Technical Note

TO	South Ribble Borough Council	**FROM**	Stephen Horne
DATE	**26 July 2022**	**CONFIDENTIALITY**	**Public**
SUBJECT	**Bee Lane Bridge Improvements– Indicative Cost Estimates**		

Introduction

WSP have been approached by South Ribble Borough Council to provide advice on indicative costs for a number of options to enhance the road traffic provision over the West Coast Mainline at Bee Lane in Penwortham, Lancashire (see figures 1 & 2).

The bridge has Network Rail number CGJ5/113 and is positioned just north of Farington Curve Junction where the twin track East Lancashire Line joins the Up and Down slow lines of the West Coast Main Line which are under the west span of the bridge, with the Up and Down fast lines of the West Coast Main Line under the east span.

All four railway lines have 22 kV overhead electrification and the portion of Bee Lane bridge that spans over them has a raised parapet with steeple coping that may provide the required 1.8m height for touch potential to the electrified lines.

A bridge assessment from 2002 rated the structure 40 Tonnes Assessment Live Load to BD 21/01 or 15 units of HB loading. The existing bridge parapet is of brick construction and appears likely to provide N1 or N2 vehicle containment to CS 461; 'Assessment and Upgrading of in Service Parapets'.

This technical note sets out the background to the existing structure, the potential improvement options considered, the constraints to the provision of the proposed options and indicative cost estimates for each solution based on previous similar projects.

Figure 1 - Penwortham, Lancashire

Figure 2 - Bee Lane Bridge

The existing bridge is a three-span brickwork arch bridge on masonry supports, each span being approximately 9.2m square span, the central and western spans have 2 tracks passing through each, the eastern span is empty (See Figure 3, below).

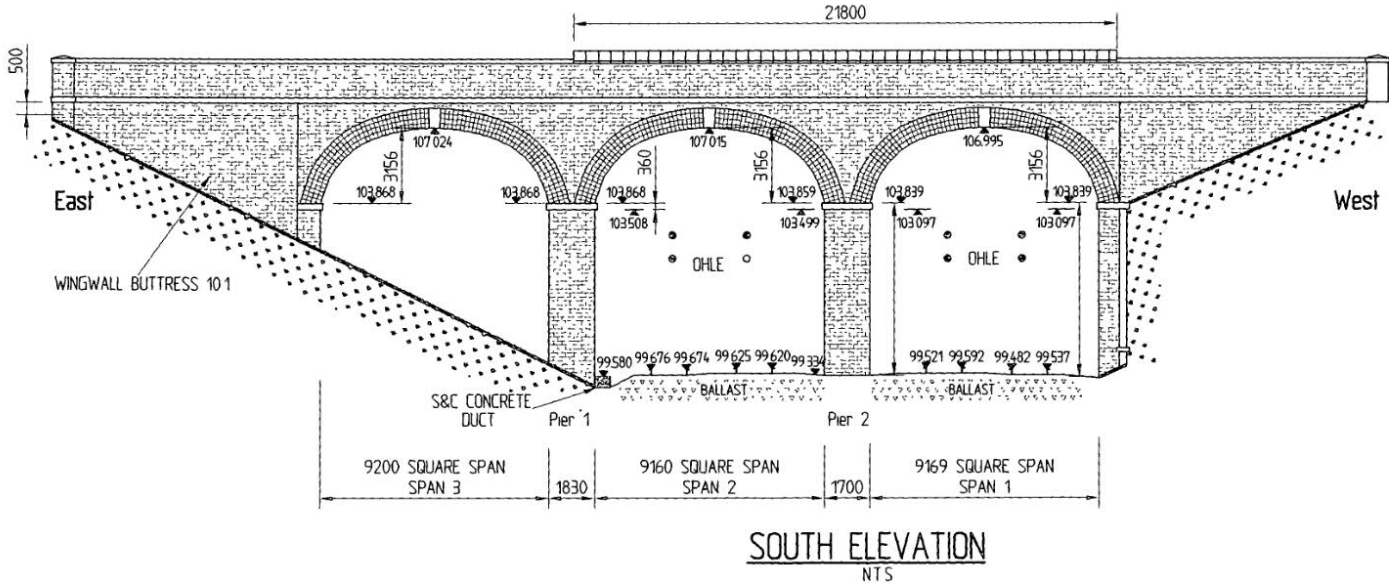

Figure 3 - Existing bridge elevation

The carriageway is 6.3m total width with masonry and brickwork parapets (See Figure 4 below), the layout has recently been modified to create a single 3.75m carriageway and segregated 2m footway, this is considered unsuitable for future traffic conditions.

Figure 4 - Bee Lane Bridge (looking West)

Proposed Options

Option 1

New Pedestrian / Cycle bridge probable location south of existing bridge. *LTN 1/20* recommends min 4.5m shared width for 300ped/cycle per hr. DMRB document *CD 353; 'Design of Footbridges'* requires a minimum width of 3.5m for unsegregated pedestrian and cycle use and 5m when segregated. Existing bridge retained for road traffic only. Spanning the existing 4 tracks with minimum 4.5m clearance either side implies a minimum clear span of 25m, say 26m effective and requiring bank seats on the railway cutting slopes. Standard NR 400 series bridge design is suitable for spans up to 28m although only up to 2m width so would require adaptation / bespoke design to the provide the required widths.

Option 2

New Road / Cycle and Pedestrian bridge location south of existing bridge. An all-purpose rural road to *DMRB CD127 'Cross sections and headrooms'* consistent with The Cawsey to the east consists of 2 lanes at 3.65m plus 1m hard-strip each side with 3m cycleway one side and 2m footways both sides, 16.3m total width (14.3m with footway one side only) (see Figure 5). Span assumed similar to Option 1 at 26m. Potential to use narrower carriageways if the remainder of Bee Lane is not to be widened, adopting 3m running lanes and combined footpath cycleway could reduce required width to 9m.

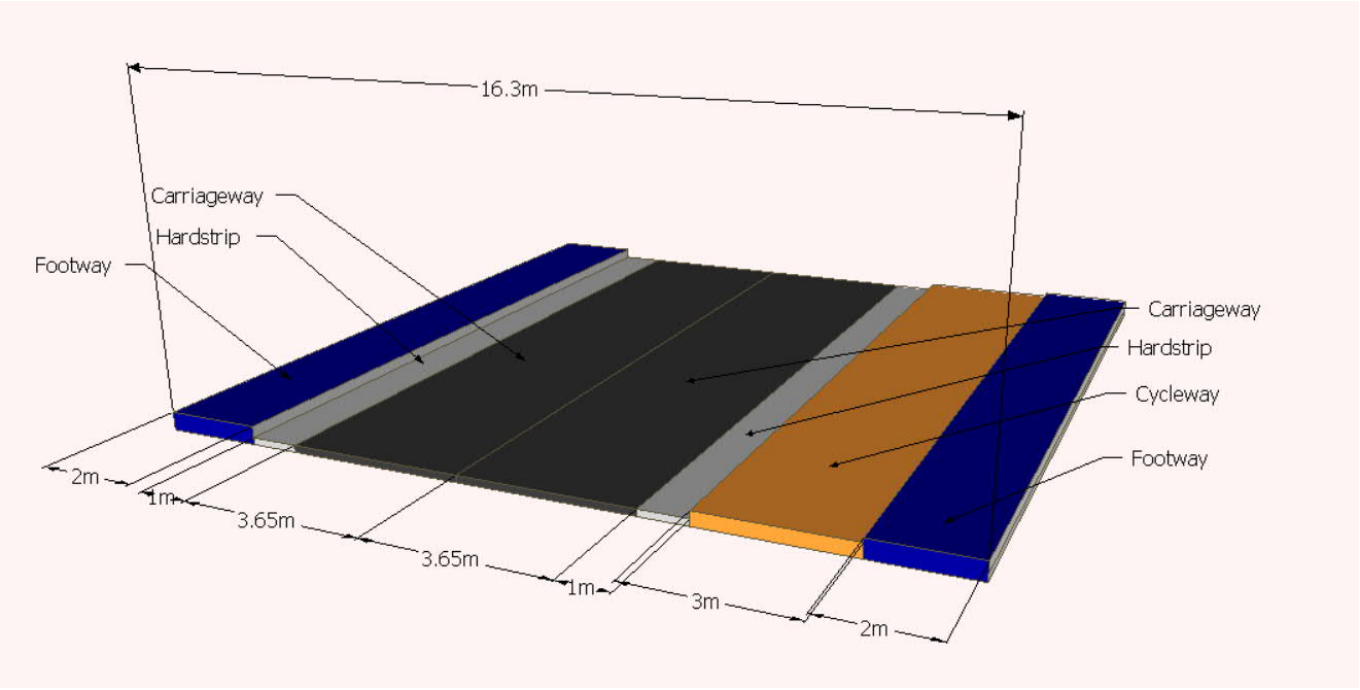

Figure 5 – All-purpose rural road carriageway cross-section

Other Options Considered

Option 3

Demolish existing bridge superstructure, modify foundations and supports, install widened superstructure as new bridge, *DMRB CD127*, All-purpose rural road 2 lanes at 3.65m plus 1m hard-strip each side, 3m cycleway one side and 2m footways both sides, 16.3m total width (14.3m with footway one side only). Based on the construction of the existing bridge, the modifications required to the foundations to permit the extent of widening needed is considered to be impractical. Option 3 is potentially more achievable for a narrower superstructure but would provide lower cost benefit in terms of useable space compared to option 1.

Option 4

Construct new bridge for road traffic only. Retain existing structure for pedestrian / cycle use. Assume total width of 9m. This option would remove issues associated with the capacity and structure of the existing bridge for increased road traffic, however issues of highway alignment would require consideration.

Constraints

Construction of a twin span bridge would require works within Network Rails track boundary, this would require significant track possession time thereby increasing construction costs and reducing the benefit derived from the lesser material costs associated with a shorter span construction.

Spatial constraints associated with highways alignments and trackside infrastructure may constrain the potential positioning of a replacement or complementary bridge or requiring the existing bridge to be demolished before a new bridge can be constructed.

The railtracks are electrified with OLE present through both occupied spans and along the adjacent lengths of track. Clearances of deck over OLE would require consideration in respect of parapet design. OLE return

conductors are direct fixed to the bridge arches in 4 locations and would require support in a reconstructed design.

The existing bridge accommodates a number of services crossing the railtrack, including gas, water, electric and telecoms. Service diversions would be required if the existing bridge was to be removed.

The existing parapets may be considered sub-standard for the increased vehicle volumes associated with future traffic conditions, therefore there is a potential requirement to upgrade the parapets on the existing bridge to achieve vehicle containment compliance with current standards for new designs. The costs associated with an upgrade of this nature have been estimated at £2m.

Comparable Project Examples

Green Street Footbridge, Gillingham, Steel truss 33m (3m wide footbridge) – (2021) - c£1.25m

Stapenhill Footbridge, steel 27m single span (3m wide footbridge) – (2021) - c£1.1m

Ilkeston Station Footbridge, 37m single span (3m wide footbridge) – (2017) - c£2.5m

Dr Stewart Adams Bridge, Nottingham, steel truss 50m single span (4.5m wide cyclepath) – (2018) - c£4m

Awsworth Road Bridge, Ilkeston, steel composite 33m single span (7.65m carriageway & 2m footpath) on existing foundations – (2017) - c£3m

Indicative Cost Estimates

Option 1 (New cycle pedestrian bridge, steel single span 26m)

£2m to £3m

Option 2 (New full carriageway bridge, steel composite single span 26m)

£7.5m to £12.5m, depending on carriageway cross-section.

Option 3 (widening existing bridge to 8m carriageway)

£3.5m to £5.5m

Option 4 (New highway bridge, steel composite single span 26m)

£6m to £7.5m

Assumptions and Exclusions

The prepared costs are based on a number of assumptions as follows;

- Designs follow standard Network Rail design requirements.
- Bridge forms are selected for lowest cost with no architectural enhancements.
- Scheme approvals via Town and Country Planning Act.
- No significant environmental issues are present.
- Consultant design and management costs at 10% of estimated construction value.
- Contingency included at 10% of total project value.

The following items have not been allowed for within the costs as the extent of their requirement cannot be determined at this stage;

- No allowance for service diversions costs
- No allowance for land purchase costs
- No allowance for load capacity improvement works to, or removal of, the existing Bee Lane Bridge
- No allowance for associated highways alignment works
- No allowance for adverse ground conditions or contaminated land
- No allowance for Network Rail access costs

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