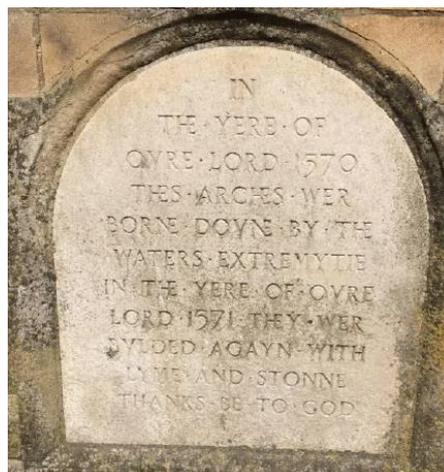


Oundle North Bridge (Structure No 1093) is Grade II listed and comprises of 13 arch spans (both single and multi-span arches) in brick/stonework with stone headwalls/spandrels/voussiors/cutwaters and parapets.

The structure provides an important access into Oundle which is one of Northamptonshire's valued historic market towns, the bridge is of tremendous importance locally not only in Oundle but also to surrounding parishes.



BACKGROUND

As the highway authority Northamptonshire County Council has a duty not only to safeguard members of the public, but to manage its structures that they do not pose an unacceptable risk to public safety.

We do this by having in place programmes for regular

- Inspections, to identify any defect that may cause an unacceptable safety or serviceability risk or a serious maintenance requirement
- Structural Assessments, which determine load carrying capacity

Both regimes provide information that enables the management and maintenance of Northamptonshire's stock of structures to be planned on a rational basis in a systematic manner.

The inspection regime consists of a general inspection every 2 years and a principal inspection every 6 years. Structural assessments are generally carried every 12 years.

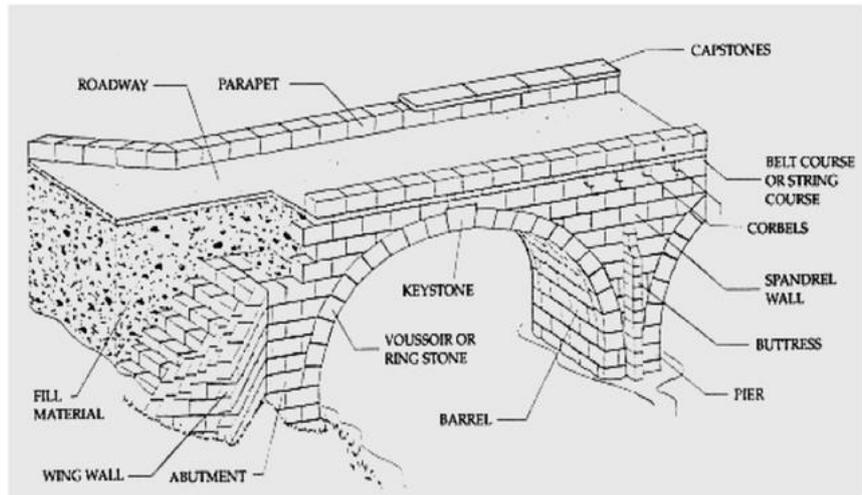


Crack between South Voussoirs and the masonry arch



PRINCIPAL INSPECTION 2018

The latest inspection identified that the majority of arches had longitudinal cracks which generally ran the full circumference of the arch, indicating transverse movement is occurring, which is of particular concern as longitudinal cracks tend to indicate that the arches are beginning to divide in to separate sections which will affect the ability of the arch to spread the applied load (vehicles) evenly to the abutments/piers. There were also significant vertical cracks between the voussoirs and masonry arches (indicates that the spandrel walls are moving) and in the cutwaters/pilasters on the upstream elevation as well as a number of diagonal cracks in the parapets



ASSESSMENT

Oundle North was assessed, to determine its load carrying capacity, in October 2014. The bridge assessment concluded that 7 of the 13 arches of this Listed Grade II structure were deficient in their loading capacity; the viaduct was assessed to have a capacity of 3tonnes.

Initial structural assessments are generally carried out using simple but conservative analytical methods. Where the adequacy of a structure cannot be confirmed, or falls short of requirements using simple methods, progressively more precise and advanced methods are used to determine capacity.

MONITORING

Since the 2014 assessment the structure has been monitored, over recent months the bridge is showing increased signs of distress, as borne out in the latest Principal Inspection. We have used a



Crack in northern section of the arch



remote camera to detect the type and size of vehicles causing the distress, however this has found to be unreliable.

The condition of the structure is deteriorating and whilst there is not an immediate risk of collapse which would result in a full closure, action does need to be taken in the short term to prevent more damage

7.5t or 3t CAPACITY

We have explored the feasibility of implementing a 7.5tonne restriction, we have concluded that it is not feasible as set out in the following explanation.

The masonry arches were analysed using the modified MEXE method and Archie-M. Where there are two methods of analysis, the assessed capacity is taken as the larger of the two results in accordance with National Standard BD 21/01 The Assessment of Highway Bridges and Structures clauses 6.19 (i).

The deficiency of the loading capacity of the arches is caused by a combination of circumferential cracks limiting the load distribution of the arch barrels and ring separation limiting the effective thickness of the arch barrels.

While four-hinge mechanism is considered as the main form of failure under static loading, ring separation has been identified as the main form of failure under cyclic loading and also in certain cases under static loading.

The only reason that the arches can still support 3tonne Assessment Live Load is the fact that, unlike Farthinghoe Bridge on the A422 where we have been forced to close the road, we have enough fill material above the arches on North Bridge to redistribute the loading.

We are now moving forward with the implementation of the 3tonne restriction, to prevent any further deterioration to the condition of this historic Grade II listed structure.



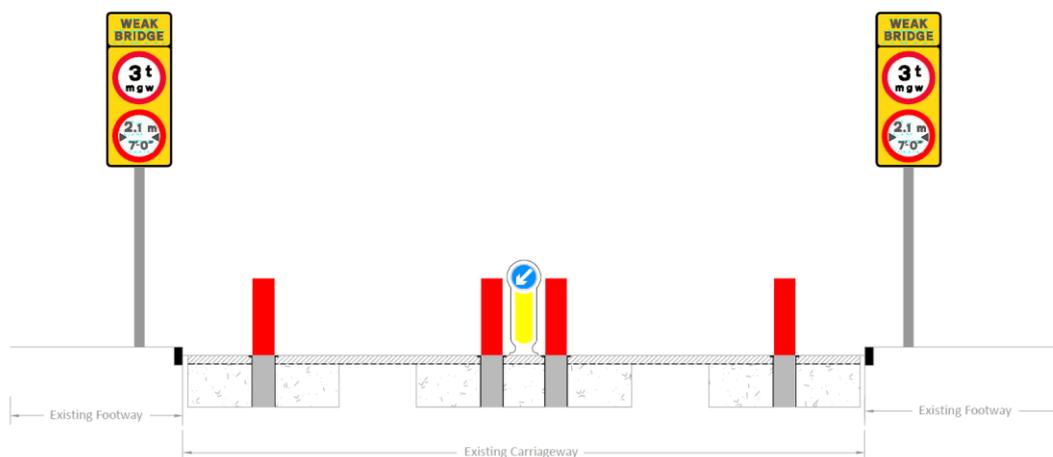
Cracking in spandrel wall between Arches 1 & 2. Note crack between the Voussoirs and spandrel wall



TRAFFIC RESTRICTION

The 3tonne restriction would allow 2 way car traffic to continue over the structure, minimising traffic disruption and delay, only vehicles more than 3tonnes would be excluded.

The proposed traffic restriction will be “self-enforcing”, via the use of a traffic width restriction of 2.1m at each end together with appropriate signage from either direction. Similar to the system previously used on South Bridge Oundle.



The process of implementing a permanent restriction requires that we notify affected parties of our intention. We have had the statutory consultation and a delegated decision report has been prepared. Once the delegated decision report has been signed we will move to the public consultation stage of the process. This will take approximately 6 weeks.

The proposed restrictions were originally within the confines of the Grade II listed structure, therefore we were required to obtain Listed Building Consent from East Northamptonshire District Council. As there were a number of objections to the application, the restriction was redesigned so that it is off the structure itself and is more sympathetic to the historic surroundings.

As part of implementing the restriction we have commissioned a Historic Building Investigation and Assessment, which will also help to inform and support our forthcoming application for Listed Building Consent for the proposed strengthening of the structure.

The assessment will consider structural and historic evidence for the date and phasing of the various elements of the structure. This would include consideration of documentary sources (cartographic, written and photographic), stratigraphic analysis of the physical structure, stylistic observations and fabric comparisons, to understand the history and phasing of the structure and to determine where



historic fabric of greater sensitivity is present/ is likely to be present and the sensitivity of that fabric to the proposed works.

The survey element of the investigation and assessment will be to Historic England Level 3 standards as defined in the Historic England publication *Understanding Historic Buildings: A Guide to Good Recording Practice* (HE 2016). It would also be undertaken in accordance with the Chartered Institute for Archaeologists (CIfA) Standard and guidance for the archaeological investigation and recording of standing buildings or structures (CIfA 2016).

TRAFFIC MANAGEMENT

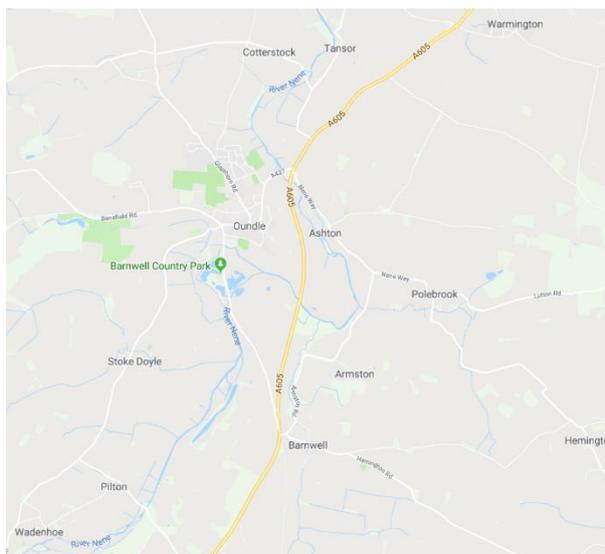
There are four bus and coach services that use the structure along with twelve to eighteen school buses. Discussion is on-going with the bus and coach companies on how to mitigate the effects of the proposed 3tonnes weight limit on their service.

A working group has been set up to discuss the implication of the 3tonne prohibition on the traffic movements in the area with Oundle Town Council and the surrounding parishes.

The best thing we can do is to make sure that the traffic flow through Oundle and the surrounding parishes flows as smoothly as possible. To that end an option appraisal report for the diversionary route has been commissioned. The report will undertake a qualitative assessment of each option for the diversionary route.

We are currently reviewing what mitigation works maybe required following the proposed traffic restrictions on the structure. As part of this review options are being considered for the Barnwell Road Junction which will certainly gain an increase in HGV Traffic movements both in and out of Oundle following the North Bridge Closure. An assessment is being carried out based on Traffic Data previously obtained at various points within Oundle to ascertain the likely amount of HGV movements that will now have to utilise the Barnwell Junction to access Oundle. Once we have a full understanding of these facts we can assess the impact this may have on the surrounding Network and potential improvements that are required.

The A605 is a Primary Route within Northamptonshire and as such is not suitable for traditional traffic calming techniques, due to vehicle volume and speed. Mitigation works may include a reduction in speed limit amongst other options but these cannot be fully considered until the assessment review has been undertaken.



Key to the movement of traffic in and around Oundle is South Bridge, whilst South Bridge is under signal control there is no physical width restriction currently in place to prevent larger vehicles using the bridge. There is an existing 18tonne amenity restriction on South Bridge, this is an amenity restriction rather than a structural restriction, South Bridge can take up to 40tonne vehicles. The amenity restriction was placed on the bridge to discourage HGV's from using it, there is no structural reason for the 18tonne restriction. When the amenity restriction is revoked Northamptonshire Highways will monitor South Bridge to assess the impact of an increase in HGV traffic movements over it.



Cracking in barrel of the arch

Please be assured that the safety of all users will be fully reviewed and considered at the Barnwell Junction, as part of the mitigation proposals of the North Bridge restrictions.

STRENGTHENING AND REFURBISHMENT

The structure requires 7 spans to be strengthened to increase their arch capacities to current traffic loading of 40t Assessment Live Load (ALL).

We continue to progress options for strengthening, these options will ensure that the existing carriageway level is maintained and that the external appearance of the structure stays unchanged, which should satisfy the requirements for Grade II listed structures.

The structure also requires general maintenance/refurbishment activities to be undertaken at the same time as the strengthening works, again these will not change the external appearance of the structure.

Of the various options considered, those requiring the complete closure of Oundle North to all traffic for the duration of the works or pose an



View showing junction between the north stone and the central 'red' brick sections



archaeological risk to the works were discounted and only two options are being considered for further development both of which are both proprietary systems.

The cost of strengthening/repairing the structure was estimated at £750,000 in the feasibility study. However, the estimate may have to be revisited as a more recent Principal Inspection (April 2018) indicated that the structure had deteriorated further.

We are currently working with a designer/contractor to put a budget price together. The likelihood that the sum required for the repairs/strengthening will be in excess of £1,000,000 when taking everything into consideration.

The intention would be to continue the 3tonne weight limit and allow the 2-way car traffic to continue thus minimising traffic disruption and delay in Oundle and surrounding Parishes.

FUNDING

Given the current financial challenges that Northamptonshire faces the availability of additional funding has been severely restricted and therefore any exceptional and priority works now have to be accommodated from within the available budget envelope.

We have explored alternative avenues of funding and we continue to have dialog with the Department for Transport to support our case for exceptional funding.

The bridge strengthening/refurbishment works all depends on when we can secure funding to carry out the works.

CONCLUSION

We are aware that the bridge provides an important access; we are expediting the works as much as is possible.

The consequences of the current inaction could be catastrophic, the liability for which we are not prepared to take. Whilst there is significant inconvenience to the people of Oundle, a structural collapse would have a devastating effect.

We will keep all affected parties informed as the scheme progresses and continue to have meetings with the Town and Parish Councils.

bridges@kierwsp.co.uk



Crack between the northern voussoirs and the spandrel wall with evidence of water seepage

