

Transport and Environment Committee

10.00am, Thursday, 6 October 2022

Response to Motion by Councillor Booth - Rainbow Bridge/Lindsay Road Bridge

Executive/routine	Routine
Wards	13
Council Commitments	

1. Recommendations

- 1.1 It is recommended that Transport and Environment Committee:
 - 1.1.1 Notes that removal of the Lindsay Road Bridge deck is the only technically feasible solution and is required for the long-term safety of members of the public;
 - 1.1.2 Notes the necessity to prioritise funding and staff resource on critical bridge infrastructure without nearby alternative routes, that a replacement crossing is not being progressed at this time, and therefore that Option 4a will be progressed; and
 - 1.1.3 Discharges the action arising from the approved motion on Rainbow Bridge/Lindsay Road Bridge from 30 June 2022.

Paul Lawrence

Executive Director of Place

Contact: Stephen Knox, Transport Manager – Structures & Flood Prevention

E-mail: stephen.knox@edinburgh.gov.uk | Tel: 0131 529 3587

Response to Motion by Councillor Booth - Rainbow Bridge/Lindsay Road Bridge

2. Executive Summary

- 2.1 Lindsay Road Bridge originally carried vehicles over the railway but until its closure in November 2021, it was a footbridge over the Hawthornvale Path. The southern end of the bridge continues to be used as an outdoor seating area for a local pub.
- 2.2 The bridge has reached the end of its lifespan and is deteriorated beyond economic repair. Options to ensure the long-term safety of the bridge have been explored, and the recommended option is removal of the bridge deck whilst retaining the existing masonry piers and abutments.
- 2.3 There is a current shortfall of £2.2m per annum within the Structures team and so funding is not available to construct a replacement crossing. Other funding sources and technical solutions were explored but deemed not feasible.

3. Background

- 3.1 Lindsay Road Bridge is located at the junction of North Fort Street and Lindsay Road in Newhaven, Edinburgh. The bridge was constructed in 1938 and is a three-span structure with span lengths of 10.3m, 9.8m and 11.25m (numbered 1-3 from north to south). A cycle path/footway runs below span 1, and spans 2 and 3 are also publicly accessible.
- 3.2 The bridge originally carried vehicular traffic over the North Leith branch of the Caledonian Railway but is now a footbridge over the Hawthornvale Path.
- 3.3 Each span has a different form and of mixed steel and concrete construction. The bridge carries low and high voltage power and fibre optic cables.
- 3.4 With permission from the Council, a community-backed project painted the bridge in rainbow colours in August/September 2021, on the understanding that the bridge was due to be demolished. This led to the bridge being referred to locally as the 'Pride' or 'Rainbow' bridge.

- 3.5 A Special Inspection of the structure was carried out in accordance with the Design Manual for Roads and Bridges (DMRB), CS450 Inspection of Highway Structures, in November 2021.
- 3.6 Lindsay Road Bridge was found to be in poor to very poor condition, with span 2 noted to be in the worst condition. Spans 1 and 3 are serviceable but poor condition and there are safety concerns due to the very poor condition of span 2.
- 3.7 Due to the immediate health and safety risk at the bridge, particularly with concerns around span 2, the following immediate actions were taken in December 2021:
 - 3.7.1 The underside of span 2 was fenced-off immediately with heras panels.
 - 3.7.2 The topside of span 2 was fenced-off immediately with steel barriers.
 - 3.7.3 Weekly monitoring of the structure has been undertaken, paying particular attention to span 2.
- 3.8 Despite the current focus being on the condition of span 2, span 1 has also been under close observation in recent years, including a period of weekly safety monitoring and regular removal of spalled concrete. Whilst this is currently stable, deterioration continues to all three spans.
- 3.9 The bridge is currently closed, with a short 200m detour available for pedestrians. Tram works hindered this diversion in late 2021/early 2022 resulting in a longer diversion using the Hawthornvale path, but these works have now been completed.
- 3.10 Due to continued criminal damage to safety barriers effecting the closure of the bridge, a more robust concrete barrier was installed in August 2022.
- 3.11 Regular dialogue has been ongoing with Ward Councillors since it became apparent in December 2021 that the bridge was to be closed. A letter was issued on 14 December informing of the closure. A meeting was offered in January 2022, then further updates were provided in March, April and July. The July update was a detailed feasibility study and the options detailed within this provided the basis of Appendix 1 of this report.
- 3.12 On [30 June 2022](#), the Council approved a motion by Councillor Booth agreeing that a report should be presented to the meeting of Transport and Environment Committee in October 2022, outlining options for the future of the bridge, which should include but not be limited to, the option of an immediate solution of partial infilling of the very corroded middle space, which may allow the bridge to continue to be used for walking, wheeling and cycling and may also allow its continued use as an outside hospitality area.

4. Main report

- 4.1 Appendix 1 is an excerpt from a recent briefing note to Ward Councillors and explores five options to ensure the long-term safety of the bridge:
 - 4.1.1 Option 1: Repair or strengthening of span 2;

- 4.1.2 Option 2: Infilling the underside of span 2;
 - 4.1.3 Option 3: Demolition of span 2 superstructure and replacement with a prefabricated footbridge section;
 - 4.1.4 Option 4: Demolition of all three superstructure spans and a follow-up secondary solution; and
 - 4.1.5 Option 5: Demolition of the entire bridge and a secondary solution.
- 4.2 Options 2 and 3 are only interim solutions that do not address the long-term safety of the bridge. Option 4 is therefore the most suitable solution to address the safety concern of the bridge whilst facilitating future restoration of a crossing. This solution would involve removal of the bridge deck across all three spans, but leaving the foundations, piers and abutments in place.
- 4.3 This has been assessed taking into account technical, economic and environmental factors, whilst maximising the opportunities for future development. Whilst the robust concrete barrier should address the immediate safety concern of pedestrians crossing the structure, the long-term safety of the bridge will continue to be a concern in its current state.
- 4.4 Records suggest that the bridge was 'stopped up' at the north end in the 1970s and fully closed to vehicles in 1998, and that demolition has been under consideration for at least 25 years. The structure has now reached the end of its lifespan and demolition is the only feasible option for the bridge. Any further investment into strengthening or other remedial works will be wasteful.
- 4.5 Appendix 1 also explores secondary follow-up options to Option 4. This report will focus on the following:
- 4.5.1 Option 4a: Demolition of all three superstructure spans and leave structure as-is for a future superstructure to be built;
 - 4.5.2 Option 4b: Demolition of all three superstructure spans and build new prefabricated superstructure spans now; and
 - 4.5.3 Option 4c: Demolition of all three superstructure spans and future proof as active travel link.
- 4.6 Option 4a would be the default position but Options 4b and 4c have been explored.
- 4.7 Over and above Option 4a, Option 4b is at a cost of c.£700,000 and 280 tonnes of CO₂e. Carbon cost to the environment aside, the financial cost of constructing replacement deck sections is not something which can be accommodated within the current Roads and Transport Infrastructure Capital Budget, when considered against other bridge project priorities. The Council's [Sustainable Capital Budget Strategy 2022-2032](#) notes a shortfall of £2.2m per annum for bridges and structures, and this figure was determined prior to the current inflationary and other financial challenges being faced across the Council. Capital investment and limited staff resources are being prioritised for the lowest-scoring bridges (based on Bridge Condition Indicators) which do not have alternative routes nearby, as is the case at Lindsay Road Bridge.

- 4.8 A matched-funding application to Sustrans was considered, however the Active Travel Investment Programme (ATInP) approved by Committee on [14 October 2021](#) did not identify this as a priority project. Officers do not see the bridge as a priority for active travel investment as there would be negligible value. Furthermore, if the bridge were invested in as a walking and cycle route, the provision of the outdoor seating would not be compatible with this as it would introduce conflict in the constrained area.
- 4.9 Alternative sources of funding from various sources have been explored to support this Option. This has included the UK Government Community Ownership Fund, National Heritage Lottery Grants and the Archaeology Scotland Adopt a Monument Scheme. None of these are considered suitable due to the short alternative route nearby, the ownership arrangements, and because the structure does not fall within a Conservation area.
- 4.10 Option 4c has not been costed however is considered impractical. Due to the very steep embankment on the south side of the Hawthornvale path (approximately 4m high retaining wall at the bridge abutment), extensive earthworks would be required to construct a path at an accessible 1:20 gradient. The length of the path would therefore be approximately 80m. This, plus the length of the new proposed path connection being constructed as part of the Trams to Newhaven contract would be almost the same length of the alternative route around Lindsay Road, bringing no benefit to travel distance. Concerns over the use of the Hawthornvale Path at night have also been raised previously. Implementing Option 4a would not discount Option 4c in future.
- 4.11 As a result of current Capital funding pressures, it is therefore recommended that Option 4a is progressed, i.e. the bridge deck of Lindsay Road Bridge is removed until such time that Council budget or external sources of funding are identified that may be suitable for progressing a follow-up solution utilising the existing piers and abutments. Works to 'tidy up' the ends of the deck will seek to retain some of the outdoor seating area, however the possibility or extent of this will be confirmed during preparations for deck removal.

5. Next Steps

- 5.1 The demolition of the bridge deck is subject to diversion of services crossing the structure. This task will now be progressed with the relevant public utilities companies through the C4 process.
- 5.2 Following diversion, removal of the deck can proceed, and the open ends of the bridge will be made safe in a way sensitive to the surrounding infrastructure.

6. Financial impact

- 6.1 The costs of the various solutions explored are detailed in Appendix 1.

- 6.2 Due to other bridge works priorities in the city and a current shortfall in funding of the Structures team, works at Lindsay Road Bridge will be limited to the minimum necessary to ensure the long-term safety of the public, i.e. removal of the bridge deck.
- 6.3 The estimated cost of utility diversions, removal of the bridge deck, and making safe the open ends of the bridge is estimated at £500,000.

7. Stakeholder/Community Impact

- 7.1 Under licence from the Council, the bridge is used as an outdoor seating area for a nearby pub, and the bridge provides a link between Nichollfield/North Fort Street, and the northern part of Lindsay Road. This seating area is positioned on the southern span of the bridge deck and will not be available following removal of the deck.
- 7.2 Removal of the bridge deck will increase the length of some journeys in this area by less than 200m.
- 7.3 It will ensure the safety of the public walking and cycling along the Hawthornvale Path under the structure, and curtail further costs associated with inspection and maintenance works.

8. Background reading/external references

- 8.1 None.

9. Appendices

- 9.1 Appendix 1 – Options for the long-term safety of members of the public

Appendix 1 – Options for the long-term safety of members of the public

1.0. Options for make-safe

The condition of the bridge has meant that an assessment of load carrying capacity is not possible, i.e., the structure of the bridge has deteriorated to a stage where calculations cannot justify any load rating.

The following options have been considered to address the immediate safety concern of the bridge condition:

1.1. Option 1 – Repair or strengthening of span 2

Repair of span 2 would involve removing corroded steelwork, welding or bolting replacement pieces, and repainting. The Council regularly undertakes this type of repair work on structures, however the extensive areas of corrosion and section loss, combined with the intricate nature of the steel lattice beams, means that this option is not feasible.

Remedial, or even replacement works, to spans 1 and 3 would also likely be required within the medium term (next 5 years).

Therefore this option has been discarded as it is technically unfeasible.





Condition of span 2 lattice structure renders repairs unfeasible

1.2. Option 2 – Infilling the underside of span 2.

Infilling is a technique usually used on masonry arches where the arch has been weakened from deterioration or where it has been assessed as unsuitable to carry the required loads.



Before and after infilling of Great Musgrave Bridge, Cumbria

Infilling the underside of span 2 of Lindsay Road Bridge would block-off access to the underside and also allow the top side of the structure to be re-opened. This would only be a temporary solution for the bridge as remedial, or even replacement works, to spans 1 and 3 would also likely be required within the medium term (next 5 years). At this stage the remaining central span and infilling would have to be removed.

It would require the placement of between 600 and 700 tonnes of low-density 'foam' concrete below span 2, at a significant financial (£60,000) and environmental (130t CO₂e) cost. These figures are based on 'dumping' concrete as shown above, but in reality at this location it would be necessary to a vertical wall to retain the infill, likely at 3-4x the cost and so less cost-effective than other options explored below.

In terms of public space, this option would guarantee the use of the deck level by pedestrians and cyclists as well as the availability of the outdoor seating area on the deck, currently used by the Dreadnought Pub. By contrast, it would have a detrimental effect in the available space in the underside of the bridge.

This option has been discarded for environmental and economic reasons, and also since it would only provide a temporary solution until inevitable remedial or replacement works on the other spans would be required.

1.3. Option 3 – Demolition of span 2 superstructure and replacement with a prefabricated footbridge section.

This alternative would require demolition of the central span, and reconstruction of this span utilising existing piers. As per Options 1 and 2 above this does not address the poor condition of spans 1 and 3 and so would only be a temporary solution.

Should this option be progressed, the services crossing the structure would be diverted. Given the inevitable works required to spans 1 and 3 in the near future, it would not be economic to temporarily suspend the services across the 'gap' whilst span 2 is being constructed, and then divert at a later date.

As a result of the diversion required, costs would be significant; approximately £500k for demolition and service diversion/protection. The design and construction of a new prefabricated footbridge across span 2 is expected to be approximately £150k. The estimated carbon emissions associated with this option would be 187t CO₂e.

In this case, public space will be restored being accessible for users at deck level and underside including the Dreadnought pub outdoor seating area.

This option has been discarded as it is not considered cost-effective and will not address the issues of the poor condition of spans 1 and 3.

1.4. Option 4 - Demolition of all three superstructure spans and a secondary solution.

Demolition of all three superstructure spans and diversion of existing services that are present in the bridge. This option ensures that risks associated with a bridge superstructure in bad condition will be eliminated.

This solution would leave the two piers and abutments in place so a superstructure can be built in the future. The estimated cost for demolition and service diversion/protection is £500k. Two secondary options have been considered following Option 4:

1.4.1 Option 4a – Leave sub-structure as-is for a future superstructure to be built

This would be considered a separate project and it will benefit from having part of the existing structure in place to accommodate the new superstructure spans. The carbon emissions for this options would be approximately 5t CO₂e that are associated with the demolition and service diversions.

The outdoor seating area would be eliminated and passage would be via the short 200m detour along Lindsay Road.

1.4.2 Option 4b – Build new prefabricated superstructure spans now

Replacement with prefabricated footbridge sections that can utilise the existing abutments and piers.

The three spans would all be different lengths so different designs will be required involving higher costs.

The outdoor seating area would remain in place after the construction of the prefabricated superstructure. This would guarantee pedestrian and cyclist access over the bridge.

£700k is the estimated cost for the design and construction of new prefabricated footbridge. This option would be environmentally costly involving approximately 285t CO₂e although less costly than also having to construct new foundations and substructure.

1.4.3 Option 4c – Leave sub-structure as-is and future proof an active travel link

The Trams to Newhaven project is constructing an Active Travel link from the North section of Lindsay Road, to the Hawthornvale Path below. An alternative to the bridge crossing would be to extend this path southwards, from Hawthornvale Path onto the South section of Lindsay Road.

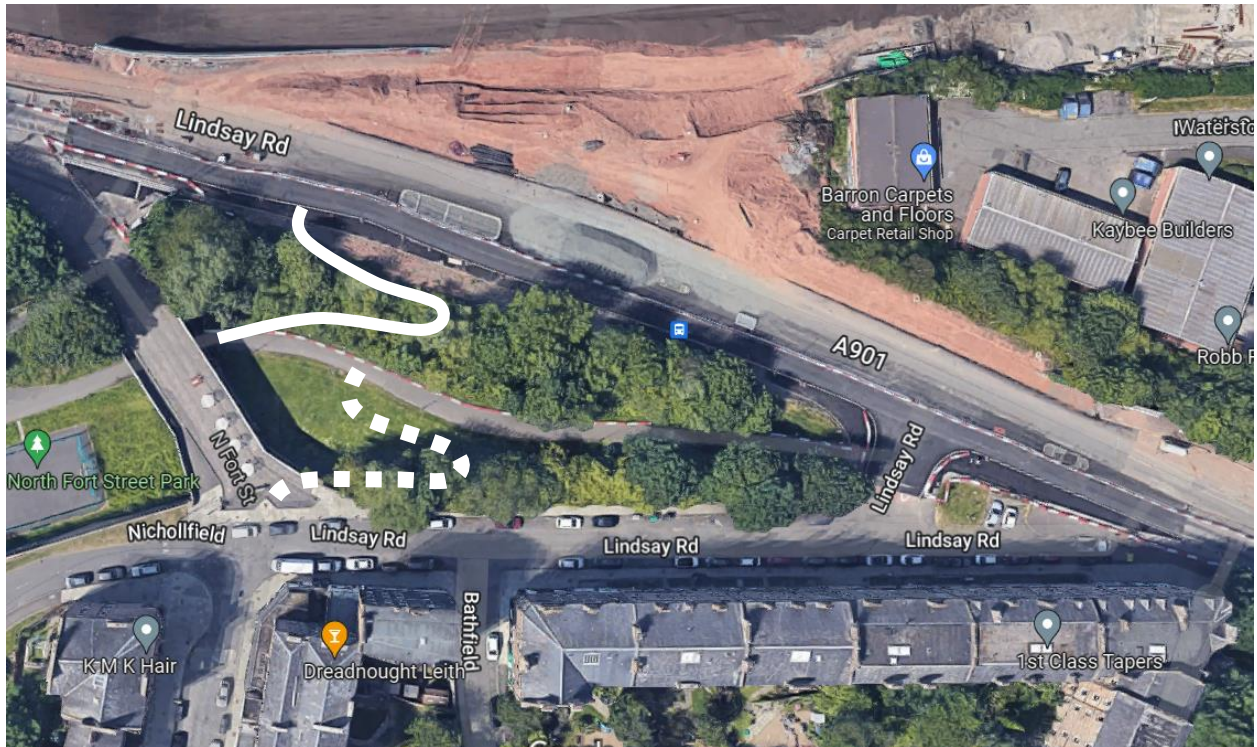
This would be technically challenging due to the steep embankment and significant level difference, and so a topographical survey and some design would be necessary to confirm feasibility. The outdoor seating area would be substantially reduced if not eliminated although its extent could be discussed in consultations.

Such a link would not be progressed by the Council's Structures team but may be progressed as part of other Active Travel schemes such as the LDPAP Transport Priority Actions. If this was to be a preferred option, the extents of demolition would take cognisance of this secondary solution. There are no significant additional costs to demolition and service diversion other than those associated with consultations.

This option would have a relatively low environmental cost of 5t CO₂e and it would potentially generate indirect carbon emission savings in the long run after the implementation of an active travel route.

Progressing this option would still leave the option of a new bridge open for future development.

It's worth noting that the length of the active travel link, including extension, would probably be a similar length to the diversion along the existing footpath, due to the steep embankments, and so questionable if these works would represent value for money for the Council.



Active travel link under construction as part of Trams to Newhaven project (solid line), and possible future extension following demolition (dashed line)

1.5. Option 5 – Demolition of the entire bridge and a secondary solution

Demolition of the full structure including the superstructure of all three spans and the piers. This would involve the diversion of public utility ducts before demolition. This option would eliminate the safety risks that this structure poses.

The estimated costs for demolition and service diversion are £500k.

Two secondary options have been considered following Option 5:

1.5.1 Option 5a – Leave south abutment in place and future proof an active travel link

As per Option 4c, however rather than leaving all piers and abutments in place, only the South abutment would remain to help facilitate the active travel path link.

1.5.2 Option 5b – Build a new footbridge.

Due to the construction of new foundations in addition to Option 4b, the estimated financial costs for the design and construction of a new bridge are £900k and the environmental cost would be approximately 555t CO₂e.

The footbridge would not be wide enough to accommodate outdoor seating, but this could be incorporated at the south end of the structure at additional cost.

2.0. Options Summary

	Advantages	Disadvantages	Cost	CO ₂ e
Option 1 - Repair or strengthening of span 2	N/A	Impracticable	N/A	N/A
Option 2 - Infilling the underside of span 2 (Interim solution only)	Stabilise Span 2 Deck level accessibility Outdoor seating area Low cost	Visual impact Environmental cost Reduced underside public space Temporary solution High carbon emission Works in Span 1 and 3 will be required in near future	£60k*	130t
Option 3 - Demolition of span 2 superstructure and replacement with a prefabricated footbridge section (Interim solution only)	Stabilise Span 2 Deck level accessibility Outdoor seating area	Diversion of services Works in Span 1 and 3 will be required in the future High cost	£650k	187t
Option 4a - Demolition of all three superstructure spans and leave sub-structure to support a new future deck.	Demolition of an unsafe structure Reduction of maintenance costs Relatively low carbon emission Piers and abutments remain with the future option to replace deck	Diversion of services Unavailable outdoor seating area Detour along Lindsay Road Visual impact High cost	£500k	5t

<p>Option 4b - Demolition of all three superstructure spans and build a new deck now</p>	<p>Deck level accessibility Outdoor seating area Demolition of an unsafe superstructure Piers and abutments remain</p>	<p>Diversion of services Different superstructure designs for each span High cost High carbon emission</p>	<p>£1.2m</p>	<p>285t</p>
<p>Option 4c - Demolition of all three superstructure spans and future proof as active travel link</p>	<p>Demolition of an unsafe structure Reduction of maintenance costs Relatively low carbon emission Piers and abutments remain Reinstated link</p>	<p>Diversion of services Reduced/eliminated outdoor seating area Visual impact High cost Steep embankment and technically difficult – long path (almost the same length as diversion)</p>	<p>£500k + active travel link costs</p>	<p>5t</p>
<p>Option 5a - Demolition of the entire bridge and future proof an active travel link</p>	<p>Demolition of an unsafe structure Relatively low carbon emission</p>	<p>Diversion of services No deck level accessibility Reduced/eliminated outdoor seating area High cost Steep embankment and technically difficult – long path (almost the same length as diversion)</p>	<p>£500k + active travel link costs</p>	<p>5t</p>
<p>Option 5b - Demolition of the entire bridge and build a new bridge</p>	<p>Deck level accessibility Outdoor seating area Demolition of an unsafe structure Replacement of the bridge</p>	<p>Diversion of services High cost as new foundations required High carbon emission</p>	<p>£1.4m</p>	<p>555t</p>

* but likely 3-4x this cost to include vertical retention as would be environmentally and visually necessary at this location. As this is only an interim solution (5 years) it cannot be compared to the other solutions, and a long-term follow-up solution at a cost of £1m+ will be necessary for long term safety.