

27 May 2020



C98 New Elvet Bridge - Major Maintenance

Delegated Decision

Report of Alan Patrickson, Corporate Director Neighbourhoods and Climate Change

Councillor Brian Stephens, Cabinet Portfolio Holder for Neighbourhoods and Local Partnerships

Electoral division(s) affected:

Elvet and Gilesgate.

Purpose of the Report

- 1 To inform CMT of the requirement and proposals to undertake major maintenance on New Elvet Bridge in Durham City in 2020/21 and 2021/22 along with the reasons why this is required, the implications on the highway network and capital funding needs.

Executive Summary

- 2 Regular inspections of New Elvet Bridge have identified structural issues which do not currently affect the structural integrity of the bridge but need to be addressed to maintain the integrity in the future.
- 3 The scheme was initially estimated to cost £5 million but following detailed design and costing along with an increase in scope, has now increased to £7.5 million and require a full road closure lasting 60 weeks.
- 4 A bid for funding, based on an initial budget estimate of £5 million, submitted to the Department for Transport (DfT) Challenge Fund in October 2019 was successful in securing £4.238 million towards the scheme. The maximum amount available from the Challenge Bid was capped at £5 million.
- 5 Costs in excess of the DfT allocation will be met from allocated budgets.
- 6 The impact of the closure of New Elvet Bridge on people's movements around the city will be significant. Traffic modelling has been undertaken

and a number of measure proposed in an attempt to minimise disruption. These include installation of additional traffic monitoring camera's and sensors, alteration of traffic signal timings, alterations to pedestrian crossing introduction of a bus only lane and restricted right hand turns.

- 7 Alongside efforts to change the transport network, the success of the scheme will lie heavily on our ability to persuade individuals and institutions to reduce peak hour travel during these periods. A detailed communications plan has therefore been prepared by the Communications & Marketing team and is continually being reviewed and updated as the scheme has developed. The focus will be on local residents and businesses impacted by the closure and ensuring that they have the relevant information. Wider stakeholders have also been identified and considered and will receive appropriate communications.
- 8 The communications strategy will be phased in accordance with the scheme and tailored to specific audiences. This will includes messaging through social media, press releases, advance warning signs and distribution of printed materials. Paid for outdoor advertising in key locations and digital advertising will also be implemented to inform of the proposals in advance of starting works.
- 9 The delays to the scheme due to additional design works has reduced the timetable for communication but we are still working to a 20th July start date.
- 10 This report outlines the proposals for the scheme including costs, timescales, impact on the network and proposes communications

Recommendation

- 11 CMT are asked to note the content of this report, the proposed way forward and to approve the commencement of the communications plan in the run up to to a project start date of 20th July.

Background

- 12 New Elvet Bridge carries the C98a over the River Wear within the City of Durham. It is the main vehicular link between the east and west side of the city carrying an annual average daily traffic flow of approximately 17,000 vehicles.
- 13 The structure was constructed in 1975 to relieve traffic from the adjacent Old Elvet Bridge and the Market Place as part of the Durham City Relief Road Project following the opening of the new River Wear Crossing known as Milburngate Bridge in 1967. A footpath passes beneath the north span and a small access road passes beneath the south span. A towpath/footpath passes beneath the central span on the north side of the river.
- 14 The bridge includes a three-span reinforced concrete cellular deck as detailed in Appendix 2: Construction Diagram. The side spans and cantilever arms in the main span are continuous over the intermediate piers. The central suspended span is supported on reinforced concrete half joints, which are a critical element of the bridge, at the tips of the cantilevers. In each span the depth of the deck varies along the length with the soffit forming a concave shape. Access to each of the four cells running the full length of the deck is through a manhole located towards the ends of the deck.
- 15 Half joints were introduced into bridge decks as a means of simplifying design and construction operations. However, it is now recognised that half joints are a notoriously problematic element due to leakage of de-icing agents through failed deck joints above them which can lead to the corrosion of the steel reinforcement in the deck and problems with bearings (paint breakdown and movement impingement etc.) generally exacerbating deterioration. They are a critical element in structural terms. In modern design, half joints would not be used due to the durability problems and maintenance liability they present. Furthermore, half joints are not easily accessible and without regular inspections defects can go unnoticed potentially leading to a sudden and unexpected failure.
- 16 However, the council are satisfied that the continued management and inspection of the bridge is sufficient to identify any further deterioration and associated risks of failure.

Inspection and Maintenance History

- 17 The inspection and maintenance history of the bridge since its construction is detailed in Appendix 3: Inspection and Maintenance History.

- 18 It should be noted that there is no evidence of previous maintenance to the half joints.

Principal Inspections and Further Investigation

- 19 Due to the limited current information on the internal condition of the bridge and the critical nature of the half joints the bridge was included in the first batch of Principal Inspections (PI) to be undertaken as part of the approved Principal Inspection Programme.
- 20 A PI of New Elvet Bridge was undertaken on 3 November 2014 with the findings reported March 2015.
- 21 The PI indicated that whilst the bridge was generally in a fair condition there were a number of significant defects identified which would require to be rectified in the near future in order to slow or prevent further deterioration, increase the residual life of the bridge and ensure the bridge remains safe for use.
- 22 The most significant issue identified was the condition of the half joints which were found to have some substantial cracking and spalling of concrete with exposed and corroding reinforcement in places as detailed in Appendix 4: Bridge Condition Photographs.
- 23 The PI recommended an extensive concrete repair scheme to the half joints and other areas of delamination to the deck soffit as a high priority in order to prevent further deterioration and eventual failure of the half joints. A structural assessment of the bridge was also recommended to ensure that the bridge still had the required load carrying capacity and would not require a weight restriction or full closure. It was also recommended that consideration be given to removing the half joints which would remove a poor detail and maintenance liability and would provide the most cost effective long-term solution. This would be a significant undertaking in terms of design, buildability and construction and a full study including a review of available options would be required to inform this decision.
- 24 The structural assessment undertaken in October 2015 found the assessed strength and serviceability to be satisfactory and adequate for current highway loading. It should be noted that a 7.5 tonne weight restriction (except for access) has been implemented on the C98 in this area of the city but this is for environmental reasons rather than the bridge having a reduced load carrying capacity. The order for the weight restriction provides for an exemption for public transport. Vehicles with a weight greater than standard highway loading (abnormal load movements) are required to notify the authority before travelling and are being informed that they are not currently permitted to use the bridge.

- 25 Whilst no immediate concerns were raised with the capability of the bridge to carry the current loading, the recommendations made in the PI regarding the condition of the half joints and the requirement for a major maintenance scheme to maintain the integrity in the future were reiterated. It was also recommended to continue to monitor the condition of the half joints.
- 26 In order to gather the required information on the condition of the half joints and other elements of the bridge to allow a scheme to be progressed a programme of further investigation and inspections was undertaken as detailed in Appendix 5: Schedule of Scheme Development.
- 27 The bridge is currently being inspected externally every three months and internally every six months to ensure the bridge remains safe for use with the paramount concern being the condition of the half joints.
- 28 In view of the structure's critical element (half joint) condition this structure has been added to the Highways Services' risk register and the decision taken to prepare a full repair scheme.

Scheme Proposals

- 29 In 2018/19, Jacobs UK Limited were appointed to prepare a major maintenance scheme for the refurbishment of New Elvet Bridge. This was completed in January 2020. These works will address the issues identified as detailed above and ensure the ongoing serviceability of this key strategic structure.
- 30 The initial preferred option was to completely remove both half joints was found not to be feasible due to the remaining existing elements of the bridge, such as the piers and foundations, not having the capacity to carry the resulting increased loading.
- 31 The final proposed scheme, which was progressed through to detailed design and costing, involves the permanent removal of one deck half joint and reconstructing and retaining the other deck half joint. This ensures that no further structural modification or strengthening works are required to the pier heads, piers or pier foundations. Extensive concrete repairs, joint replacement, waterproofing and resurfacing are also proposed.
- 32 Jacobs UK Limited's completed design has been forwarded to Balfour Beatty who have been appointed as contractor by the council via the SCAPE Civil Engineering and Infrastructure framework to provide pre-construction services for the New Elvet Bridge project.

- 33 Using the SCAPE framework enables the council to get the project to construction earlier than would be achieved through a traditional procurement approach along with retaining economic benefit and spend in the locality. The SCAPE process provides time and cost certainty for the client including key performance indicators (KPI) with regard to value for money transparency and an open book arrangement.
- 34 This early contractor involvement has allowed a review of the design proposals to consider temporary works, ensure buildability and consider potential opportunities/value engineering to identify any potential savings and achieve a best value solution. A cost estimate and programme for the proposed work has also been provided.
- 35 The pre-construction stage was completed on 24th April 2020 and subject to agreement award of contract on 26 May 2020. Work is provisionally programmed to commence on site on 20 July 2020 subject to confirmation.
- 36 It was initially estimated that the scheme would £5 million with the construction phase taking up to 52 weeks to complete.
- 37 As the detailed design progressed and further concrete testing undertaken the indication was that full cathodic protection was required to increase the long term durability of the bridge to achieve a design life of 50 years. Jacobs were appointed to undertake the design of this as part of their ongoing commission.
- 38 Cathodic Protection is a technique used to control the corrosion of a metal surface, in this case the reinforcement, and increase the durability and design life of the structure.
- 39 A full review of cathodic protections options was undertaken with Jacobs and Balfours to select the current proposal. This review considered initial cost, future maintenance implication, future disruption
- 40 The overall cost of the works including full cathodic protection proposals is estimated to be £6.2 million and a works programme of 60 weeks. This excludes costs associated with design and supervision, pre-construction, traffic management, utility apparatus and work to the existing road network to try to mitigate against the likely delays. These additional costs are anticipated to cost in the region of £1.21 million.
- 41 Along with the work previously identified the current proposal includes the installation of a mesh type cathodic protection system to the soffit of the bridge along with discrete cathodic protection installed around the

perimeter of the reconstructed half joints and all other areas of concrete repairs including within the deck cells.

- 42 Including the cathodic protection to the soffit during these main works is more cost effective, overall, because the site set up, resource and access systems would already be in place the concrete repair work.. Conversely, to come back and install CP at a later date would necessitate a separate site set up, resource and access costs, and result in additional disruption to the public.
- 43 The reconstruction of the half joints along with the proposed work and cathodic protection to the soffit addresses the majority of the required concrete repairs. This removes the current risk associated with the half joints and potential for deterioration and delamination of concrete to the soffit.
- 44 The reconstructed half joints are designed to current standards and have a minimum design life of 50 years.
- 45 Without a full cathodic system to the internal areas of the deck some deterioration will continue to occur and it is difficult to confirm the residual of the remaining elements although a minimum of 15 years has been specified.
- 46 However the work proposed along with a routine maintenance regime, will address many of the issues responsible for the current condition of the structure and prevent any acceleration of deterioration. This alongside regular internal inspections, and concrete repairs when necessary, is likely to give a residual life significantly more than 15 years. This is considered to be an appropriate way to manage the structure,

Communication

- 47 Effective communication will be required with all stakeholders during development of the scheme whilst publicity to the wider community and road users will be essential.
- 48 It is essential that the requirement to undertake the works, in order to ensure the ongoing serviceability of this key strategic structure, is emphasised.
- 49 A detailed communications plan has been prepared by the Communications & Marketing team and is continually being reviewed and updated as the scheme is developed. The focus will be on local residents and businesses impacted by the closure and ensuring that

they have the relevant information. Wider stakeholders have also been identified and considered and will receive appropriate communications.

- 50 The communications strategy will be phased in accordance with the scheme and tailored to specific audiences. A multi-channelled approach will be adopted throughout the campaign to maximise its impact. This includes messaging through social media, press releases, advance warning signs and distribution of printed materials. Paid for outdoor advertising in key locations and digital advertising will also be implemented to inform of the proposals in advance of starting works.
- 51 Initial discussions have already been held with the following key stakeholders to inform them of the proposals:
- (a) emergency services: routes to and from North Durham University Hospital are to be maintained; this may require repositioning of emergency vehicles;
 - (b) Durham Police station: significant impact due to its proximity to the bridge; consideration is being given to relocating staff;
 - (c) prison service: prison transfer routes may be affected;
 - (d) Durham Crown and County Courts;
 - (e) Network Rail;
 - (f) Highways Agency;
 - (g) Durham University;
 - (h) Dean and Chapter; and
 - (i) public transport.

Phase 1 (Prior to the Works Commencing)

- 52 The objective of the messages in phase 1 will be to inform the public of works and provide advance warning of plans to as many people as possible prior to works. This will also provide an opportunity to explain why the works are essential. The promotion of the diversion routes and details on the changes within the city will aim to reduce impact on the travelling public.

Phase 2 (During the Works)

- 53 The objective is to keep the traffic moving through the city and promote the fact that the city remains open during the works. This will include

traffic monitoring during peak times, promotion of alternative means to travel in and around the city focusing on public transport with the aim of reducing the number of car journeys within the city. Promotion of the diversion routes and traffic cameras will also allow people to make informed decisions in travel planning.

Phase 3

- 54 Following the completion of the works the messages will announce the re-opening of the bridge and thank everyone for their patience and cooperation during the works.

Impact on the Road Network

Background

- 55 Durham City centre currently accommodates a significant volume of vehicular traffic with Milburngate Bridge carrying 40,000 vehicles per day. Although traffic volumes and congestion are most noticeable in the morning and evening peak hours traffic volumes in the city remain relatively high throughout the day.
- 56 The city centre is the main employment location in County Durham with 36,000 jobs compared to the next most popular location of Peterlee with 15,000 jobs. The employment in the city is focussed on a number of off-centre locations; Aykley Heads to the north, the university to the south and Belmont and Dragonville to the east, with many people accessing these sites by crossing the city. In addition, the road network provides access to many external trips with over 30% of the traffic on Milburngate Bridge travelling straight through the city centre.
- 57 Recent improvements in the city at Gilesgate and Leazes Bowl roundabout, with linked traffic signals, have improved the general flow of traffic. However, it is widely recognised that the city network suffers from a lack of resilience with no obvious bypass or diversionary routes. A recent example of a broken manhole cover, reducing Leazes road to only one lane, resulted in 30 minute delays in the afternoon peak.

New Elvet

- 58 New Elvet provides an essential link between the A690 and the city centre to the south east typically carrying nearly 17,000 vehicles on a weekday. The necessary closure of the New Elvet Bridge to complete essential repairs will have a number of impacts:
- (a) people travelling in from the south east of the city will need to divert onto the A167 or the A690 to access the city;

- (b) people living to the north and east of the city wishing to access the university, with over 4,000 employees, will need to divert onto the A167;
- (c) the New Elvet area which accommodates Police, courts and university administrative buildings, as well as many other businesses, will have limited access;
- (d) public transport routes from the south and east will be compromised; and
- (e) generally, the city could potentially face disruption and significant delays in all directions.

The “Do-Nothing” Scenario

- 59 Modelling has been undertaken to understand how traffic would flow with no mitigation measures. This would be the same forecast if the bridge had to close unexpectedly. The model assumes that drivers would divert to the least congested routes as if they had knowledge of the traffic flows across the city. This generally reflects driver behaviour several days after a significant change.
- 60 In this scenario traffic queues and delays are experienced across the city centre. Vehicles diverting along Quarryheads Lane and Margery Lane block the roundabout at Potters Bank bringing the southern section of the city to a standstill. In addition, vehicles queuing along the A690 between Nevilles Cross and North Road, block Milburngate Junction which then brings Milburngate Bridge and Framwellgate Peth to a standstill. The resultant queues then extend to beyond County Hall.
- 61 When the model is used it generates minor variations for each run to try and reflect driver behaviour. In some of the model runs in the morning peak some vehicles entering the city at 8.00 a.m. have failed to leave by 9.00 a.m.

Mitigation Measures

- 62 To mitigate the potential impact of the works the most important element is to try and reduce the number of people travelling through the city in the peak hours. Whilst the message should very much be that it is business as usual in Durham the council needs to persuade people commuting in the peak hours to either change modes, car share, change routes or change their time of travel. Indeed, it would be extremely beneficial if the council were to promote similar initiatives. The council do however need to be realistic and a target of traffic levels of 90% have been assumed.

- 63 In terms of additional traffic management the measures detailed below have been derived to assist in overcoming the queuing experienced when New Elvet Bridge is closed:
- (a) a bus lane on Margery Lane northbound: this is considered necessary due to:
 - limited capacity of Crossgate Peth traffic signals;
 - high pedestrian flows (mainly students) along Margery Lane;
 - pedestrian movements adjacent to Durham School;
 - character and horizontal alignment of Margery Lane and Quarryheads Lane; and
 - potential blocking back onto Potters Bank.
 - (b) traffic signal timing changes: these have been made where appropriate to reflect new traffic patterns as a result of traffic diverting onto alternative routes as detailed in Appendix 6: Changes to Traffic Signal Timing;
 - (c) banned right-turns: proposed from the A690 into The Avenue, Hawthorn Terrace and Allergate have been assumed because of a problem highlighted by the model in the evening peak with traffic tailing back through Leazes Bowl roundabout;
 - (d) A690 zebra crossing replaced with a signal controlled crossing: whilst this will introduce additional delays for pedestrians it will reduce the impact of queues at Crossgate and North Road roundabout;
 - (e) additional traffic cameras and monitoring equipment: the additional information available to the public, combined with delay and capacity information available internally, will allow improved feedback to the public during the busiest periods;
 - (f) traffic management company: to be available on a 24 hours basis to respond to any emergencies; and
 - (g) other work: consideration of other projects particularly the programme and timing of other highway works.

Emergency Services

- 64 One of the issues to be considered is access by emergency services, especially the Police, given the location of the Police station on New

Elvet which houses the custody suite. The current suggestion is that Old Elvet Bridge is maintained as a “blue light route”. The historic bridge is pedestrianised during the day only allowing vehicles to use the bridge to load and unload between 6.00 p.m. to 11.00 a.m. Vehicles currently using the bridge in this way can only enter from Saddler Street and must exit via New Elvet.

- 65 Allowing emergency vehicles to use this route in both directions will have little immediate impact, even though they will emerge into a sometimes crowded pedestrian environment, this should be done with care and under blue lights. The challenge, which could be considerable, will be to allow access to emergency services, allow vehicles to load and unload, however, to prevent use by others as a short-cut.
- 66 The current intention would be to install camera monitoring equipment. Whilst footage of any offences would be viewed by council staff any subsequent action including prosecution would need to be via the Police. It is highly likely that other groups such as taxi drivers and local residents would seek to use this route which would need to be resisted.
- 67 As a result of the use of this route by emergency services the council will need to review the loading times on New Elvet Bridge, together with the existing tables and chairs licences, as they could become a potential obstruction.

Impact of Proposals

- 68 With the measures detailed above in place and a traffic volume which has been reduced to 90% it is anticipated the city can largely function. The modelling suggests that in this scenario delays in the peak hours will be on average up to a maximum of 15 minutes which is likely to be exceeded on some days.
- 69 In reality, when the bridge closes at the start of the school holidays, the traffic situation will be very similar to a normal, non-school holiday weekday. At this point the council will potentially face criticism that the message warning of difficulties and the action plan have been too pessimistic especially from Durham City residents and businesses. This situation will deteriorate in September 2020 with the end of the school holidays and is expected to become worse again in October 2020 with the return of the university. In order that the delays can be kept to a minimum the council’s efforts to change travel behaviour and reduce peak hour car use at this time will be essential.
- 70 Within the period from September 2020 to Christmas 2020 and potentially beyond, depending on the duration of the works, the highway network will have very little resilience. The impacts of any incidents or

events are likely therefore to become magnified. This will include the ability to deal with issues of poor weather conditions.

- 71 Currently, many people avoid Durham in the peak hours by using a variety of local roads, especially for journeys from the west. During any periods of ice or snow these people tend to return to the main road network increasing traffic delays. Any periods of prolonged bad weather during the closure will therefore place considerable strain on the city.

Air Quality

- 72 Potential increased congestion on areas of the network may result in increased vehicle emissions and negatively impact on air quality. However, with the implementation of the mitigation measures identified above to keep traffic flowing this will be minimised.
- 73 It should be noted that due to the restrictions in place some areas may benefit from a reduction in traffic and hence a reduction in emissions.
- 74 There will be no permanent impact on air quality as a result of the proposed work.

Conclusion

- 75 The impact of the closure of New Elvet Bridge on people's movements around the city will be significant. Whilst the traffic management plan and subsequent modelling shows that we can deliver a workable solution the impact will vary significantly depending on location and time of year. Despite efforts to change the transport network, the difference between success and failure, will lie heavily on our ability to persuade individuals and institutions to reduce peak hour travel during these periods.

Impact on River Traffic

- 76 Use of the river will be restricted whilst works are carried out especially during the jacking/lifting operations and concrete repairs to the deck underside. This is due to the need to erect temporary working platforms beneath the bridge.
- 77 Excepting the above operations smaller craft such as rowers and the nearby Browns Boathouse hire boats will still be able to pass beneath the bridge whilst work is ongoing. However, due to the reduced headroom it is anticipated that the Prince Bishop cruiser will not be able pass beneath the bridge.
- 78 The working platforms will be fully sheeted to protect river users passing beneath the bridge from any falling debris.

79 Detailed discussions with river users who will be affected by the proposed work will take place in accordance with the communication strategy.

Potential Risks

80 If the continued development of this project is not approved there is the potential risk that the bridge deteriorates to the extent where it would require more extensive works increasing costs and increasing the duration of any future maintenance scheme and prolonging disruption. If it was allowed to deteriorate to the point where it became unsafe for vehicular or pedestrian traffic and an unplanned partial or full closure was necessary on safety grounds then this would cause immediate significant disruption.

Finance

81 Overall cost of project estimated to be £7.5 million.

82 A bid for funding, based on the original budget estimate of £5 million, submitted to the Department for Transport (DfT) Challenge Fund in October 2019 was successful in securing £4.238 million towards the scheme. . The maximum amount available from the Challenge Bid was capped at £5 million.

83 Costs in excess of the DfT allocation will be met from allocated budget.

Main Implications

84 The main implications are detailed within the report.

Conclusion

85 A major scheme is required to restore the bridge to a safe condition for all highway users. This report details the complexity of the scheme, the options available, recommended option and funding requirements.

Appendices

- Appendix 1: Implications
- Appendix 2: Construction Diagram
- Appendix 3: Inspection and Maintenance History
- Appendix 4: Bridge Condition Photographs
- Appendix 5: Schedule of Scheme Development

- Appendix 6: Changes to Traffic Signal Timing.

Background Papers

- None.

Other Useful Documents

- None.

Author(s)

Brian Buckley

Tel: 03000 268097

Paul Newman

Tel: 03000 265272

Appendix 1: Implications

Legal Implications

Under Section 41 of the Highways Act 1980 the council as highway authority has a statutory duty to maintain the highway including its structures.

Finance

As detailed within the report.

Consultation

Initial consultations have been held with priority stakeholders as detailed within the report. Further consultation with all stakeholders will be undertaken in accordance with the communications strategy.

Equality and Diversity / Public Sector Equality Duty

The proposed scheme will affect all highway users without exception. Existing facilities will enable disabled access across the city centre.

Climate Change

As detailed within the report.

Human Rights

None.

Crime and Disorder

None.

Staffing

A scheme has been prepared by an external consultant and in conjunction with Highways Services and an external contractor appointed to undertake the work.

Accommodation

None.

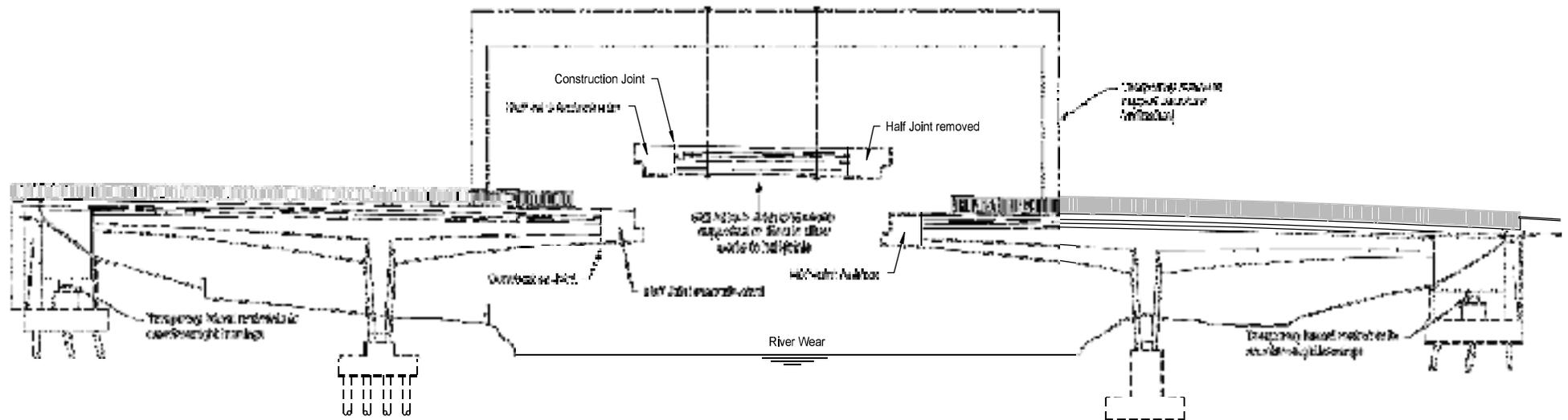
Risk

As detailed within the report.

Procurement

Highways Services are to procure external resources to deliver the design and construction of the work.

Appendix 2: Construction Diagram



Appendix 3: Inspection and Maintenance History

Inspections

The council's records indicate that the bridge has been inspected at regular intervals since 1979. Since 2004 these inspections were carried out as part of a bi-annual general inspection rota including completion of bridge condition indicators (BCI) Forms.

However, these inspections have primarily involved inspection of the external elements of the bridge with the exception of 2000, 2001 and 2007 which included some limited inspection of the deck voids.

A PI that was undertaken in 1995/96 did not include inspection of the internal elements.

Maintenance

The maintenance works detailed below have been carried out:

- 1983: parapets were re-painted;
- 1988: sheet pile and granite set riverbank protection installed;
- 1993: parapets were re-painted;
- 1997: sheet piles placed around abutment foundations due to Boots Store development; previously installed revetment removed from the Claypath side;
- 1998: footpath and revetment were reinstated following the Boots Store development;
- 1999: new highway expansion joint north east side; parapets cleaned and painted following Boots development;
- 2000: drainage improvement, waterproofing, joints and resurfacing work; and
- 2006: painting scheme.

Appendix 4: Bridge Condition Photographs



1. New Elvet Bridge



2. Loss of concrete and corroded reinforcement to soffit of bridge.



3. Cell 1 North half joint West side



4. Cell 1 North half joint West side



5. Cell 3 North half East side



6. Cell 3 North half joint West side



7. Cell 3 North half joint bottom nib cracking



8. Spalling and heavily corroded reinforcement to the South end of Cell 2

Appendix 5: Schedule of Scheme Development

Date	Activity	Contractor	Purpose
March 2015	Principal inspection	Jacobs UK Limited on behalf of DCC	To determine the condition of all elements
June 2015	Half joints investigation and concrete testing	Nicholls Colton Group Limited on behalf of DCC	To fully investigate determine the condition of the half joints
October 2015	Structural assessment	Jacobs UK Limited on behalf of DCC	To determine the load carrying capacity of the bridge
September 2016	Further assessment and pier hinge investigation	Jacobs UK Limited on behalf of DCC	To analyse the structure to determine the effect of load effects on the pier hinges and deck half joints, and inspection of pier hinges
September 2016	Pier hinge investigation	Jacobs UK Limited on behalf of DCC to supplement the 2015 PI	To expose and determine the condition of the pier hinges within trial holes
October 2016 to March 2017	Rehabilitation options report	Jacobs UK Limited on behalf of DCC.	Identify options for the remediation of the structure
January 2017	Initial concrete testing	Nicholls Colton Group Limited on behalf of Jacobs UK Limited	To test the condition of the concrete in the outer deck cells, the cantilever span soffit and the north pier to inform the options study
January 2017	Confined space inspection of outer deck cells.	Jacobs UK Limited on behalf of DCC	To determine the condition of the half joints within the outer deck cells to inform the options study
April 2017	Further concrete testing	Nicholls Colton Group Limited on behalf of Jacobs UK Limited	To supplement the initial testing undertaken in January 2017 and inform options study

July 2017 to December 2017	Further concrete testing and updating of rehabilitation options report	Nicholls Colton Group Limited on behalf of Jacobs UK Limited	To update the options report to include whole life costing of options to inform the way forward and to provide additional information should Challenge Funding become available
July 2018 to January 2020	Scheme development and detailed design	Jacobs UK Limited on behalf of DCC	Further preliminary design to identify the preferred option to take forward to full detail design and preparation of contract documents
October 2019	Feasibility study	Balfour Beatty on behalf of DCC	To confirm the best value solution for the project for Challenge Bid submission.
January 2020	Pre-construction	Balfour Beatty on behalf of DCC	To provide early contractor involvement to assist in delivering a best value solution

Appendix 6: Changes to Traffic Signal Timing

Changes to the timing of the traffic signals are proposed at the following locations:

- (a) Milburngate roundabout: increase the green time for Castle Chare which consequently increases westbound queues on Milburngate Bridge (the council have tried to strike a balance between eastbound and westbound traffic reducing eastbound delay by increasing westbound delay);
- (b) Duke of Wellington traffic signals: the green time for Potters Bank will be increased significantly which leads to the longer queues on the A167 northbound;
- (c) Nevilles Cross traffic signals: these are under pressure from all directions. The A167 right-turn green time will be increased in the morning peak to deal with the increased volumes northbound turning back into Durham. In the afternoon peak the green time is already significant to deal with southbound right-turn traffic;
- (d) Crossgate Peth traffic signals: the A690 green times will be increased but this is mostly offset by reducing Margery Lane green as it is bus-only. The increased green will not help much if the right-turns mentioned above block the road; and
- (e) Leazes Bowl Roundabout signals: these need to remain. With them turned-off in the afternoon peak the traffic from Claypath, Market Place and Prince Bishops carpark turning left at the junction cannot get out and queue will back up to Claypath. This prevents A690 eastbound traffic destined for the Market Place and Prince Bishops carpark getting out at the top of sliproad which then tails back onto A690 and locks up Milburngate roundabout.