safety concerns and the likelihood of an uncontrolled collapse it meant that options to prop the bridge had to be discounted- the bridge was damaged beyond safe repair.

It is proposed that as the bridge has been partially demolished, the listed asset will be de-listed as much of the significance of the asset has been lost.

## HISTORIC ENGLAND GUIDANCE

Historic England recognizes that listed buildings may need to be demolished without obtaining prior consent. Due to the imminent fear of collapse it was not possible to delay making the site safe to go

through the usual procedures, however the local planning authority was involved and through them Historic England.

## CONSOLIDATION

After the dangerous elements of the bridge were removed (upon agreement with the council and Trust representatives), see the photo record document, attention turned to consolidation of the remaining structure.

Mortar was added to the exposed brickwork on the towpath side to protect it from rainfall. Where possible bricks and the dressed stone blocks from the coping course and string course at deck level were saved. They are palleted and fenced off at the site.

### OFFSIDE STABILISATION

*(Please read in conjunction with 'offside stabilisation plan' PDF)*

The offside abutment is unstable, so additional works to consolidate the structure are required.

The blue area is to have all loose material removed and a double thickness wall of concrete filled sandbags (laid in English bond as per our standard details (see standard detail stabilisation PDF) (with steel pins through the bags) built to 300mm above normal water level. There may well be the remains of the old masonry waterway wall under all the roots – if this is found and in solid condition then bags can be placed up to it.

The remaining bricks in the bed exposed following dewatering are to be removed and stacked on pallets.

Bagwork is to be place on top of the abutment wall (red area). A single thickness of concrete filled bags laid as overlapping stretchers on top of the existing masonry to bring levels up to 300mm above normal water level. This will probably taper from 2 or 3 bags at the downstream side (away from the lock) to 1 at the other side. The bags will run for 5 metres on the abutment. It should be noted that this is a temporary solution to protect the remaining structure. The concrete bags are self-contained and will not adhere to any historic surfaces, it is also reversible.




FIGURE 6: WORKS TO STABILISE THE STRUCTURE.



FIGURE 7: WEATHERPROOFING APPLIED TO THE BRICK REMAINS ON THE TOWPATH ABUTMENT.



FIGURE 8: STONE AND BRICK SALVAGED FROM BRIDGE 37.

# REPLACEMENT BRIDGE

The take down of the dangerous elements of bridge 37 means that the form of the bridge has been lost and much of the structural integrity gone. Bridge 37 is in the Caldon Canal Conservation Area and located in a prominent position next to listed lock 12, and part of a sensitive canal scape- so replacement will need to consider the setting of other listed assets and the conservation area. Optioneering is currently taking place. Three steps were taken to keep options open:

- The remains have been consolidated. On the towpath side the abutment remains and the corner stone and ghost of the curve of the arch. On the offside the abutment has survived but is increasingly unstable, part of the wingwall has survived.
- Original material: bricks, stone copers and the stone blocks from the string course were saved.
- The bridge was laser surveyed before it was partially taken down.

Discussions will be held with Trust representatives, Staffordshire Moorlands District council and other stakeholders.

# APPENDIX 1: TIMELINE

## MARCH 2020

| Date | Action |
|---|---|
| Thursday 27th February | A fabric dam was installed by specialist contractors. |
| Friday 28th February | The dam signed off as being safe to work behind. |
| Saturday 29th February | The dam was visually inspected on Saturday and found to be in good condition. |
| Sunday 1st March | Trust received a call from residents, concerned about the condition of the bridge. Trust personnel, in conjunction with the police, closed off all accesses to the bridge. |
| Monday 2nd March | The first engineering inspection of the bridge was undertaken by Rob Malpass, a Senior Engineer with the Canal & River Trust. Later that day (2nd March) the bridge was Inspected by Simon Hughes – Principal Engineer. |
| Wednesday 4th March | Sally Boddy – Regional Engineer visited the bridge to start an investigation into the cause of the failure. Sally was also joined by Mark Durham, a Principal Engineer, who is also a Chartered Civil Engineer and Peter Simpson, a Trust Senior Bridge Engineer, a specialist in brick arched bridges. The site was also visited by the Trust Heritage Advisor and Staffordshire Moorlands District Council Conservation Officer. |
| Thursday 5th March | Recording of the bridge took place by Survey Operations. Recap RCP, Tru View and photographs. |
| Friday 6th March | Document sent to the council and Historic England which provided details (as far as was possible at that stage) as to the structural condition of bridge 37 and what may have caused the partial collapse and what the Trust's next steps are. The engineer at Historic England reviewed the photos and suggested that stone tonne bags being dropped in to support the arch. It was deemed unsafe to put anyone under a structure to install any temporary works to provide support. |
| Monday 9th March | Take down of the bridge began by our contractors Kier. |
| Tuesday 10th March | Second visit with Kier, Trust representatives and Staffordshire Moorlands District Council to agree the extent of the take down required. |
| Wednesday 11th March | Initial take down completed. |
| 11th March onwards | Weatherproofing of surviving brickwork. Salvage of bricks and stonework. Consolidation of offside abutment. |