

NCC BRB Assessments

**Assessment Report**  
**60045644-026-AR-01**

Bridge Name: **Melkington**  
BRB Ref: KLO/29  
NCC Bridge No.: A698/01RY

Northumberland County Council  
April 2009



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# Report Preparation

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Title Graduate Engineer

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Date 24-04-2009

Checked by:

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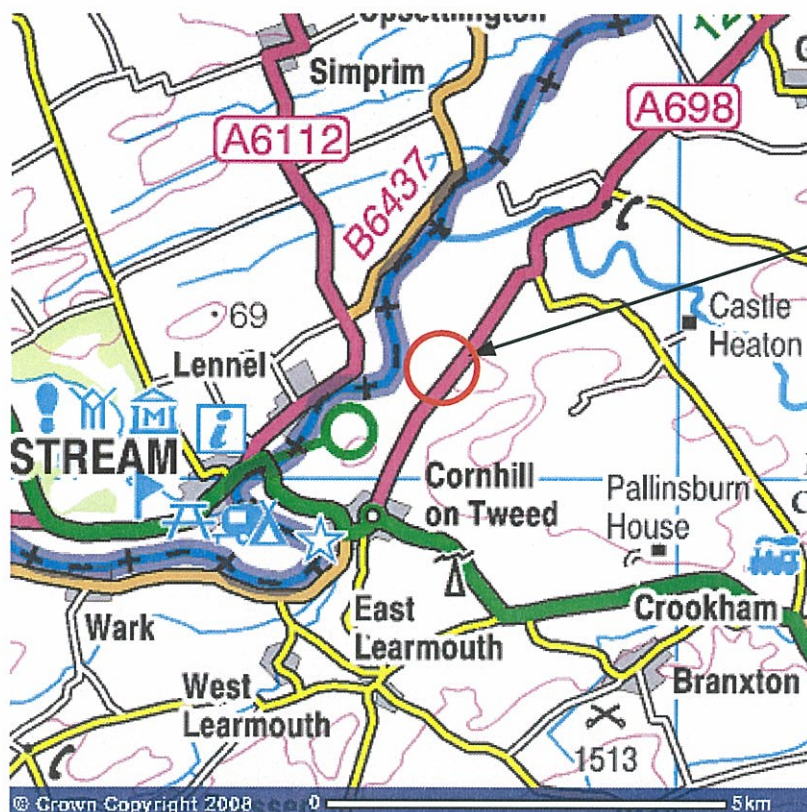
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Signed

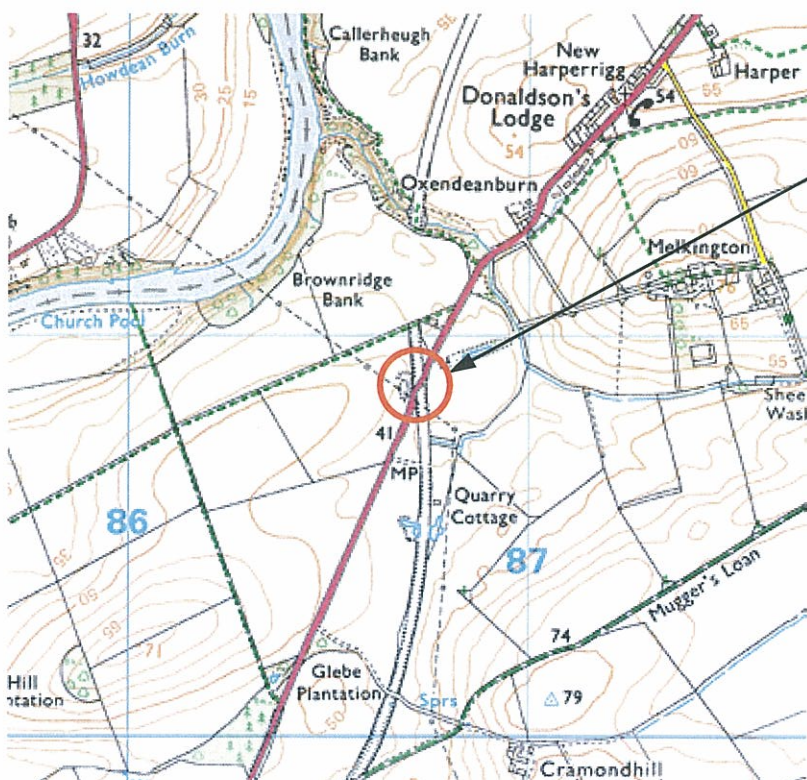
Date 4/8/2009

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## Location Plans



Melkington Bridge



Melkington Bridge

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# Assessment Report

# 1 Details of Structure

## 1.1 General Description

Melkington Bridge is a single span masonry arch bridge. The bridge carries the A698, a two lane single carriageway, over a dismantled railway at OS Grid Reference: NT 867 408, from Coldstream to Berwick upon Tweed. The orientation of the bridge is such that spans from the North East to South West.

The date of construction is not known. The highway carried over the structure is a two lane single carriageway approximately 8.6m wide, with 2.35m wide verges to either side. The total distance between parapets is 10.95m. A footpath runs across the bridge parallel to the northern edge of the road, this footpath is included in the dimensions for the verge.

The bridge has a skew span of 14.35m between abutments with a skew of 50.47 degrees.

## 1.2 Deck Description

The arch has a circular profile and is constructed bricks in a coursed helicoidal pattern. The edges of the arch are finished with hammer dressed stone voussoirs of varying shape and size which prevent visual determination of the arch barrel thickness.

The rise of the arch is 2.389m at mid-span and 1.839m at the quarter points. Archive data suggests that the arch barrel is 457mm (18") in thickness with mortar joints between 6mm and 12.5mm.

The typical depth of fill above the arch at crown level is 554mm.

The spandrel walls are constructed from small to medium sized hammer dressed coursed ashlar blocks.

The type of fill material is not known, but is assumed to be well compacted.

## 1.3 End Supports

The abutments and wing walls are constructed from medium sized coursed ashlar blocks with a hammer dressed finish.

## 1.4 Bearings and Articulation

The arch spans from stone imposts at springing level of the abutments.

## 1.5 Deck Ancillaries

### 1.5.1 Waterproofing Membrane

It is not known if a waterproof membrane exists over the structure, however there was evidence of water ingress, particularly underneath the verges.

### 1.5.2 Parapets

The parapets are constructed from large sized hammer dressed coursed sandstone blocks with a hammer dressed finish. The parapet height is approximately 1.4m above road level.

### 1.5.3 Surfacing

The road surfacing is of bituminous construction, the thickness of which is not known.

## 1.6 Drainage System

There is no drainage system in place for the bridge and no weep holes were observed to the abutments.

## 1.7 Services

There is no evidence to suggest the presence of services beneath the bridge is unknown.

## 2 Archive Information

### 2.1

#### **Archive Information**

Assessment data 1994

Assessment Calcs 1994

Parapet Photos 1995

## 3 Summary of Previous Assessment

### 3.1 Summary of Previous Assessment

Melkington Bridge was assessed by Northumberland County Council in June 1994. The assessment was carried out using the modified MEXE method. The assessment found the arch barrel of the bridge to have a capacity of 40 tonnes. No calculations were carried out to determine the HB rating of the bridge. The bridge geometry used in this assessment was largely the same as that used with the present assessment however the 1994 assessment found the thickness of the arch barrel to be 580mm compared to the AIP value of 457mm.

# 4 Inspection for Assessment

## 4.1 Inspection Team and Equipment

The inspection for assessment was undertaken on foot on the 15th June 1994 on behalf of Northumberland County Council.

A subsequent inspection was undertaken by Faber Maunsell staff on the 22<sup>nd</sup> May 2008. The weather was dry and bright.

Access to the underside of the structure was obtained on foot via the embankments.

## 4.2 Results of the Inspection

### 4.2.1 Masonry Arch

The inspection found the arch barrel to be in fair shape with the mortar in the joints missing to a depth of 100mm in some places. Extensive salt and calcareous deposits were noted to the arch barrel, particularly beneath the verges.

### 4.2.2 Abutments and Wing Walls

The abutments and wing walls were found to be largely in good condition with joints and stones intact and in good shape.

### 4.2.3 Foundations

The foundations of the bridge are not visible and were not inspected

The arch shape was found to be good and a level survey found the springing levels to be consistent, suggesting no major signs of differential settlement or movement of the foundations.

### 4.2.4 Parapet and Spandrel Walls

The inspection found the parapet and spandrel walls to be in good condition.

### 4.2.5 Carriageway

The road surface was in generally good condition with only minor surface break up to the edge of the carriageway.

# 5 Assumptions for Assessment

## 5.1 Loading

The structure will be assessed in accordance with clauses 6.15 and 6.16 of BD21/01 and for loading from Table 3/6 of BA16/97 for Load Capacity and Gross Vehicle Weight Restrictions for Masonry Arches.

An HB rating is not normally determined for arch structures; however, Network Rail Current Information Sheet 27 calculates an HB rating. This will be adopted for the assessment should the arch achieve 40t / 40t Assessment Live Loading.

## 5.2 Superstructure

For assessment the span of 14.35m will be used with the arch profile taken to have a rise at crown of 2.389m and a rise at quarter points of 1.839m as detailed in section 1.2.

The arch barrel thickness is assumed to be 457mm but 100mm will be deducted from this value in order to take into account mortar loss.

The arch barrel is in moderate condition therefore a condition factor of 0.8 will be applied when assessing the arch. 0.1 has been deducted for the arches general condition and 0.1 deducted for salt and water ingress.

The actual depth of fill was measured to be 554mm but will be taken as 357mm in accordance with BA 16/97.

The arch barrel will be assumed to be constructed from bricks in a fair condition with a barrel factor of 0.9 in accordance with the AIP.

The fill will be assumed to be a well compacted material with a fill factor of 0.7 in accordance with the AIP.

Joints were found to be 6mm to 12.5mm in width therefore a width factor of 0.9 will be used in accordance with the AIP.

The joints of the stonework are 12.5mm to one 10th insufficiently filled; however the mortar loss has been taken account of in the arch barrel thickness therefore depth factor of 1.0 will be used rather than 0.9 as stated in the AIP.

It is assumed that the remaining mortar is in a loose or friable condition hence a mortar factor of 0.9 will be used.

Axle lift off will not be considered due to the profile of the carriageway on the bridge.

Due to the high skew of the bridge an ARCHIE-M assessment will be carried out to confirm the results obtained during the MEXE calculation. The type of brick masonry present to the arch barrel is assumed to be Wire cut masonry with properties in accordance with Figure 4.2 of BD21/01.

The ARCHIE-M assessment will be based on the assumptions stated above in addition to an arch barrel masonry strength of 6MPa (4.8 when adjusted to allow for condition factor) and unit weight of 21kN/m<sup>3</sup>, abutment strength of 6MPa and unit weight of 21kN/m<sup>3</sup>, fill unit weight of 19kN/m<sup>3</sup> and phi (degree) of 30.

The backing to the arch will be assumed to be the minimum backing as in accordance with Network Rail 'Current information Sheet 18 – Mechanism Analysis of Multi-Span arches'.

## 5.3 Spandrel Walls and Parapets

Parapets and spandrel walls will be assessed qualitatively based on the results of the inspection.

## 5.4 Substructure

The foundations, abutments and wing walls will be assessed qualitatively based on the results of the inspection.

## 6 Assessment Methods & Results

### 6.1 Superstructure

The Arch Barrel has been assessed using the modified MEXE method and the factors determined in section 5. The arch barrel was found to be able to accommodate vehicles with Max Gross Vehicle Weight of 10t, and a HB rating of 6 units.

The ARCHIE-M assessment found the arch barrel to be capable of accommodating a Group 2 Fire Engine and 5 units of HB.

### 6.2 Spandrel Walls and Parapets

The spandrel walls and parapets have been assessed qualitatively as adequate in accordance with BA16/97 as there are no defects to suggest any ill effects.

### 6.3 Substructure

The abutments and wing walls have been assessed qualitatively as adequate in accordance with BA16/97 as there are no defects to suggest any ill effects.

# 7 Conclusions

## 7.1

### Conclusions

The ARCHIE-M assessment is considered to give the most accurate result for the bridge capacity therefore the capacity of the arch has been found to be a **Group 2 Fire Engine** and up to **5 units of HB**. The ARCHIE-M assessment shows that if the arch barrel is re pointed then the capacity of the bridge would increase to 13 tonnes of assessment live loading and 10 units of HB. Extensive strengthening work would be required in order to increase the capacity of the arch up to 40 tonnes assessment live loading.

The spandrel walls, parapets and substructure have been assessed qualitatively as adequate.

## 8 Recommendations

### 8.1 Recommendations

The structure has been assessed to a **Group 2 Fire Engine** and **5 units of HB**, hence a weight restriction of 3t is recommended. The arch barrel should be re-pointed in order to increase the capacity of the bridge to 13 tonnes and 10 units of HB however any further increase in capacity would require extensive strengthening works to be carried out.



## **Structural Assessment Summary of Results**

### **Analysis Results: Melkington Masonry Arch**

Span Reference	Span 1	Span 1	
Method Used (e.g. MEXE)	MEXE	ARCHIE-M	

### **Single Span Analysis**

Allowable Axle Loads	Single Axle Load	7.56 T	-	
	Double axle Load	4.32 T	-	
	Triple Axle Load	3.24 T	-	

### **Multi Span Analysis**

Overall Global Capacity			
Maximum Gross Vehicle Weight	10T	3T	
Assessment Live Load Rating	10T	3T	
HB Rating	6 Units	5 Units	

### **Comments**

- The ARCHIE-M assessment gives the more accurate result.
- Should re-pointing be carried out then the capacity would increase to 13 Tonnes and 10 units of HB

## Appendix B: Calculations

# CALCULATION SHEET

FABER MAUNSELL | AECOM

Project: NCC BRB Assessments - Melkington Bridge		Ref:	26
Section: MEXE Assessment		Job No:	60045644
		Date:	Feb 2009
Made By: [REDACTED]	Checked By: [REDACTED]	Sheet No:	Sheet 1 of 1

## ASSESSMENT OF MASONRY ARCH BRIDGES BY THE MODIFIED MEXE METHOD IN ACCORDANCE WITH SECTION 3 OF BA16/97

				Comments
Span	L	14.350	m	Skew Span
Rise at Crown	r <sub>c</sub>	2.389	m	From level survey
Rise at Quarter points	r <sub>q</sub>	1.839	m	From arch profile data
Thickness of Arch Barrel (Reduced if applicable)	d	0.357	m	0.457m (AIP) - 100mm for loss of mortar (level survey)
Actual Depth of Fill at Crown	h'	0.554	m	
Fill Depth to be used (<=d) (cl. 6.17 BD21/01)	h	0.357	m	From level survey
Provisional Axle Load (cl. 3.10)	$PAL = \frac{740(d + h)^2}{L^{1.3}}$	PAL	11.82	t
Span/Rise Ratio (L/rc)			6.01	
Span/Rise Factor (cl. 3.11 & Fig 3/3)	F <sub>sr</sub>		0.74	
Profile Ratio (r <sub>q</sub> /rc)			0.77	If 0.75 or less then F <sub>p</sub> = 1.0
Profile Factor (cl. 3.12 & Fig 3/4)	$F_p = 2.3 \left[ \frac{(r_c - r_q)}{r_c} \right]^{0.6}$	F <sub>p</sub>	0.95	
Barrel Factor (Table 3/1)	F <sub>b</sub>		0.9	Bricks in a fair condition
Fill Factor (Table 3/2)	F <sub>f</sub>		0.7	Assume well compacted
Material Factor (cl. 3.13)	$F_m = \frac{(F_m \cdot d) + (F_f \cdot h)}{d + h}$	F <sub>m</sub>	0.80	
Width Factor (Table 3/3)	F <sub>w</sub>		0.9	6 - 12.5mm
Mortar Factor (Table 3/4)	F <sub>mo</sub>		0.9	Loose or friable mortar
Depth Factor (Table 3/5)	F <sub>d</sub>		1.0	Barrel thickness reduced by 100mm
Joint Factor (cl. 3.16)	$F_j = F_w \cdot F_d \cdot F_{mo}$	F <sub>j</sub>	0.81	
Condition Factor (cl 3.17 & Annex D)	F <sub>cM</sub>		0.8	-0.2 for condition and salt
Modified Axle Load (cl. 3.24)	$MAL = F_{sr} \cdot F_p \cdot F_m \cdot F_j \cdot F_{cM} \cdot PAL$	MAL	4.32	t
Axle lift off is considered to be appropriate. Hence use Fig 3/5a for axle factors				
Axle Factor (Single - Fig 3/5a)	A <sub>t1</sub>		1.75	
Axle Factor (Double - Fig 3/5a)	A <sub>t2</sub>		1.00	
Axle Factor (Triple - Fig 3/5a)	A <sub>t3</sub>		0.75	
Centrifugal Factor (Effects are minimal)			1.00	
Allowable Axle Load (Single - MAL x A <sub>t1</sub> )	AAL1		7.56	t
Allowable Axle Load (Double - MAL x A <sub>t2</sub> )	AAL2		4.32	t
Allowable Axle Load (Triple - MAL x A <sub>t3</sub> )	AAL3		3.24	t
Max Gross Vehicle Weight (Table 3/6)	gvw		10	t
Weight Restriction (Table 3/6)			10	
HB Rating (no. of units = MAL x A <sub>t2</sub> x 1.6)			6.9	units
(In accordance with Network Rail Current info sheet 27)				

### Notes

## Appendix C: ARCHIE-M Assessment

# Calculation Sheet

FABER MAUNSELL | AECOM

Project: **NCC BRB ASSESSMENT**

Job No: 60045644

Section: ARCHIE-M ASSESSMENT

Date: 18 March 2009

Made by: [REDACTED]

Checked by: [REDACTED]

Sheet No: 1 of 2

## ARCHIE-M Input

### Material

Effective Masonry Strength: 6.4MPa (Wire cut masonry)

Unit weight: 21kN/m<sup>3</sup>

### Arch

LHS: X: 0

LHS: Y: 2500

Span: 14350mm

Rise: 2389mm

Q-rise: 1839mm

d-ctr: 357mm

d-spr: 357mm (457mm -100mm loss)

### Abutment

Thickness at top (left): 1000mm

Thickness at top (right): 1000mm

Masonry strength: 6N/mm<sup>2</sup>

Masonry unit weight: 24kN/m<sup>3</sup>

### Fill

Unit weight: 18kN/m<sup>3</sup>

Phi value: 30 degrees

### Road Level

Point	X	y
1	-1500	5822
2	0	5822
3	3587.5	5861
4	7175	5900
5	10762.5	5821
6	14350	5742
7	15850	5742

Depth of surfacing: 50mm

Depth of Overlay: 0mm

Surfacing unit weight: 24kN/m<sup>3</sup>

Overlay unit weight: 18kN/m<sup>3</sup>

Lane Width: 2500mm

# Calculation Sheet

FABER MAUNSELL | AECOM

Project: **NCC BRB ASSESSMENT**

Job No: 60045644

Section: ARCHIE-M ASSESSMENT

Date: **18 March 2009**

Made by: [REDACTED]

Checked by: [REDACTED]

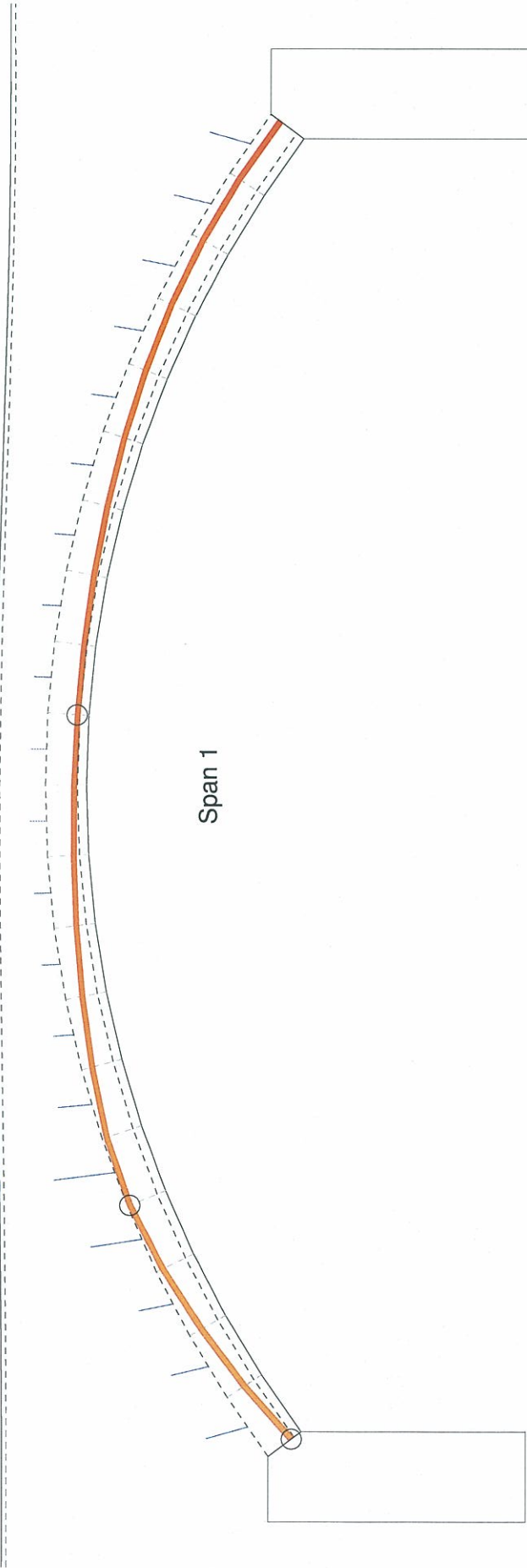
Sheet No: 2 of 2

## Summary of ARCHIE-M analysis

The ARCHIE-M analysis found the bridge to have a capacity of 3 tonnes plus a Group 2 Fire Engine and was found to be able to accommodate 5 units of HB. The capacity of the arch would increase to 13 tonnes and 10 units of HB if the arch was re-pointed. Any further increase in capacity would require extensive strengthening work to be carried out as the capacity of the arch is largely limited by its relatively flat profile.

# Melkington

FE 2 Single Axle with Impact at 2726 mm



FE 2 Single Axle with Impact @ 2726 [mm]

gammaFI dead load: 1.00  
 gammaFI superimposed: 1.00  
 gammaFI live load: 1.90  
 gammaF3 load effect: 1.00  
 gammaM material: 1.00

File path: F:\PROJECTS\Structures - NCC BRB Assessments\04 Calculations\26 Melkington\Structure1.brg

NAME: Melkington

LOCATION: On the A698 between Coldstream and Berwick upon Twe

NUMBER: A698/01RY

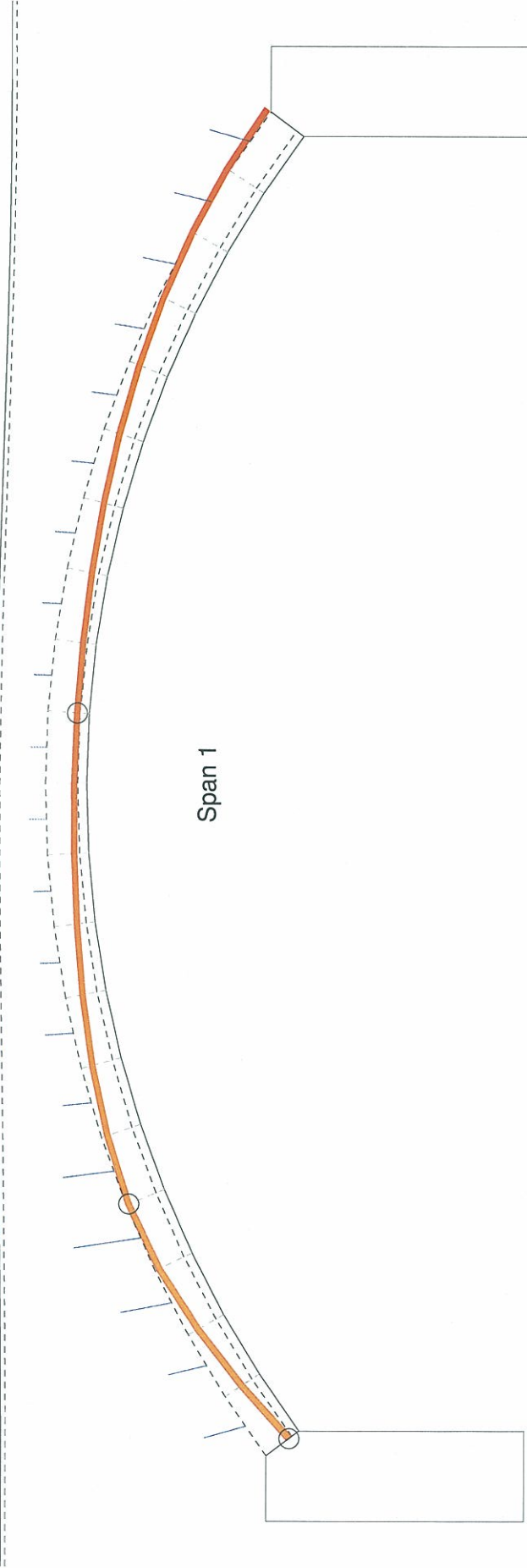
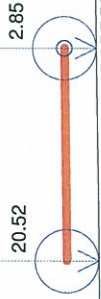
Faber Maunsell

DATE: 18 March 2009

Printed on: Wednesday, March 18, 2009 14:39:35

# Melkington

RF (7.5t 2-axle R) impact axle 2 at 4226 mm



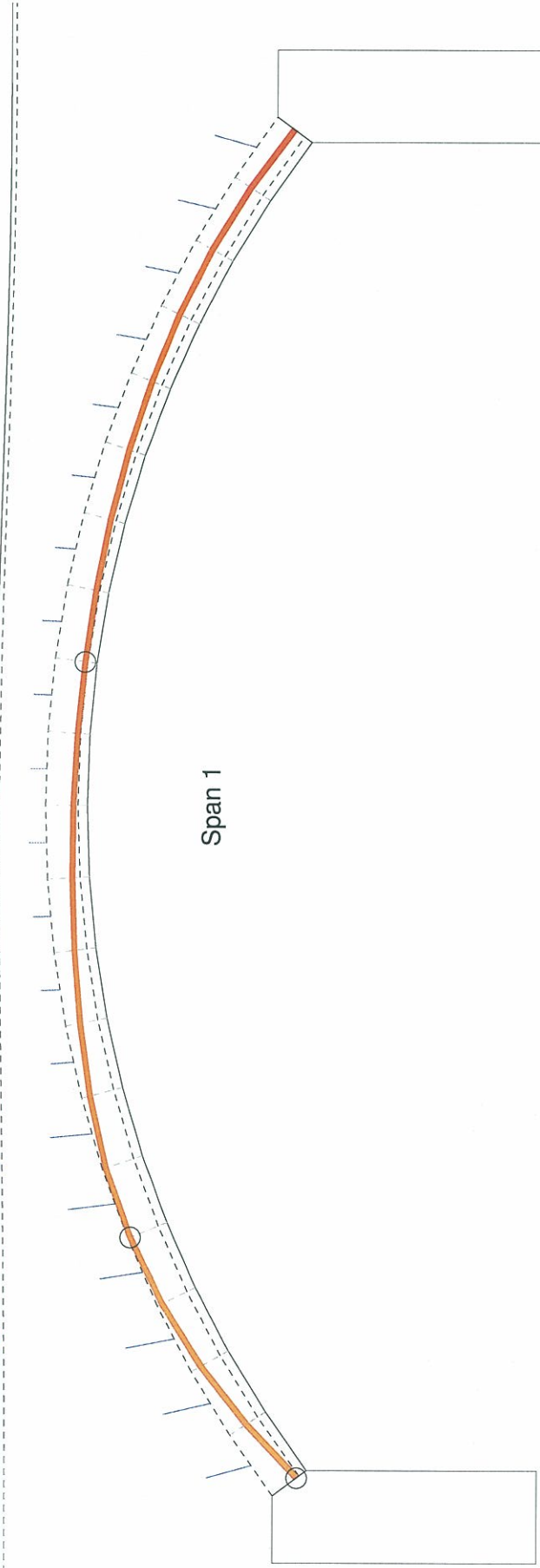
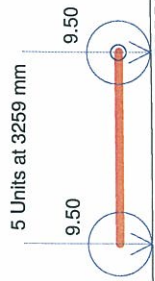
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 gammaFI superimposed: 1.00  
 gammaFI live load: 1.90  
 gammaF3 load effect: 1.00  
 gammaM material: 1.00

RF (7.5t 2-axle R) impact axle 2 @ 4226 [mm]

NAME: Melkington  
 LOCATION: On the A698 between Coldstream and Berwick upon Twe  
 NUMBER: A698/01RY  
 Faber Maunsell  
 DATE: 18 March 2009  
 Printed on: Wednesday, March 18, 2009 14:37:43

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# Melkington



Span 1

gammaFI dead load: 1.00  
gammaFI superimposed: 1.00  
gammaFI live load: 1.90  
gammaF3 load effect: 1.00  
gammaM material: 1.00

5 Units @ 3259 [mm]

NAME: Melkington

LOCATION: On the A698 between Coldstream and Berwick upon Twe

NUMBER: A698/01RY

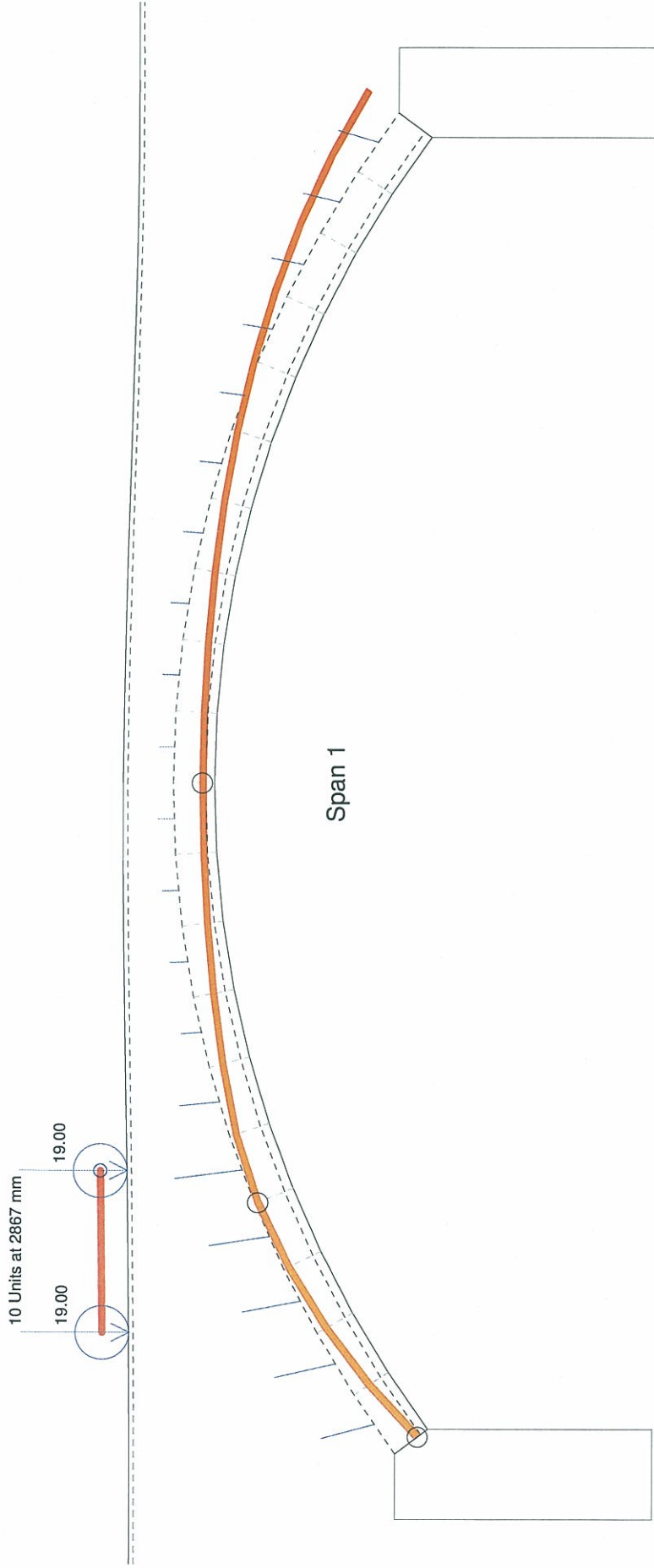
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# Melkington



gammaFI dead load: 1.00      10 Units @ 2867 [mm]  
gammaFI superimposed: 1.00  
gammaFI live load: 1.90  
gammaF3 load effect: 1.00  
gammaM material: 1.00

File path: F:\PROJECTS\Structures - NCC BRB Assessments\04 Calculations\26 Melkington\Structure1.brg

NAME: Melkington

LOCATION: On the A698 between Coldstream and Berwick upon Twe

NUMBER: A698/01RY

Faber Maunsell

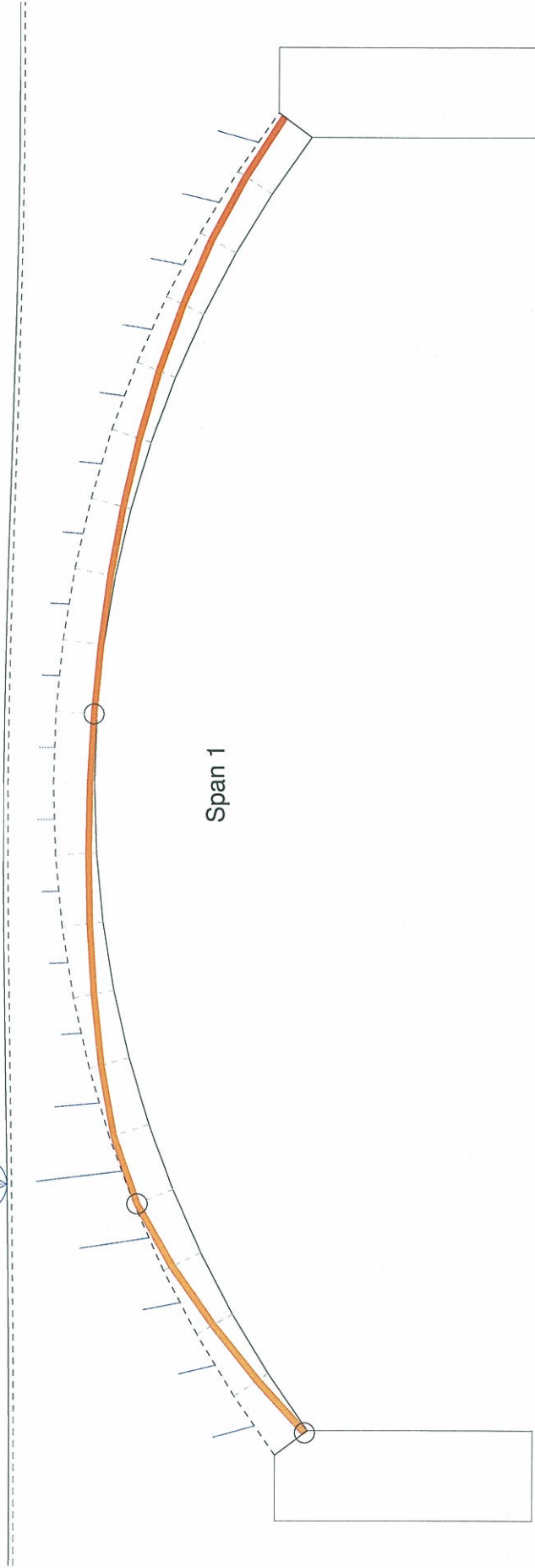
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# Melkington

13-t Single Axle with Impact at 2726 mm

30.78



Span 1

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gammaFI superimposed: 1.00  
gammaFI live load: 1.90  
gammaF3 load effect: 1.00  
gammaM material: 1.00

13-t Single Axle with Impact @ 2726 [mm]

NAME: Melkington

LOCATION: On the A698 between Coldstream and Berwick upon Twe

NUMBER: A698/01RY

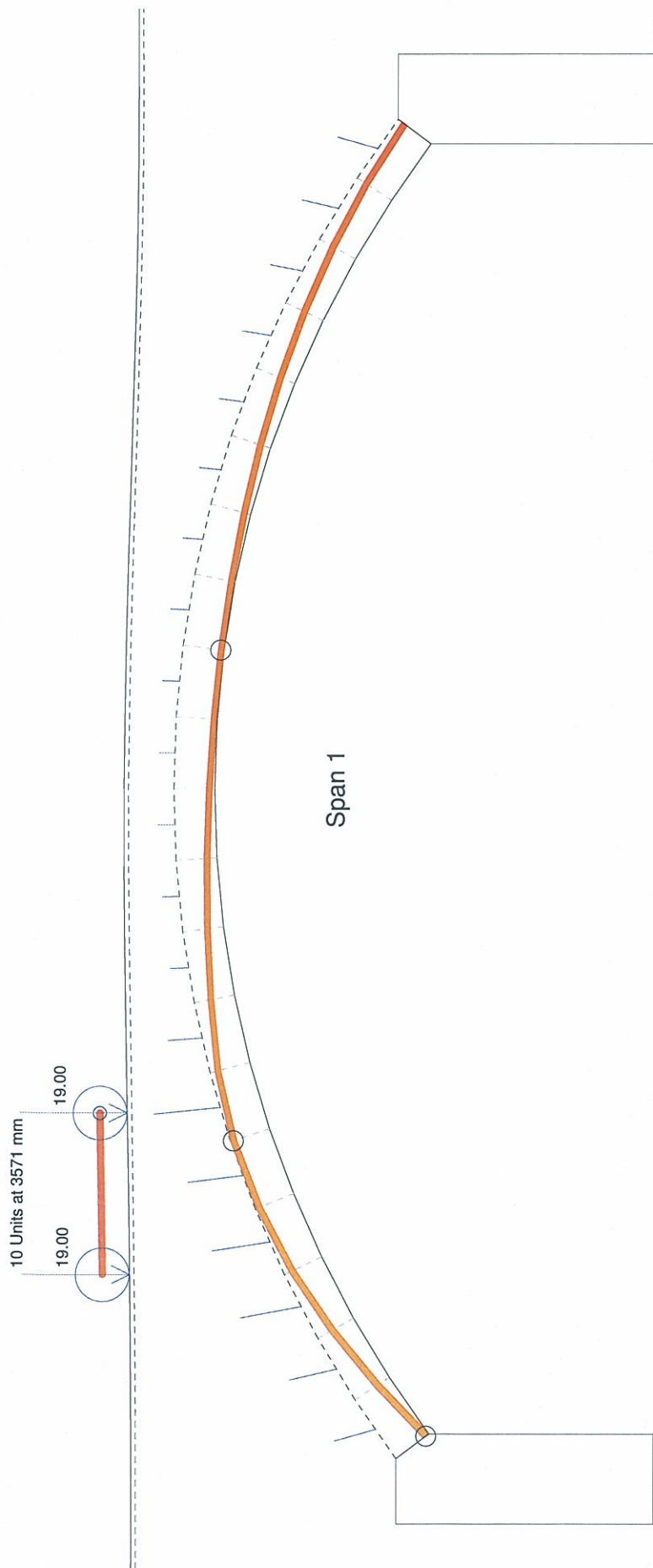
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# Melkington



gammaFI dead load: 1.00 10 Units @ 3571 [mm]

gammaFI superimposed: 1.00

gammaFI live load: 1.90

gammaF3 load effect: 1.00

gammaM material: 1.00

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NAME: Melkington

LOCATION: On the A698 between Coldstream and Berwick upon Twe

NUMBER: A698/01RY

Faber Maunsell

DATE: 18 March 2009

Printed on: Wednesday, March 18, 2009 15:12:16

## Appendix D: Inspection Photographs



Photo 1. North Elevation



Photo 2. South Elevation



Photo 3. East Abutment



Photo 4. West Abutment



Photo 5. Soffit Typical



Photo 6. Bridge deck surface





## FORM 'BA' (BRIDGES)

GC/TP0356

ELR/ Bridge No KLO/29

Appendix: 4

Issue: 1

Revision: A (Feb 1993)

**CERTIFICATION FOR ASSESSMENT CHECK**

**Assessment Group: -** Faber Maunsell (on behalf of Northumberland CC)  
First Floor  
One Trinity Gardens  
Quayside  
Newcastle upon Tyne  
NE1 2HF

**Bridge/Line Name: -** Redesmouth Bridge. A698/01RY  
Grid Ref: NT 867 408

**Category Of Check: -** 1

**ELR/Bridge No.: -** KLO/29

I certify that reasonable professional skill and care have been used in the assessment of the above structure with a view to securing that:

- (1) It has been assessed in accordance with the Approval in Principle (where appropriate) as recorded on Form AA approved on 16/10/2003
- (2) It has been checked for compliance with the following principal British Standards, Codes of Practice, BRB (Residuary) Limited Technical notes and Assessment standards.

List any departures from the above, and additional methods or criteria adopted, with reference and justification for their acceptance (commenting on the results if appropriate).

*A depth factor of 1.0 was used in the assessment and mortar loss accounted for in the barrel thickness in accordance with Table 3/5 of BA16/97, not 0.8 as stated in the AIP.*

**STATEMENT OF CAPACITY**

The bridge deck is capable of accommodating **Group 2 Fire Engine** assessment live loading and **5 units** of HB loading.

The substructures and foundations have been assessed qualitatively as adequate.

**Recommended Loading Restrictions**

3 tonnes

**Description of Structural Deficiencies and Recommended Strengthening**

Re-point arch barrel to increase capacity. This could increase the rating to 13 tonnes ALL and 10 units of HB loading

## FORM 'BA' (BRIDGES)

GC/TP0356

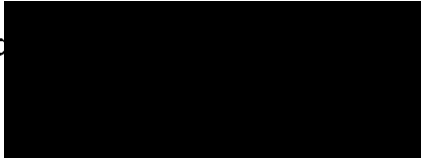
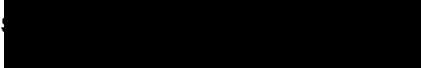
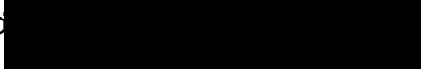
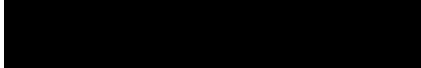
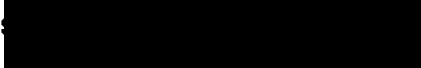
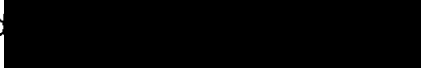
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ELR/ Bridge No KLO/29

Issue: 1

Revision: A (Feb 1993)

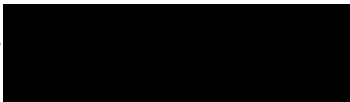
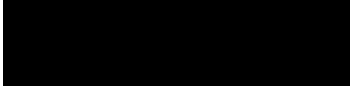
**CERTIFICATION FOR ASSESSMENT CHECK**Category 1

Signed  Title Engineer  
Name  Date 24-04-2009  
To be signed by the leader carrying out the assessment  
Signed  Title Senior Engineer  
Name  Date 24-04-09  
To be signed by the leader carrying out the check  
Signed  Title Regional Director  
Name  Date 24-04-2009

To be signed by a Director in the organisation responsible for the staff carrying out the assessment and check

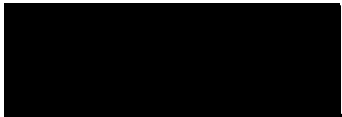
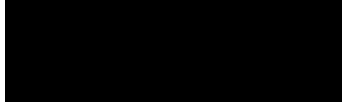
Acceptance by Reviewer

I accept this certificate as a record that the assessment and checking of the structure identified above have been carried out in accordance with the criteria given.

Signed  Title Structures Team Manager  
Northumberland County Council  
Name  Date 26/05/09

Acceptance by the Director Structure's

I accept this certificate as a record that the assessment and checking of the structure identified above have been carried out in accordance with the criteria given.

Signed  Title Director Structures  
Name  Date 4/8/2007



## FORM 'AA' (BRIDGES)

GC/TP0356

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Date: FEB 93

**APPROVAL IN PRINCIPLE FOR ASSESSMENT**

STRUCTURE/LINE NAME

Melkington Railway Bridge, A698/01RY  
Grid Ref: 386729E 640877N, see location plan in  
Appendix B

ELR/STRUCTURE NO.

KLO /29

**BRIEF DESCRIPTION OF EXISTING BRIDGE:****(a) Span Arrangement**

Single arch of skew span 14.4 metres between abutments with a skew of 40°.

**(b) Superstructure Type**

The arch barrel was constructed of bricks in a coursed helicoidal pattern. The spandrel walls were of small to medium sized rock faced coursed stone.

**(c) Substructure Type**

Construction of foundations is not known.

Abutment walls : small to medium sized coursed stone.

Wingwalls : walls run parallel to the highway and comprise small to medium sized rock faced coursed stone with buttresses.

The parapets were constructed of large sized rock faced coursed sandstone.

**(d) Details of any Special Features**

None

**ASSESSMENT CRITERIA****(a) Loadings and Speed**

Traffic speed to be used shall be 60 mph.

HA Loading shall be 40 tonnes assessment live load as detailed in BD 21/01

Footway Live Loading shall be Accidental wheel loading as given in BD 21/01 clause 5.35. The footway loading will be applied in accordance with BD 21/01 clause 5.36.

If bridge passes the 40 tonnes assessment, the number of sustainable HB units will be determined. HB loading shall be applied in accordance with BD 37/01 but using associated live loads as specified in BD 21/01

**FORM 'AA' (BRIDGES)****GC/TP0356**

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**APPROVAL IN PRINCIPLE FOR ASSESSMENT****(b) Codes to be used**

See Appendix A

In addition the following Railtrack Current Information Sheets will be referred to

19 Rigorous Arch Analysis – Application of Condition Factors

20 Assessment of Skew Arches

21 Single Span Arches  $h > d$ 

27 HB capacity from MEXE

**(c) Proposed Method of Structural Analysis**

Substructure and foundations

Qualitative assessment in accordance with BD21/01 and BA16/97.

Superstructure

The assessment will be carried out using the Modified MEXE method on the skew span dimensions.

**(d) Details of any Special Requirements**

Axle lift off effects need not be considered.

Centrifugal effects will not affect the assessment of the structure.

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**APPROVAL IN PRINCIPLE FOR ASSESSMENT****STRUCTURAL ASSESSMENT ENGINEER'S COMMENTS**

The bridge carries the A698 road from Coldstream to Berwick upon Tweed. The road is two lane single carriageway approximately 7.3m wide.

The bridge was inspected on the 15 February 2001 in fair weather. The scope of the survey was to inspect the visible and accessible parts of the bridge fabric access only available on foot and did not include for the removal of finishes, exposure of foundations or structural testing of materials.

The bridge was generally in a fair condition. The bricks were laid with 6 to 12.5mm joints. The arch barrel was 457mm (18") deep at the crown (as drg No CD/2252/5/3/1). There was water ingress underneath the verges with calcareous deposits. There was evidence of spalled bricks, however due to extensive soot deposits it was difficult to establish the extent. The depth of mortar missing was estimated at up to 100mm in various locations.

There was no evidence of separation of the arch rings. The spandrel walls showed no signs of bulging or tilting. The overall shape of the arch was good.

There was approx 350mm of standing water underneath the bridge.

**Factors for Modified MEXE Assessment**

Condition factor	$F_{CM} = 0.80$	0.1 reduction for general condition 0.1 reduction for salt and water ingress
Arch barrel factor	$F_b = 0.9$	Barrel comprised coursed bricks in a fair condition.
Fill Factor	$F_f = 0.7$	Fill material is unknown but the carriageway is in good condition with little rutting or depressions, therefore fill shall be assumed well compacted.
Width factor	$F_w = 0.9$	Joints vary between 6mm and 12.5mm.
Mortar factor	$F_{mo} = 0.9$	The mortar in the arch barrel was in poor condition.
Depth factor	$F_d = 0.8$	There is some mortar loss.

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**APPROVAL IN PRINCIPLE FOR ASSESSMENT**CIVIL ENGINEER'S COMMENTS

None.

BRB WORKS GROUP COMMENTS - IF APPLICABLE

## PROPOSED CATEGORY FOR INDEPENDENT CHECK:

SUPERSRUCTURE .....Category I.....

SUBSTRUCTURE ..... Not Applicable.....

NAME OF CHECKER SUGGESTED IF CAT 2 OR 3 .....N/A.....

CATEGORY 1

The above assessment, with amendments shown, is approved in principle:

SIGNED

TITLE

DATE

[Redacted Signature]  
Senior Civil Engineer  
16/10/2003

CATEGORY 2 AND 3

The above assessment, with amendments shown, is approved in principle:

SIGNED

TITLE

DATE

SIGNED

TITLE

DATE

## FORM 'AA' (BRIDGES)

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**APPROVAL IN PRINCIPLE FOR ASSESSMENT****APPENDIX A - List of relevant documents****SCHEDULE OF DESIGN AND ASSESSMENT DOCUMENTS RELATING TO  
BRITISH RAILWAYS BOARD BRIDGES AND STRUCTURES CARRYING  
HIGHWAYS**

(All documents are taken to include revisions current at date of this TAS).

**1. Department of Transport - Departmental Standards**

BD 02/02 Technical Approval of DTp Highway Structures on Motorways and Other Trunk Roads.

~~BD 12/95 Corrugated Steel Buried Structures.~~~~BD 21/01 The Assessment of Highway Bridges and Structures.~~~~BD 31/87 Buried Concrete Box Type Structures.~~~~BD 37/01 Loads for Highway Bridges.~~~~BD 44/95 The Assessment of Concrete Highway Bridges and Structures.~~~~BD 52/93 The Design of Highway Bridge Parapets.~~~~BD 56/96 The Assessment of Steel Highway Bridges and Structures.~~~~BD 61/96 The Assessment of Composite Highway Bridges and Structures.~~**2. Department of Transport - Department Advice Notes**~~BA 16/97 The Assessment of Highway Bridges and Structures.~~~~BA 37/92 Priority ranking of existing parapets.~~~~BA 39/93 Assessment of Reinforced Concrete Half joints.~~~~BA 44/96 Assessment of Concrete Highway Bridges and Structures.~~~~BA 51/95 The Assessment of Concrete Structures Affected by Steel Corrosion~~~~BA 52/94 The Assessment of Concrete Structures Affected by Alkali Silica  
Reaction~~~~BA 56/96 The Assessment of Steel Highway Bridges and Structures.~~~~BA 61/96 The Assessment of Composite Highway Bridges~~**3. Department of Transport - Technical Memoranda (Bridges)**~~BE 3/78 Reinforced Earth and Anchored Earth Retaining Walls and Bridges-  
Abutments for Embankments.~~~~BE 5/75 Rules for the Design and Use of Freyssinet Concrete Hinges in Highway  
Structures.~~~~BE 23 Shear Key Decks.~~**4. Miscellaneous**~~Guidance Note for the Assessment and Design of Unreinforced Masonry-  
Vehicle Parapets produced by the County Surveyor's Society Vol. 1-  
(First Edition - 1995).~~

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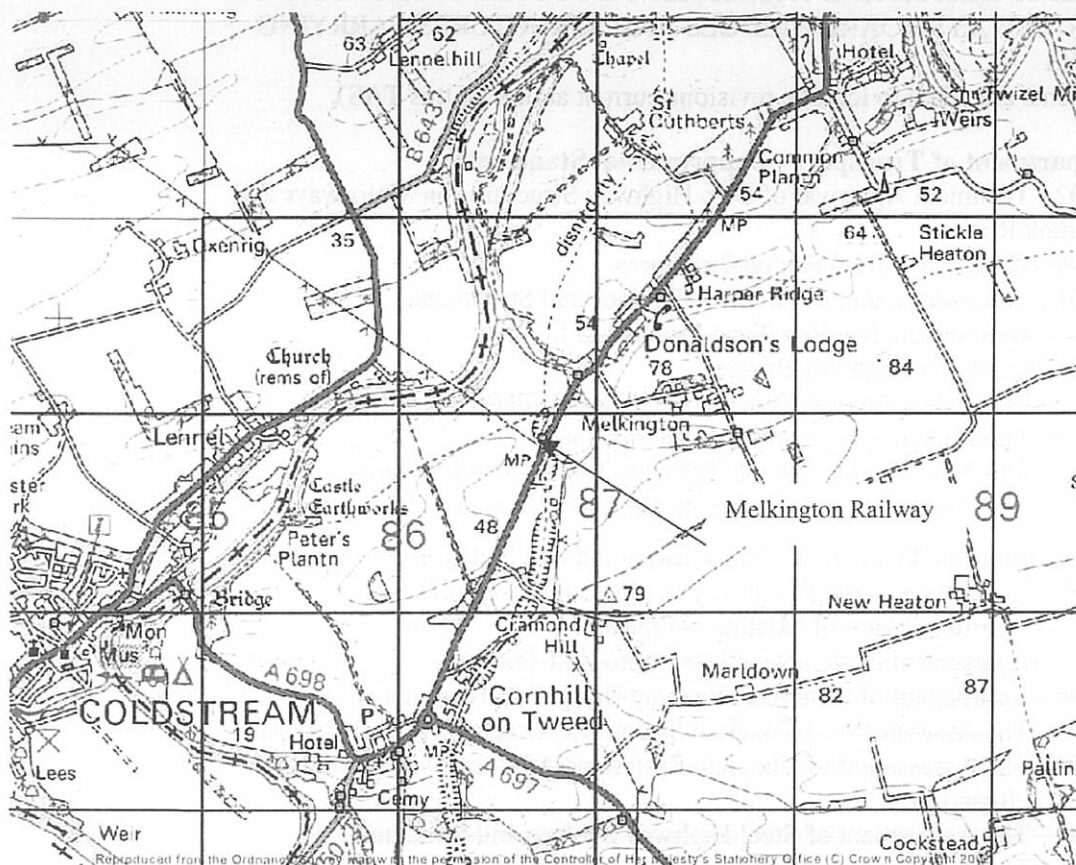
Issue: 1

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Date: FEB 93

## APPROVAL IN PRINCIPLE FOR ASSESSMENT

## APPENDIX B – LOCATION PLAN



**FORM 'AA' (BRIDGES)**

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**APPENDIX C – PHOTOGRAPHS**



Arch Barrel



South Elevation

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South Elevation