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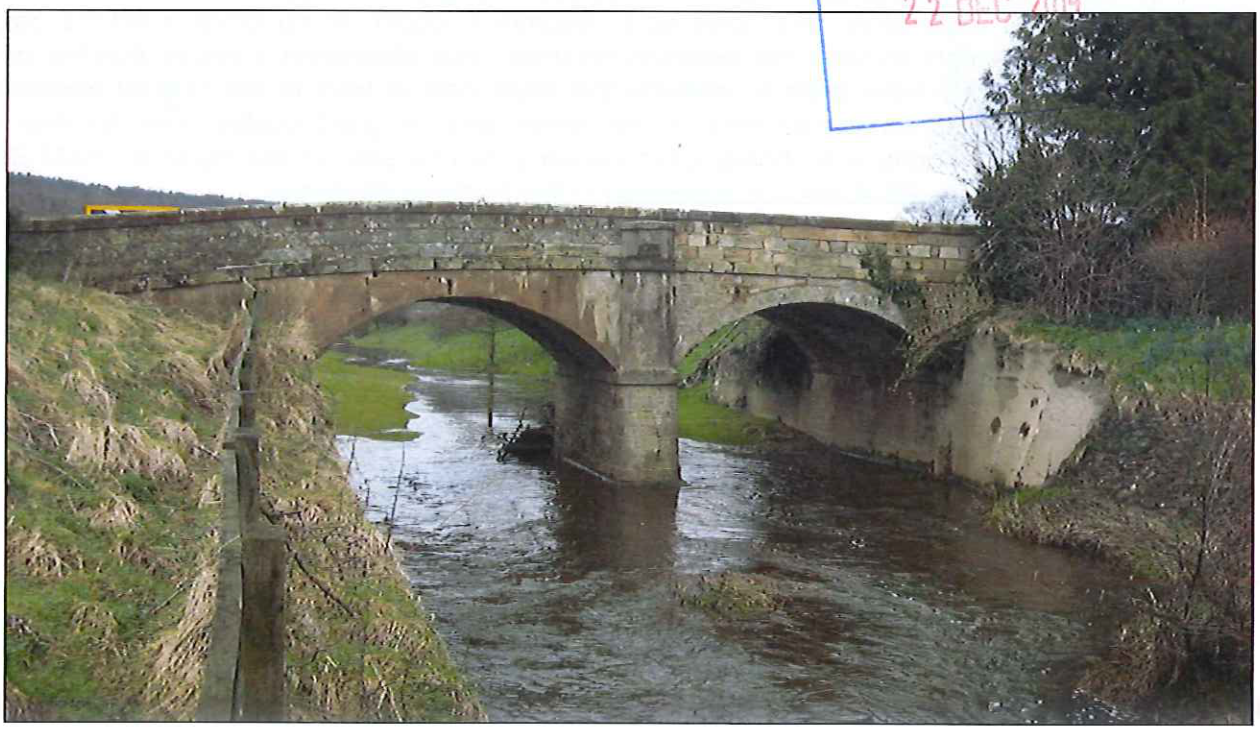
Morgan House, Mount View, Northallerton DL6 2YD

19 December 2014

Mowthorp Bridge, Everley, Hackness, near Scarborough
Listed Building Consent Application
Heritage Statement + Design + Access Statement

Mowthorp Bridge - Western Upstream Elevation



Mowthorp Bridge - Eastern Downstream Elevation

1. DESCRIPTION OF THE EXISTING STRUCTURE

Mowthorp Bridge is a 2-span masonry and concrete arch structure which carries the narrow rural single carriageway unclassified Mowthorp Road between East Ayton and Hackness over the River Derwent Sea Cut. The bridge is orientated in a south-north direction and the Sea Cut flows from west to east beneath towards Scalby.

The structure is located within the North York Moors National Park approximately 4km north of East Ayton and 6km west of Scarborough at OS Grid Ref: SE 980 882.

Mowthorp Bridge is believed to have been built in 1804 as part of the scheme in which the Sea Cut (originally known as the New Cut) was constructed by the Muston and Yedingham Drainage Board as an artificial drainage channel to take water from the River Derwent at a point approximately 700m west of Mowthorp Bridge in order to help control periodic flooding of the lower reaches of the river.

The original bridge is believed to have been constructed entirely of sandstone ashlar but it was later significantly altered in order to slightly improve the road alignment over by extending the arches and abutments to the north west and south east corners using mass concrete and realigning the spandrel walls and parapets accordingly. The semi-circular cutwater extensions above arch springing level and the majority of the spandrel walls were reconstructed in mass concrete, with the original masonry spandrel walls remaining only to the eastern elevation of the northern span only. The wing walls were also reconstructed in mass concrete at the same time. Some of the exposed concrete faces have a thin cementitious render with inscribed imitation mortar joint lines.

It is believed by English Heritage from the study of historical maps that these alterations may have been carried out in the early 20th century at some time prior to 1928. The bridge was Grade II-listed in this already widened state in 1985.

The depth and quality of the concrete to the various altered sections of the bridge and wing walls was investigated in April 2014 by the drilling of a series of 18 no. horizontal 50mm diameter exploratory core holes up to 600mm in depth. At no location did the core hole penetrate right through the widening concrete, thus disproving a theory that the concrete may possibly have been a relatively thin layer cast in front of the original masonry. The concrete was found generally to be dense and of good quality. The findings of the exploratory coring and photographic evidence can be seen in the report by RAM Services Ltd dated May 2014 which is appended to this Heritage Statement.

The segmental arches have spans of 6.20m (south) and 6.06m (north). The original masonry arch rings are approximately 350mm thick with an estimated minimum combined depth of fill and surfacing of approximately 320mm above the crown of the south arch and 375mm above the crown of the north arch. The original voussoir stones have a tooled herringbone finish. There is a rectangular string course 225mm deep to both elevations just below carriageway level.

The parapets are approximately 220mm thick with 270mm wide by 230mm deep copings. Rectangular pilasters at the ends of the parapets are 600mm wide by 650mm long with 250mm deep capping stones with sloping tops. The original parapet stones have herringbone tooling to both faces but replacement stones insensitively incorporated into certain repaired areas of parapet are either plain-faced or have a variety of tooled finishes, some with herringbone tooling, some with herringbone and plain margins and some with random punched tooling. Both parapets are approximately 1.05m high above the adjacent carriageway surfacing.

The minimum overall width of the bridge is approximately 5.805m at its centre and the minimum width between the parapets is 5.265m. The minimum carriageway width across the bridge is approximately 4.6m. There are no footways but there are informal narrow grass verges of varying width to each side of the bridge.

The carriageway has fairly tight bends on both approaches and a fairly pronounced hump-backed profile over the bridge. The speed limit is 60mph, but because of the narrowness and poor alignment of the road in the vicinity of the bridge it might be expected that vehicle speeds here would be considerably less than 60mph. However, recent traffic survey data shows actual 85 percentile speeds to be approximately 50mph and that vehicles do fairly regularly exceed 60mph at or near the bridge. The sub-standard alignment and carriageway width together with inappropriate speed have contributed over the years to a number of road traffic accidents and regular damage to the stone parapets.

The bridge has historically been owned and maintained by the Environment Agency and its predecessor organisations. However, on 31 March 2011 ownership was transferred to North Yorkshire County Council together with a commuted sum such that necessary remedial works could be carried out in order to restore its condition.

North Yorkshire County Council applied to English Heritage to request that the bridge be de-listed on the basis that it has been significantly altered from its original form and in the expectation that de-listing, if granted, would potentially remove certain restrictions when developing and carrying out future works to the bridge. English Heritage judged, however, that whilst the concrete widenings were 'unfortunate' that the bridge still retained sufficient of its original character and had historic interest as part of a significant early 19th century flood relief scheme to warrant retention of the Grade II listing.

In April 2013 Jacobs UK Ltd was commissioned by the County Council to produce a scheme of remedial works to the bridge. A detailed inspection of the bridge was carried out by Jacobs UK Ltd in November 2013 in order to assess its condition.

2. EXISTING CONDITION OF THE BRIDGE

The abutments and pier are generally in good condition with no indications of significant instability and with only relatively minor cracking and loss of pointing.

The arch rings to both spans were found to be in generally in fair condition with no indication of any major distortion. However, there is significant circumferential and other cracking generally due to separation of the concrete widening sections from the original masonry arches but with some of the cracking being entirely within the masonry barrels. There is pointing loss to a moderate depth to some areas of the arch soffits.

There are indications of fairly extensive areas of historical dampness to the voussoirs with staining, moss and lichen growth although this was generally dry at the time of the inspection after a period of predominantly dry weather.

The spandrel walls are generally in poor condition with extensive cracking and some spalling to the concrete and rendered faces and evidence of corroded steel inserts resulting in rust staining, particularly in the concrete widening to the eastern downstream side of the southern arch.

The string courses, parapets and pilasters to both sides of the bridge are in fair condition but are generally untidy due in part to piecemeal accident damage repairs carried out over the years to inconsistent standards.

Exploratory coring carried out in April 2014 found the mass concrete to the wing walls to be generally sound and of good quality. There are no indications of any significant instability and the only visible deep cracking occurs in the north east wing wall. The rendered faces of the wing walls are unsightly and in poor condition with extensive but relatively minor cracking and some areas of spalling.

There are minor defects to the concrete scour protection and apron beneath the bridge with some cracking evident around the cutwater to the upstream side of the bridge.

The carriageway surfacing across the bridge is generally in fair condition. There are no carriageway markings across the bridge itself because of its narrowness but the centreline markings on both the southern and northern approaches to the bridge are poor condition. The chevron bend warning signs at the south western and north eastern corners of the bridge are in good condition. However, it is considered that overall the existing hazard signing and road marking provision is poor and that this may have been a significant contributory factor in the frequent parapet impacts that appear to have occurred.

The only known statutory undertakers equipment within or near to the bridge is a buried water main which crosses through the bridge close to the western parapet and an overhead British Telecom service close to the western side of the bridge.

3. PROPOSED WORKS

A preliminary proposal to further widen the bridge by means of a reinforced concrete cantilever slab with re-aligned parapets was rejected by the North York Moors National Park Authority.

An alternative scheme to restore the condition and appearance of the bridge without widening is therefore now proposed as follows, together with improvements in warning sign and carriageway markings to the bridge approaches: -

1. Provision of a temporary river crossing to the upstream western side of the bridge.
2. Removal and disposal of debris trapped against the upstream pier.
3. Removal of all vegetation from the bridge elevations and wing walls.
4. Excavation of verges and partial removal of carriageway surfacing and arch fill.
5. Careful dismantling of both masonry parapets, including copings and string courses, with the stone being set aside for later reconstruction.
6. Careful breaking out of the mass concrete spandrel walls, cutwater extensions and arch widenings down to springing levels and reconstruction to the same profiles using new stone.
7. Installation of Cintec anchors through the reconstructed sections of the arch rings in order to prevent subsequent separation and to stabilise existing circumferential cracking within the original parts of the arches.
8. Careful breaking back of the mass concrete abutment extensions at the south east and north west corners of the bridge and replacement with new stone indents to the same face profiles.
9. Minor masonry repairs, cleaning and re-pointing as necessary to the original parts of the arch soffits, abutments and pier.
10. Reconstruction of the string courses, parapets and copings by re-using the original stone where possible and incorporating new stone where necessary to match the original.
11. Concrete repairs and crack injection to the wing walls and provision of new sandstone copings to match the bridge.
12. Provision of a protective/decorative textured stone-coloured coating to exposed faces of the wing walls.
13. Localised re-surfacing of the carriageway including the hardening of the existing grass verges.
14. Improvements to signing and road markings to the bridge approaches in order to reduce speeds and increase driver perception.
15. Localised repairs to minor defects in the concrete scour protection and apron.
16. Replacement of defective timber post and rail fencing to the north west wing wall and provision of a similar new fence to protect drop from the top of the south west wing.

The defects and proposed works are shown on General Arrangement drawing B1930100/01. It is intended that the scheme of works will commence in March 2015 with a duration of approximately 16-18 weeks.

The bridge will be closed to all traffic for the duration of the works. Because the only potentially suitable diversion route is compromised by a privately owned bridge at Hackness with limited headroom clearance of only 10'3", a temporary crossing will be provided adjacent to the western upstream elevation of Mowthorp Bridge with single-way working controlled by signals. Access to all adjacent properties and to the PRoW to the south east of the bridge will remain unobstructed at all times.

The refurbished structure will be capable vehicles of carrying 40t assessment live loading because of various improved condition factors that can then be assumed in assessment calculations. The reconstructed masonry parapets will comply with the containment requirements of BS 6779-4.

As the bridge lies within the Yorkshire Dales National Park, the National Park Authority is the designated relevant planning body and must be consulted regarding listed building consent for the proposed works.

The proposed refurbishment works are considered to be: -

- Essential in order to restore the condition and live load carrying capacity of the bridge and to maintain its durability and fitness for purpose for years to come.
- Desirable for aesthetic reasons in that the removal of the mass concrete widenings and replacement with stone will greatly enhance the appearance of the bridge. Reconstruction of the parapets will offer the opportunity to improve or eradicate previously poorly executed repairs.
- Desirable on safety grounds in that the improved signing and carriageway markings should increase driver perception and reduce the likelihood of damaging vehicle impacts to the parapets.

4. AFFECT ON HERITAGE ASSET

It is considered that the appearance of the bridge will be greatly enhanced by the proposed works. Those parts of the original 1804 bridge which remain at present and in which the historic interest predominantly lays will be retained.

The early 20th century mass concrete widenings which are generally unsightly and considered by English Heritage to be 'unfortunate' will be removed from the bridge as part of the works and will be replaced by stone selected to match as closely as possible the colour, texture, coursing, finish and character of the original sections of the structure.

The replacement of the later mass concrete widenings and replacement with stone will result in a more attractive, coherent and harmonious structure although the existing profile of the widened structure will be replicated.

The constituent materials in the mortar will be selected and blended to produce a finished mortar to match the prevailing colour and texture of the existing. Cementitious mortar will be used throughout because of previous unsatisfactory experiences on North Yorkshire County Council schemes of uncertain and often unacceptably prolonged setting times for lime mortars when used in bridgeworks where conditions are not ideal and available timescales for the works are relatively short.

The parapets will be dismantled and subsequently reconstructed to the same lines and levels as existing. The majority of the existing stone will be re-used but individual stones that are in poor condition, inappropriately dimensioned or finished will be replaced with new stone.

The use of stitching anchors through the arch barrels is a tried and tested method of strengthening arch bridges and the repair will be unobtrusive with the stone plugs from the first part of the cored holes being carefully reinstated on completion. All stitching works to masonry will be carried out using non-corrosive stainless steel or GRP components.

Although the mass concrete wing walls will be retained, their appearance will be greatly enhanced following any necessary concrete repairs and crack injection by the application of a textured buff stone-coloured protective/decorative acrylic paint coating and the addition of new sandstone copings.