RICHMOND BRIDGE AND APPROACHES CONGESTION STUDY

STAGE 1 APPENDIX 2

BRIDGE INSPECTION AND STRUCTURAL ASSESSMENT

Prepared for				
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Prepared by				
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File name			
File location	Parvez Shah\Level 6\,Pod G\Octagon Parramatta		

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Date Dec 2011	Rev. No.	Comments	Approved by

This report must be read in its entirety, including all the Appendices, in order to interpret and adopt any of the recommendations made in this report for future maintenance and risk management of this bridge.

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EXECUTIVE SUMMARY

The Roads and Maritime Services (RMS) Project Development Manager (from Infrastructure Development) has made a request for a Level 3 inspection and load capacity assessment of the bridge over the Hawkesbury River at North Richmond (Bridge Number 429) in anticipation of future widening.

The existing bridge is 212.63 metres long and it consists of 13 spans. The sequence of the spans is 15.85 metres, eleven spans of 16.45 metres and a further span of 15.85 metres. The bridge was built in 1905 and widened on the downstream for a railway in 1927. The widening was converted to road deck in 1966. The original superstructure consists of a concrete arch and the existing widening consists of two arch shaped steel beams and reinforced concrete deck. The substructure consists of concrete piers and concrete headstocks.

The carriageway between kerbs is 8.53 metres wide and carries two traffic lanes. There is a footway at the upstream side. In addition, there is an 800 mm water main attached to the downstream side.

A Level 3 inspection was carried out in August 2011 and October 2011 by personnel from RTA's Bridge Engineering Branch supported by Sydney Roads Services. The overall bridge is in fair to good condition for its age.

Semi detailed analytical studies were carried out. Based on the analytical studies, the structural capacity of the bridge is adequate to carry two lanes of Higher Mass Limit (HML) General Access Vehicle (ST45.5) and HML Restricted Access Vehicle (BD68) in as good condition.

It is recommended that:

- The bridge is suitable to carry two lanes of HML ST45.5 and HML BD68 provided that the bridge is maintained in a reasonably good condition by implementing the necessary repair and monitoring regime.

- The bridge is suitable for widening at the downstream of the bridge as an independent structure to the existing structure. Widening of the bridge needs to be carried out in consultation with RMS New Design Section of Bridge Engineering

1 INTRODUCTION

The Roads and Maritime Services (RMS) Project Development Manager (from Infrastructure Development) has made a request for a Level 3 inspection and load capacity assessment of the bridge over the Hawkesbury River at North Richmond (Bridge Number 429) in anticipation of future widening.

A Level 3 inspection was carried out in August 2011 and October 2011 by personnel from RTA's Bridge Engineering Branch supported by Sydney Roads Services. Subsequent to the Level 3 inspection, analytical studies were carried out at RTA's Bridge Engineering Branch.

This report outlines the major findings from the Level 3 inspection and assessment. It also provides recommendations for widening and repair works need to be carried out in future maintenance and risk management strategies.

2 DESCRIPTION OF THE BRIDGE

The existing bridge is 212.63 metres long and it consists of 13 spans. The sequence of the spans is one of 15.85 metres, eleven of 16.45 metres and one of 15.85 metres. The original superstructure consists of a concrete arch and the existing widening consists of two arch shaped steel beams and 215 mm reinforced concrete deck. The concrete arch bridge was built in 1905 and the two steel arches were installed at down stream in 1927, which carried a railway loading till 1952. The deck above the steel arches was replaced with a reinforced concrete slab in 1966.

The substructure consists of concrete piers and concrete head stocks.

The carriageway between kerbs is 8.53m and carries two traffic lanes. There is a footway on upstream side and the width of the footway is 2.18 metres. In addition, there is an 800mm water main attached to the downstream side.

Refer to photos 1 to 12 of Appendix A (of this document) for more details.

3 SCOPE OF WORK

The main scope of work of these investigations was:

- To conduct a Level 3 inspection for the entire superstructure above water level to assess the condition of the bridge.
- To carry out analytical studies to assess the Rating Factors of the superstructure components in as good condition to carry the higher mass limit loads.
- To provide necessary recommendations for future widening, maintenance and risk management strategies.

4 STRUCTURAL INSPECTION

4.1 Inspection Programme

The Level 3 structural inspection was carried out during the nights of 11 August 2011 and 15 August 2011. A day time inspection was carried out on 19 August 2011 and 20 October 2011 by the following personnel:

1. Anu Gnanasothy – Project Engineer, Bridge Engineering.
2. Peter Ton – Bridge Load Testing Engineer, Bridge Engineer.
3. Hamid Fatemi – Materials Engineer/Surveillance Officer, Bridge Engineering.
4. Jeff Atkins – Concrete Inspector / Bridge Support Officer, Bridge Engineering.

Most of the below-deck elements were inspected during the night from a Mobile underbridge Elevated Work Platform (MOBI) with one lane closure.

On the night of the 11th August 2011 the under deck of spans 9 to 12 of the bridge were inspected by Anu and Jeff. On the night of the 15th August the under deck of spans 8 to 5 of the bridge weres inspected by Peter, Jeff and Hamid.

An above deck inspection was carried out on 19th August 2011 by Anu and Jeff from the upstream walkway with no lane closure. On the same day, the under deck of spans 1 to 4 and span 13 were inspected from the ground without any support work.

Subsequently, span 13 was inspected with a stepped ladder closer to the mid span of the concrete arch on 20 October 2011, and the piers were inspected from boat on the same day.

4.2 Limitation of Level 3 Inspection

These Level 3 inspections were limited only to visual inspection. The spans 1 and 5 to 12 were inspected at closer range.

Spans 2 to 4 and span 13 were inspected at distance from the ground. These spans were unable to be access from the MOBI due to the vegetation (trees) adjacent to these spans at the downstream side, and the walkway at upstream side. Span 13 was inspected only along the mid span due to uneven ground.

Pier columns were not accessible from the MOBI and the pier columns were unable to be inspected during the night inspection.

No material testing and no underwater inspections were carried out during the period of this Level 3 inspection.

5 FINDINGS FROM THE LEVEL 3 INSPECTION & REPAIRS

5.1 Below Deck

5.1.1 Concrete Arch

Some of the concrete arches have flexural cracking (transverse cracking) at the apex. Span 13 has the largest crack compared with all the other spans. Span 13 has been monitored since 2002, as per a previous L2 inspection report. There were crack observed in the telltales (crack monitoring glass) on span 13. New telltales were installed in October 2011 on span 13 to monitor these cracks. These cracks in span13 might have been due to a minor movement in abutment B.

Refer Appendix B and Appendix A of this document (Photos from 19 to 30) for more details.

Suggested Plan:

- *Monitor the telltales on span 13 in a regular basis, importantly during construction of any widening works.*
- *Repair concrete spall and monitor cracks annually in all the other spans.*

5.1.2 Concrete Headstock and Piers

All of the pier headstocks have a crack at mid span. However, the depth of the headstock is 3.3m and the span of the headstock is 3.35m, which would suggest that a flexural crack is possibly not from live load. This may be due to minor movement of pier foundation over many years. It is not clear that the piers and headstocks have reinforcement, as per the drawings. In addition, all the piers and headstocks have random thermal cracks.

The original drainage system (75mm earthenware pipes) within the pier / headstock has failed in the majority of piers, evidenced by water marks originating from inside piers. This water could only be coming from the drainage system. The original system is supposed to take water entering from the roadway into the rib arch system and drain it away through the 75mm diameter pipes located at the third points of the piers. Most of those outlets are still working but leakages within the system allow water to infiltrate the headstock. This water percolates through the headstock and comes out at various crack locations. The water running down the face of an old concrete structure will lead to permanent damage. This water ingress into the head stocks will be the ultimate downfall of the bridge in long term.

Restoring this drainage system is costly. It is also hard to determine if it would improve the life span of the structure. There is no rust stain in the water which indicates that there is no reinforcement being corroded.

Refer Appendix B and Appendix A of this document (Photos from 31 to 48) for more details.

Suggested Plan:

- *Extend the existing drainage water outlets, so that runoff is removed from the face of the headstocks structure.*
- *Any drainage (scupper pipes) that are active should also have their outlets directed away from any concrete or steel members.*

5.1.3 Steel Beams

Minor paint removal was observed in various locations. There were few corroded rivets found. Bird droppings and a nest was found on some of the steel bracing and steel beam connections. This may lead to corrosion on these beams and bracings in the future.

Movement at the span 9 steel beam step joint was observed. The expansion joint above the deck at span 9 was cracking. This may be due to this movement in the steel step joint.

This bridge was subjected to flooding in the 1980s and there was some debris stuck in between the steel beam bracings.

Refer Appendix B and Appendix A of this document (Photos from 49 to 66) for more details.

Suggested Plan:

- *Remove bird droppings and debris from the steel beam and bracings.*
- *Monitor all the step joints in spans 5 and 9.*

5.2 Above Deck

The roadway surface is generally without any necessary repairs. However the longitudinal joint currently along the centreline of the road does have a differential level that is not noticeable due to the painted centreline disguising. The roadway is cracking along the expansion joints,

Refer Appendix B and Appendix A of this document (Photos from 67 to 78) for more details.

Suggested Plan:

- *Restore or repair the longitudinal joint*
- *Repair the roadway cracking along the expansion joints*

6 ANALYTICAL ASSESSMENT

6.1 Assumptions

6.1.1 Preliminary Assessment:

The existing bridge was widened in 1927 to carry a railway loading. The 1927 widening was converted to road in 1966. The structural effect from the 1927 railway loading (Hall class locomotive -1177kN) is more than the design loading used in 1960s (MS 18 Design vehicle load and MS 18 lane load). Hence, the bridge is adequate for the design loading used in 1960s.

6.1.2 Analytical Assessment

The following assumptions are made:

- The characteristic compressive strength of concrete is assumed as 20Mpa for concrete arch, headstock and piers.
- The stress in reinforcing steel is assumed as 230 MPa.
- The yield stress in steel members is assumed as 230 MPa.

- The bridge is rated for 2-lanes of traffic loading one lane on concrete arch and the other on steel arch girders, since the longitudinal joint for steel arch girder deck and concrete arch deck runs along the roadway centre median.
- The Dynamic Load allowance of 30% is used.

6.2 Loading

The vehicle loads used in the assessment are as follows.

- HML General Access Vehicle – ST45.5
- HML Restricted Access Vehicle – BD68
- MS 18 Design Vehicle and MS 18 lane loading as per Australian Bridge Design Code– For comparison purposes only.

These vehicle load configurations are given under Appendix C of this document.

6.3 Structural Assessment

The structural analysis was carried out using computer modelling and analytical methods in accordance with the AS 5100 Bridge Design Code.

6.3.1 Preliminary Assessment

A one dimensional beam model was set up in *ACES* (structural software) to compare design with the proposed vehicle loading. The bridge is rated based on condition as in 1966 for the super structure.

The maximum moment and shear imposed by the proposed vehicle load is compared with the moment and shear imposed by 1960s' design loadings.

It is found that the structural effect on the super structure due to ST 45.5 and BD 68 is comparable with1960s design loading, on all the spans.

6.3.2 Analytical Assessment

Concrete Arch

A two dimensional plane frame model was set up in *Microstran* (structural software) for 8 spans for concrete arch. The load from 3m width was considered to rate the concrete arch for a single lane.

The rating factor of concrete arch for S45.5 loading is 0.9

The rating factor of concrete arch for BD68 loading is 0.9

Steel Beam

A one dimensional beam model was set up in ACES (structural software) for 13 spans for steel beams. Since there is only one lane on two steel beams and the spacing between the steel beams is 1.98m, it was assumed that 60% of the live load is carried by one Steel beam.

The rating factor of steel beam for S45.5 loading is 0.9

The rating factor of steel beam for BD68 loading is 0.9

All these members were rated based on Ultimate Limit state only. The recommended Rating Factor is 1.0 for all members with the Live Load Factor of 2.0.

6.4 Results

The rating factor both ST45.5 and BD68 loading is 0.9. Since this modelling approach is conservative, the bridge is adequate to carry 2 lanes of ST 45.5 and BD68 in as good condition.

7 PROPOSAL FOR WIDENING

Widening of the bridge should be carried out on the downstream side of the bridge adjacent to the steel beam spans as per bridge policy for widening.

The water main adjacent to the steel beams needs relocation, depending on New Design Section's widening proposal. The horizontal distance between centres of the water main and to the end of the bridge deck is only 1.07m, as per drawings and the water main is attached to the headstock.

Widening needs to be independent of the existing structure. The load of the widening should not shared with the any part of the existing structure without additional investigation by New Design Section.

Widening of the bridge needs to be carried out by consulting New Design Section

8 CONCLUSION

8.1 Assessment Findings

The rating factor for both ST45.5 and BD68 loading is 0.9. Since this modelling approach is conservative, the bridge is adequate to carry 2 lanes of ST 45.5 and BD68 in as good condition.

8.2 Inspection findings

Concrete arches are in fair to good condition with transverse cracking at the apex. Span 13 was the worst of all the spans. The old 2002 crack monitoring regime was examined and found that glass had cracked in two locations and two had failed glue joints. Three new glass telltales were glued over the crack on 20/10/2011. These should be checked monthly to determine if the crack is getting wider.

The steel beams are in good condition except minor paint removal. The rivet heads are in fair to good condition. At some locations surface corrosion has started at the rivet head plate interface and will lead to pitting and section loss over the time, if left without any adequate maintenance.

8.3 Widening Proposal

The bridge is suitable for widening on the downstream of the bridge as an independent structure to the existing structure. The water main at the down stream side needs relocation.

9 RECOMMENDATIONS

It is recommended that the bridge is suitable to carry two lanes of HML General Access Vehicle (ST45.5) and HML Restricted Access Vehicle (BD68) provided that the bridge is maintained in a reasonably good condition by implementing the necessary repair and monitoring regime.

The bridge is suitable for widening at the downstream of the bridge as an independent structure to the existing structure. Widening of the bridge needs to be carried out in consultation with New Design Section of Bridge Engineering.

Appendix A - Photographs Of Bridge Over Hawkesbury River At North Richmond

General

Photo 1 – (B-2) At the right bridge	**Photo 2 – (B-1) 001 Abutment A approach from Richmond**
	

Photo 3 – (B-51) Upstream (US)Elevation	**Photo 4 – (B-84) Downstream (DS) Elevation from Abutment B**
	

Photo 5 – (B-4) Pedestrian footpath Upstream side	**Photo 6 –(B-37)Downstream service pipe**
	

Photo 7 – (B-67) Span 1 Pier 1 steel arch	Photo 8 – (B-58) Span 2 steel arch at Pier 2
	

Photo 9 – (B-56) Abutment A	Photo 10 – (B-72) Abutment B from Upstream
	

Photo 11 – (B-74) Span 12 Pier 12 Upstream	Photo 12– (B-66) Span 1- Pier 1
	
Pier General view	**Service pipe attached with concrete arch, running between concrete arch and steel beam**

Elevated Work Platform

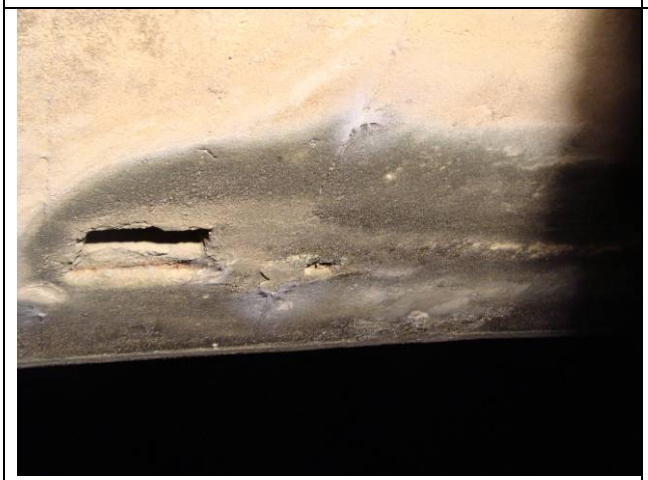
Photo 13 –(A-2) Inspection unit-MOBI	Photo 14 – (A-99) MOBI-Extended for inspection
	
Photo 15-(C-1) Ladder-Span 13	**Photo 16(C-6) Inspecting from Ladder**
	
Photo 17 –	**Photo 18– Similar Boat used for checking piers**
Intentionally Left Blank	
	(This photo was not taken at Richmond Bridge (BN 429) site)

Below Deck
Super Structure-Concrete Arch

Photo 19– (B-86) Span 13 cracking at concrete arch-	**Photo 20 – (B-87) Span 13 telltale to crack in arch**
	
Photo 21 – (C-5)Span13 - 3mm Crack	**Photo 22 – (C-7) Span13 - 3mm crack**
	
Old Tell tale- cracked	**Old Tell tale- cracked**

Photo 23 – (C-8) Sp13- 3mm Crack tell- tale cracked- closer views	**Photo 24 – (C-10) Span13- 3mm Crack- old tell-tale cracked**
	

Photo 25 –(C-013) Span4 deck slab middle- similar Arch Crack in span 5	Photo 26 –(B82) Span 13 close Pier12 water through deck
	
Photo 27 – (A-52) Span 10 spall at Upstream edge of arch	**Photo 28-(A-64)Span 9 concrete arch minor cracking**
	

Photo 29 –(A-65) Span 9 Upstream old repair failing with exposed reinforcement	Photo 30-(C-36)-Span 13-new tell tale-installed for crack monitoring
	

Below Deck –Substructure

Photo 31 – (C-15) -Span 6 Pier6	Photo 32 – (B-39) Span 4 Pier4 Downstream column old strengthening
	
Photo 33– (B-40)Span 5 Pier 5 & Pier 6 column2 - crack at pier construction joint	**Photo 34-(B-43)Span 4 Pier 4 column 1 Upstream crack at joint**
	

Photo 35 – (B-49) span 3 pier 2 Upstream column 1- similar crack	Photo 36 – (C-24) Span11-Pier12-crack pattern similar in most piers
	

Photo 37 – (C-41) Pier 2-checking for reinforcement	**Photo 38 – (C-42) Pier 2-Cover meter**

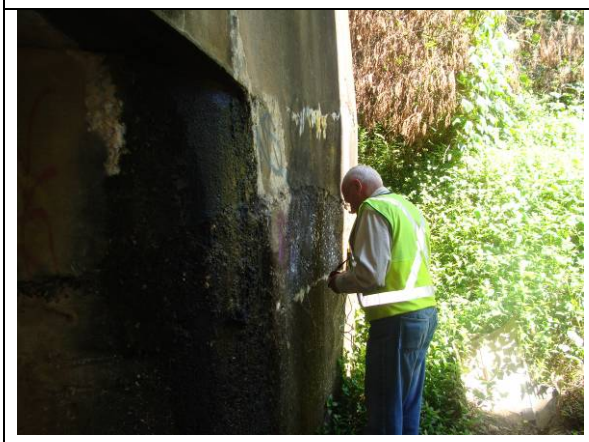



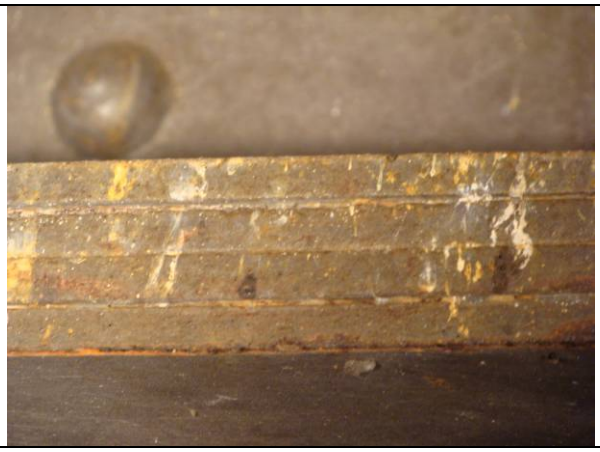
Photo 39 – (C-37) –Abutment B Downstream crack-suspect movement	**Photo 40 – (C-38) Abutment B Downstream crack suspect movement**
	
Photo 41 – (C-39) Abutment B Upstream-crack suspect movement	**Photo 42 – (C-40) Abutment B middle crack suspect movement**
	

Photo 43 – (B-42) Span 4 Pier 4 crack at mid span headstock	**Photo 44 – (B-46) Span 3 Pier3 crack at Headstock**
	
Photo 45 – (A-38) Span 4 view arch	**Photo 46 – (C-19) Span10-Pier9 Headstock crack**
	
Photo 47 – (A-25) Span 11 Pier10 drainage system failure	**Photo 48 – (A-27) Span11 construction joint at top pier 10**
	

Below Deck-Superstructure –Steel Arch

Photo 49 – (B-67) Below Deck-Superstructure - Span 1 Pier 1 steel arch	**Photo 50 – (B-57) Span 2 steel arch**
	
Photo 51 – (B-64) Abutment A steel	**Photo 52 – (B-66) Span 1 Pier 1 concrete arch**
	
Photo 53 – (A-8)Span 12- steel beam web -minor corrosion	**Photo 54 – (A-5)Span 12 Pier 11 Span1 Corrosion at hole in the stiffeners**
	

Photo 55 – (A-15)Widening adjacent Pier 12	Photo 56 – (A-16) P12 support –with birds
	
Photo 57 – (A-18) steel arch –Bird dropping at bottom flange	**Photo 58 – (A-55) Span 10- Down Stream debris stuck in the steel beam**
	
Photo 59 – (A-77) Span 8 - hole at beam stiffener	**Photo 60 – (A-78) Span 8 abrasion and corrosion at flange**
	

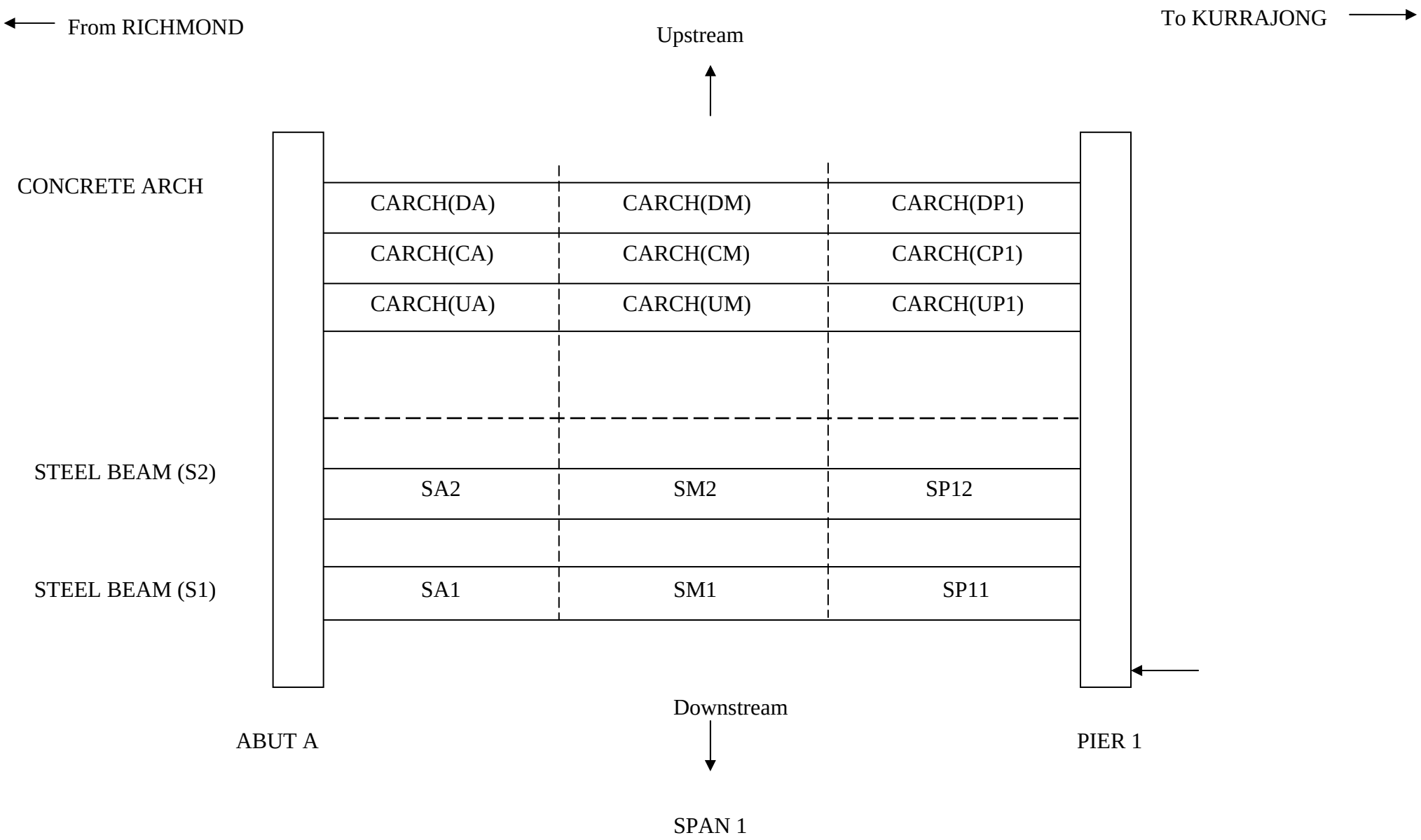
Photo 61 – (A-87) Pier 6 Steel Beam corroded k nut and also loose.	**Photo 62 – (A-90) Span 7 -4 plates at bottom flange**
	
Photo 63 – (A-58) Span 9 Suspension joint- deck movement joint	**Photo 64 – (A-103) suspension span 5**
	
Photo 65 – (A-80) Span 8 bearing condition	**Photo 66 – (B-69) Span 1 Pier1 S1 bearing Up Stream**
	
Good condition	**Good condition**

Above Deck

Photo 67 – (B-3) Abutment A road joint	**Photo 68 – (B-5) Span 1 longitudinal road joint**
	
Photo 69 – (B-10) Span 5 expansion joint	**Photo 70 – (B-16) Span 9 expansion joint**
	
Photo 71 – (B-29) Abutment B road joint	**Photo 72– (B-89)Abutment B road joint**
	
	Closer view

Photo 73– (B-24)Span 9 crack at ac Upstream	**Photo 74 – (B-15) Span 7 crack at ac Upstream**
	
Photo 75 – (B-26) Span 11 ac failure	**Photo 76 – (B-7) DS kerb repair**
	
Photo 77 – (B-9) Span 3 footpath minor trip hazard	**Photo 78– (B-8) 008 Footpath railing**
	

Appendix B – Detailed Inspection Report


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
ABUT A
PIER 1
SPAN 1

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Concrete Arch	Date:	19/08/2011
Span 1									

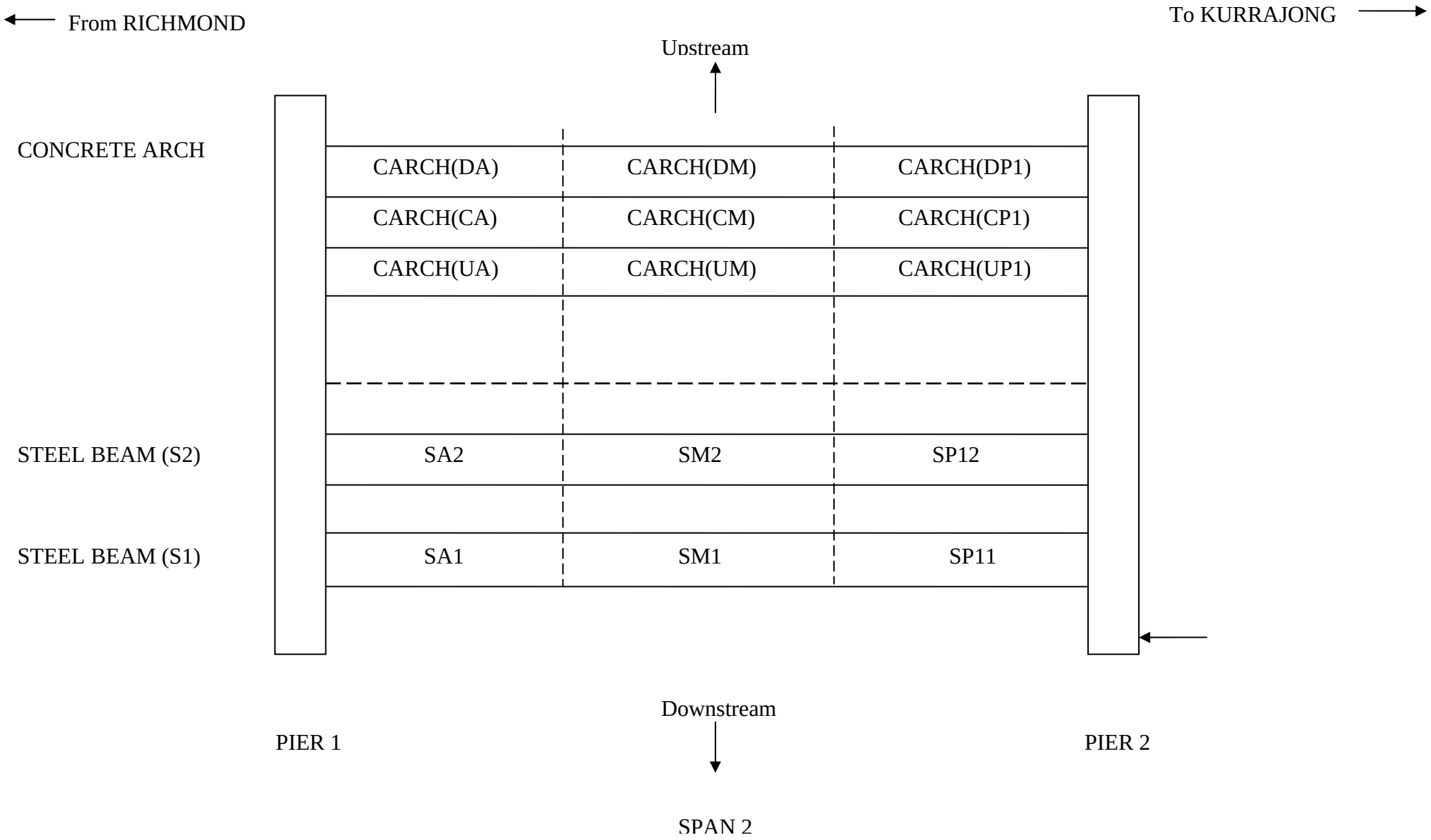
					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SA1		G	G	G	1	Nil	Arch beams starting to show breakdown in paint.	B64
			SM1		G	G	G	1	Nil	Ditto	B63
			SP11		G	G	G	1	Nil	Ditto	
		S2	SA2		G	G	G	1	Nil	Ditto	
			SM2		G	G	G	1	Nil	Ditto	
			SP12		G	G	G	1	Nil	Ditto	
	BRACING	S1			G	G	G	1	Nil	Ditto	B67
		S2			G	G	G	1	Nil	Ditto	B67
	CONCRETE ARCH	CARCH(D)	DA				G	1	N/A	CARCH appears to have minor cracking to exposed edges only.	B62
			DM				G	1	N/A	CARCH no cracking visible from ground level.	B61
			DP1				G	1	N/A	CARCH appears to have minor cracking to exposed edges only.	B60
		CARCH(M)	CA				G	1	N/A	Ditto	B62
			CM				G	1	N/A	CARCH no cracking visible from ground level.	B61
			CP1				G	1	N/A	CARCH appears to have minor cracking to exposed edges only.	B60
		CARCH(U)	UA				G	1	N/A	Ditto.	B62
			UM				G	1	N/A	CARCH no cracking visible from ground level.	B61
			UP1				G	1	N/A	CARCH appears to have minor cracking to exposed edges only.	B60
	BEARINGS	ABUT A	HS	US	F		G	2	Nil	Steel work requires cleanup and minor remedial work to paintwork.	B64
				DS	F		G	2	Nil	Steel work requires minor remedial work to paint protection.	
			AB	US	F		G	2	Nil	CARCH no cracking visible from ground level.	B56
				DS	F		G	2	Nil	Ditto	B56
		PIER 1	HS	US	F		G	2	Nil	Steel work requires minor remedial work to paint protection.	B68
				DS	F		G	2	Nil	Ditto	B69
			COL	US	F		G	2	Nil	Concrete columns sound.	
				DS	F		G	2	Nil	Ditto	
	DECK SLAB				G		G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	
	ABUT A						G	3	N/A	No significant cracking visible.	B056

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Concrete Arch	Date:	19/08/2011
Span 1									

Location	Member	Section	Element		Condition: Paint	Condition: Joint	Condition: Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 1						G	4	N/A	Typ surface cracking to rendered surface, not significant.	B060
ABOVE DECK	DECK JOINTS	ABUT A					F	3	Nil	No physical joint visible under AC, Longitudinal c/l joint uneven.	B001, B003
											B005
		PIER 1									
	HANDRAILS & POSTS		US		F		G	4	Nil	Barrier rails mounted on kerbs Fair. Handrails to footpath Fair, corroding wire mesh and rails.	B004, B008
			DS		F		G	4	Nil	Barrier rails mounted to kerbs Fair paint. Handrails has corroding wire mesh.	B006, B007
	WEARING SURFACE						G	4	N/A	AC Good.	B006
											B007

COMMENTS

Footpath has no broken slabs. Photo B004, B008.


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 1
PIER 2
SPAN 2

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & Steel arch.	Date:	19/8/2011
Span 2									

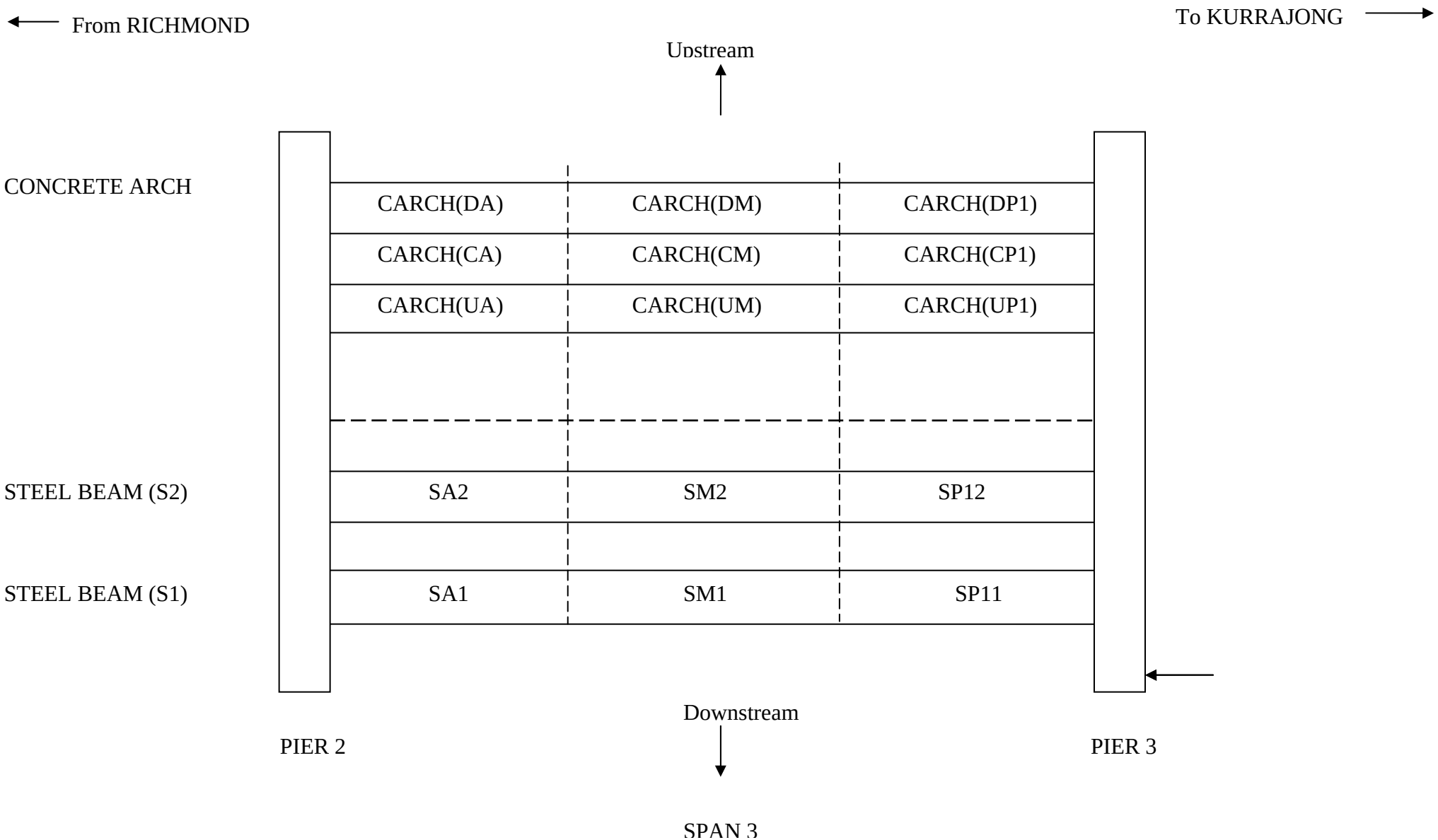
					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP1			G	G	1	Nil	Arch beams starting to show breakdown in paint protection system.	
			SM2			G	G	1	Nil	Ditto	B057
			SP21			G	G	1	Nil	Ditto	B058
		S2	SP1			G	G	1	Nil	Ditto	
			SM2				G	1	Nil	Ditto	
			SP2				G	1	Nil	Ditto	
	BRACING	S1					G	1	Nil	Arch bracing starting to show breakdown in paint protection.	
		S2					G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DP1				G			CARCH appears to have minor cracking to exposed edges only	
			DM				G			CARCH no cracking visible from ground level.	B055
			DP2				G			CARCH appears to have minor cracking to exposed edges only	
		CARCH(M)	CP1				G			Ditto	
			CM				G			CARCH no cracking visible from ground level.	B055
			CP2				G			CARCH appears to have minor cracking to exposed edges only	
		CARCH(U)	UP1				G			Ditto	
			UM				G			CARCH no cracking visible from ground level.	B055
			UP2				G			CARCH appears to have minor cracking to exposed edges only	
	BEARINGS	PIER 1	HS	US						Bearings no visible issues.	B059
				DS							
			AB	US						No concrete bearings.	
				DS							
		PIER 2	HS	US						Bearings no visible issues.	
				DS							
			COL	US						Concrete cols sound.	
				DS							
	DECK SLAB						G			Deck slab between archs appears sound, no visible cracks.	
	PIER 1						G			Typ. minor crack to mid span, considered non flexural plus others.	B060

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & Steel arch.	Date:	19/8/2011
Span 2									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 2						G			Typ. minor crack to mid span, considered non flexural, plus others.	B054
ABOVE DECK	DECK JOINTS	PIER 1					G			No joints visible in AC	
		PIER 2					G			No joints visible in AC	
	HANDRAILS & POSTS		US				F			Barrier rails mounted on kerb Fair paint. Handrails to footpath Fair , corroding wire mesh and rails.	
			DS				F			Barrier rails mounted on kerb Fair paint. Handrails has corroding wire mesh.	
	WEARING SURFACE						G			AC Good	

COMMENTS

Footpath has no broken slabs.


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 2
PIER 3
SPAN 3

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch.	Date:	19/08/2011
Span 3									

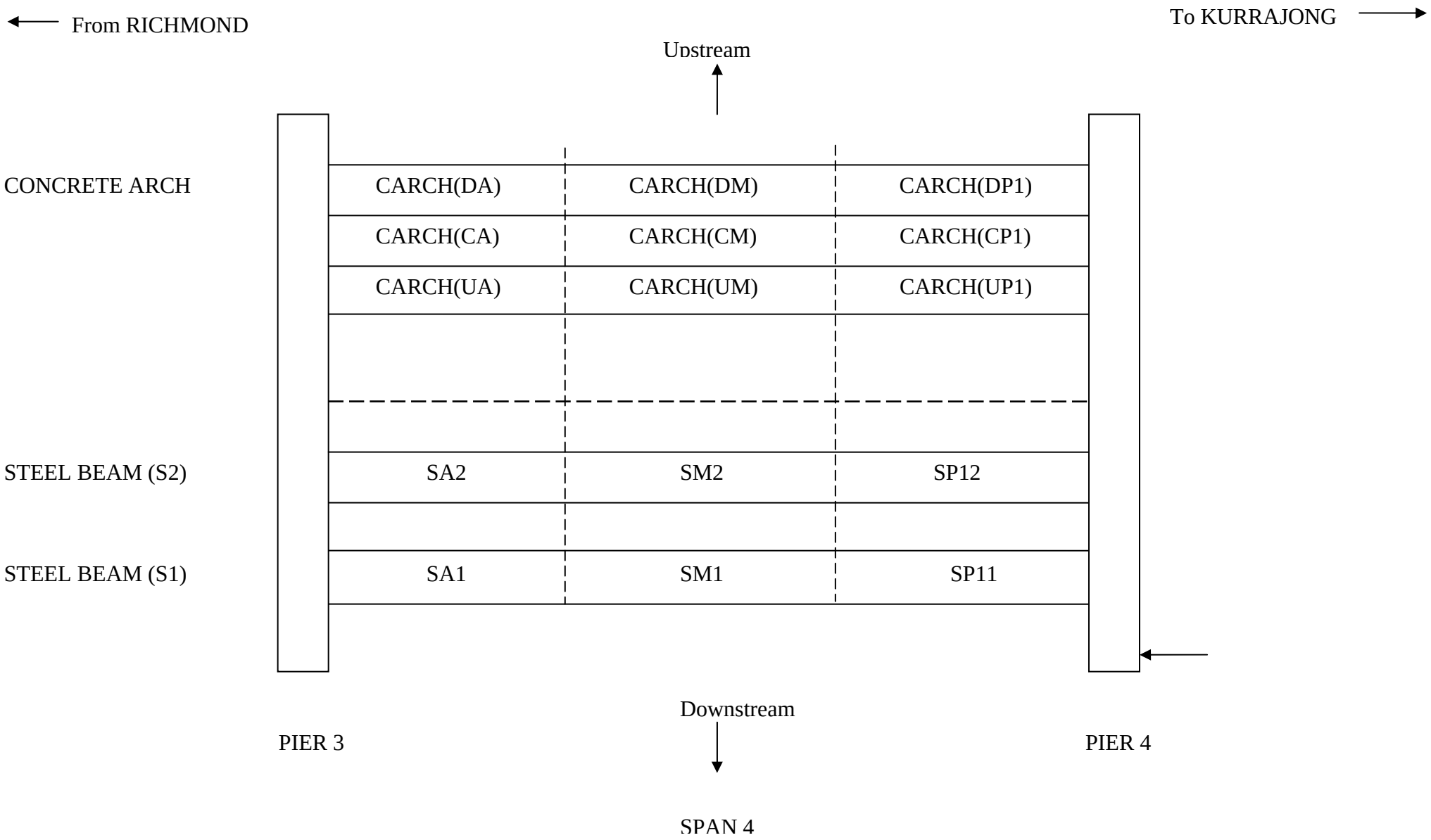
					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP2		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	
			SM1		F	G	G	1	Nil	Ditto	
			SP3		F	G	G	1	Nil	Ditto	
		S2	SP2		F	G	G	1	Nil	Ditto	
			SM2		F	G	G	1	Nil	Ditto	
			SP3		F	G	G	1	Nil	Ditto	
	BRACING	S1			F		G	1	Nil	Arch bracing starting to show breakdown in paint.	
		S2			F		G	1	Nil	Arch bracing starting to show breakdown in paint.	
	CONCRETE ARCH	CARCH(D)	DP2				G	1	N/A	CARCH appears too have minor cracking to exposed edges only.	
			DM				G	1	N/A	CARCH no cracking visible from ground level.	
			DP3				G	1	N/A	CARCH appears too have minor cracking to exposed edges only.	
		CARCH(M)	CP2				G	1	N/A	Dito	
			CM				G	1	N/A	CARCH no cracking visible from ground level.	
			CP3				G	1	N/A	CARCH appears too have minor cracking to exposed edges only.	
		CARCH(U)	UP2				G	1	N/A	Ditto	
			UM				G	1	N/A	CARCH no cracking visible from ground level.	
			UP3				G	1	N/A	CARCH appears too have minor cracking to exposed edges only.	
	BEARINGS	PIER 2	HS	US	F		G	2	Nil	Steelwork requires cleanup and minor remedial work to paintwork.	
				DS	F		G	2	Nil	Ditto	
			AB	US	F		G	2	N/A	Concrete sound.	
				DS	F		G	2	N/A	Ditto	
		PIER 3	HS	US	F		G	2	Nil	Steelwork requires cleanup and minor remedial work to paintwork.	
				DS	F		G	2	Nil	Ditto	
			COL	US	F		G	2	N/A	Concrete sound.	
				DS	F		G	2	N/A	Ditto	
	DECK SLAB						G	2	N/A	Deck slab between steel archs appears sound no visible cracks from grnd .	
	PIER 2						G	2	N/A	Concrete pier and cols sound, having minor surface cracking plus one major old crack.	B053

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch.	Date:	19/08/2011
Span 3									

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 3						G	2	N/A	Concrete pier and cols sound, having minor surface cracking.	
ABOVE DECK	DECK JOINTS	PIER 2					G	4	N/A	No physical joint visible under AC.	
		PIER 3					G	4	N.A	No physical joint visible under AC.	
	HANDRAILS & POSTS		US				F	4	Nil	Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4	Nil	Barrier rails mounted to kerb Fair. Handrails has corroding wire mesh.	
	WEARING SURFACE						G	4	N/A	AC Good.	

COMMENTS

Footpath has no broken slabs however has one minor trip hazard in span 3. Photo B009


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 3
PIER 4
SPAN 4

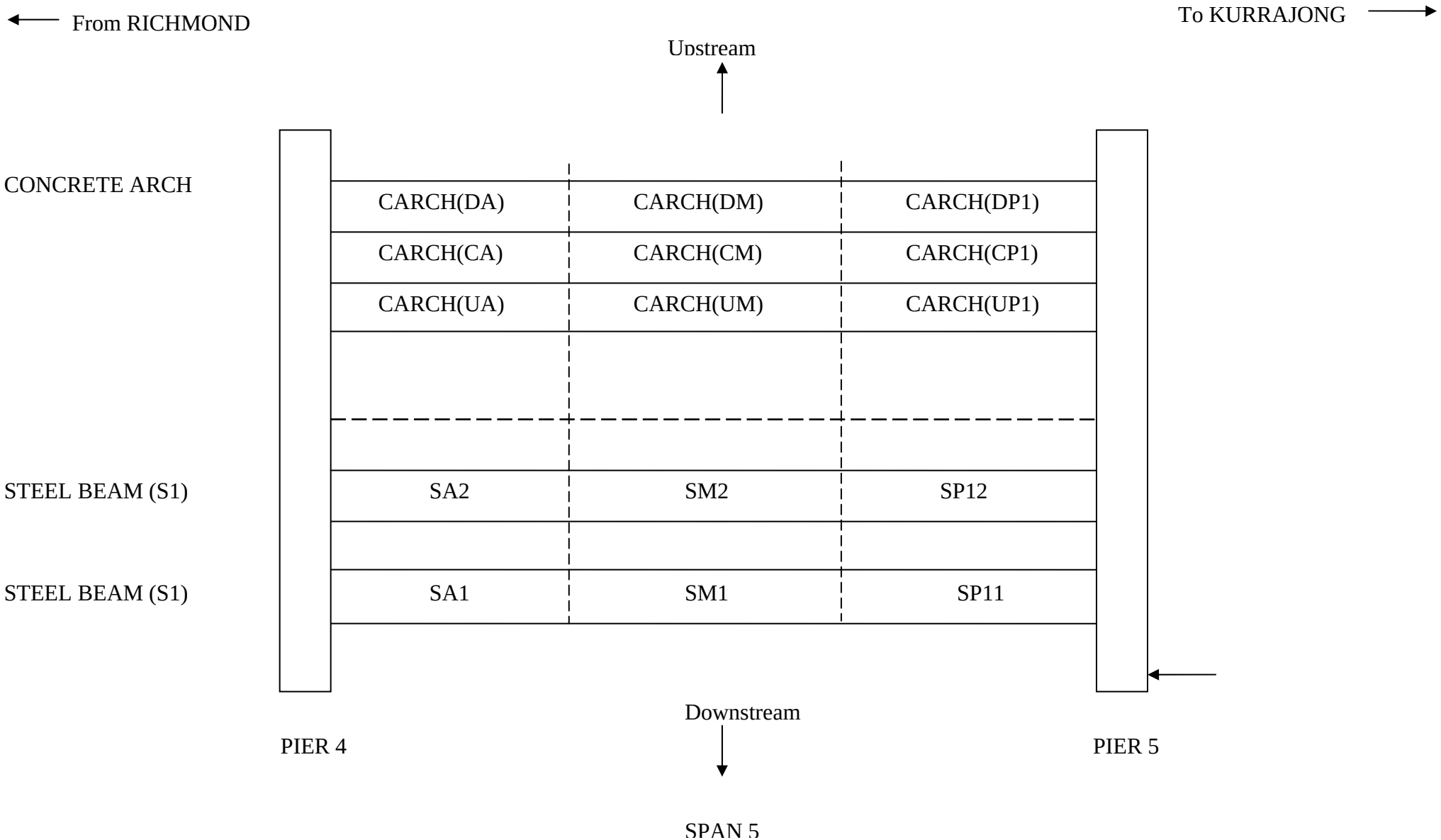
Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch.	Date:	19/08/2011
Span 4									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SA1		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	
			SM1		F	G	G	1	Nil	Ditto	
			SP11		F	G	G	1	Nil	Ditto	
		S2	SA2		F	G	G	1	Nil	Ditto	
			SM2		F	G	G	1	Nil	Ditto	
			SP12		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DA				G	1	N/A	CARCH has cracking to uptream edge.	
			DM				G	1	N/A	CARCH has an old crack extending from U/S to D/S midspan.	C13 C14
			DP1				G	1	N/A	CARCH has minor cracking to edge.	
		CARCH(M)	CA				G	1	N/A	CARCH has cracking to uptream edge.	
			CM				G	1	N/A	CARCH has an old crack extending from U/S to D/S midspan.	B42 C14
			CP1				G	1	N/A	CARCH has minor cracking to edge.	
		CARCH(U)	UA				G	1	N/A	CARCH has cracking to uptream edge.	
			UM				G	1	N/A	CARCH has an old crack extending from U/S to D/S midspan.	B41 C14
			UP1				G	1	N/A	CARCH has minor cracking to edge.	
	BEARINGS	PIER 3	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 4	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.	
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	
	PIER 3						G	3	N/A	Concrete pier and cols sound, having minor surface cracking	
					Condition						

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch.	Date:	19/08/2011
Span 4									

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 4						G	3	N/A	Concrete pier and cols sound, having minor surface cracking	
ABOVE DECK	DECK JOINTS	PIER 3					F	4	N/A	Expansion joint and crack to AC.	B011-B014
		PIER 4					F	4	N/A	No joint visible due to AC.	
	HANDRAILS & POSTS		US				F	4	Nil	Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4	Nil	Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4	N/A	AC Good	

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S1)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 4
PIER 5
SPAN 5

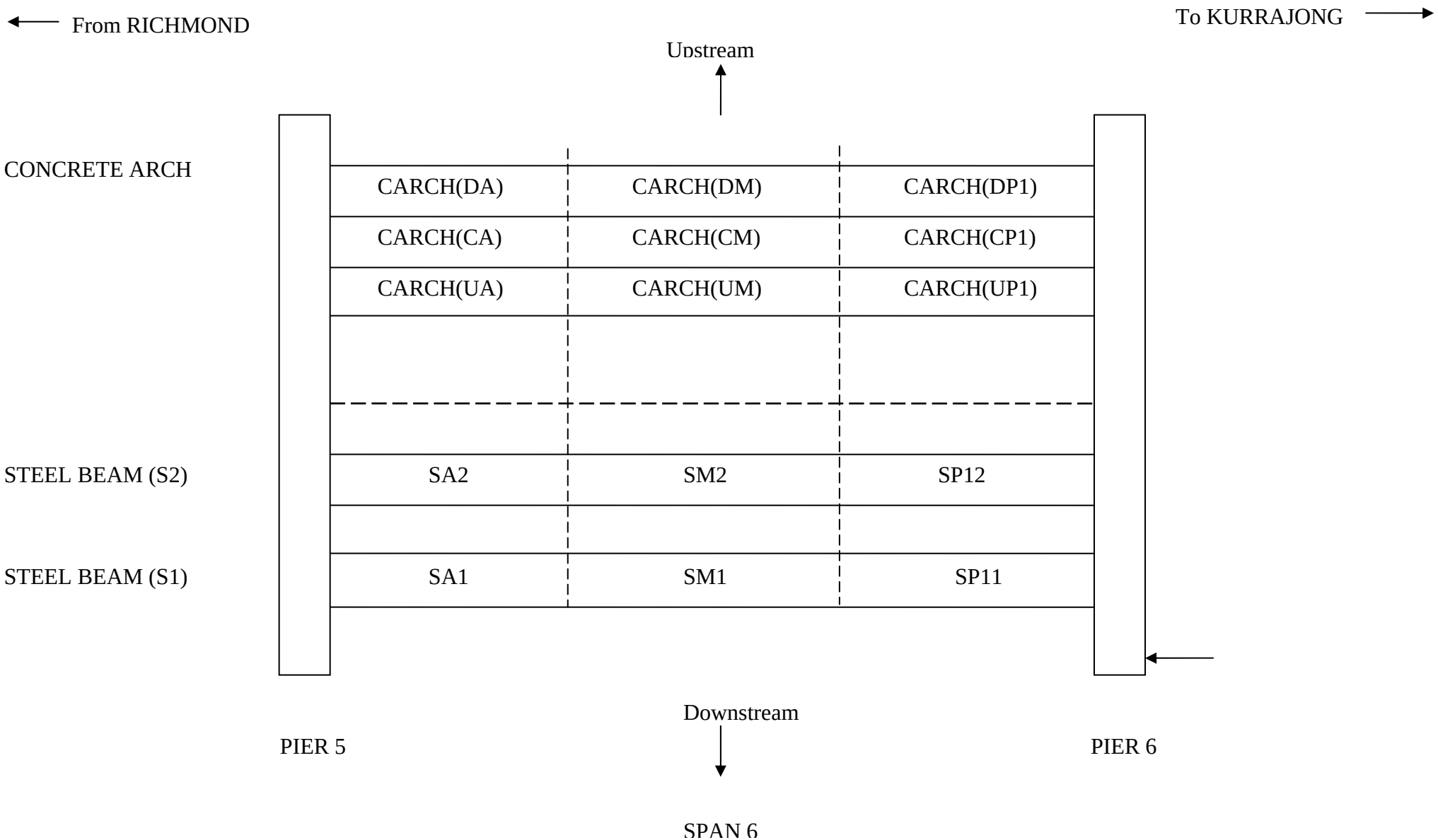
Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter & Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	15/08/2011
Span 5									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP4		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A102
			SM1		F	G	G	1	Nil	Ditto	
			SP51		F	G	G	1	Nil	Ditto	
		S2	SP4		F	G	G	1	Nil	Ditto	A103
			SM2		F	G	G	1	Nil	Ditto	
			SP5		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	A110
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DP4				G	1	N/A	Minor cracking to exposed edges.	
			DM				G	1	N/A	CARCH Has minor old crack top of arch full width.	A101
			DP5				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CP4				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH Has minor old crack top of arch full width.	A101
			CP5				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UP4				G	1	N/A	Minor cracking to exposed edges.	
			UM				G	1	N/A	CARCH Has minor old crack top of arch full width.	A101
			UP5				G	1	N/A	Minor cracking to exposed edges.	
	BEARINGS	PIER 4	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	A109
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 5	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.	
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	A104
	PIER 4						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A105-A108

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter & Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	15/08/2011
Span 5									

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 5						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	
ABOVE DECK	DECK JOINTS	PIER 4					G	3		Exp. Joint plus no other joint visible	B010
		PIER 5					G	3		No deck joint visible.	
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC	

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 5
PIER 6
SPAN 6

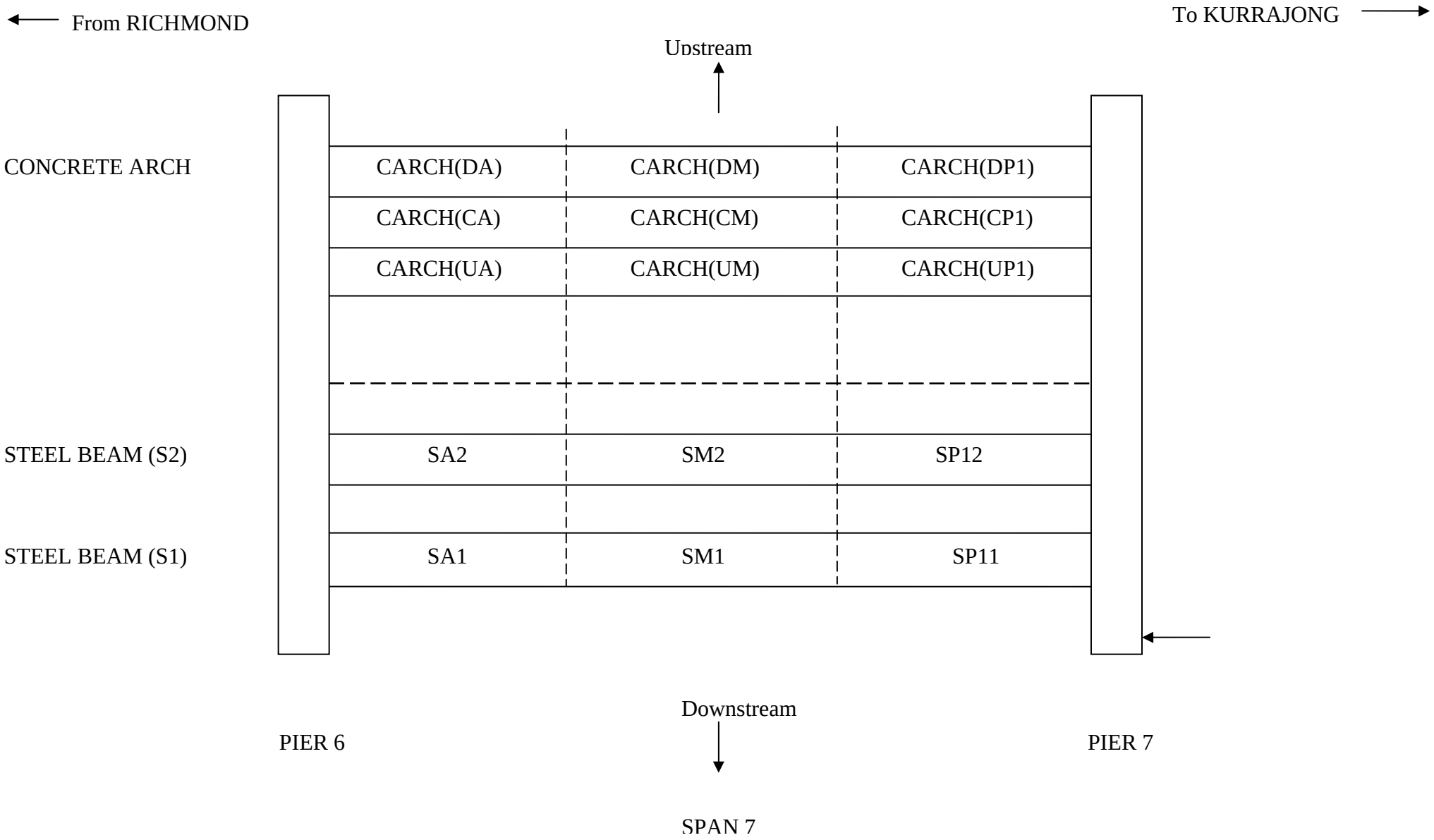
Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter, Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	15/08/2011
Span 6									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SA1		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A095
			SM1		F	G	G	1	Nil	Ditto	
			SP11		F	G	G	1	Nil	Ditto	
		S2	SA2		F	G	G	1	Nil	Ditto	A096
			SM2		F	G	G	1	Nil	Ditto	
			SP12		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DA				G	1	N/A	Minor cracking to exposed edges.	
			DM				G	1	N/A	CARCH Has minor old crack top of arch full width.	
			DP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CA				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH Has minor old crack top of arch full width.	
			CP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UA				G	1	N/A	Ditto	
			UM				G	1	N/A	CARCH Has minor old crack top of arch full width.	
			UP1				G	1	N/A	Minor cracking to exposed edges.	
	BEARINGS	PIER 5	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	A093A094
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 6	HS	US	F		F	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	A087
				DS	F		F	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	
	PIER 5						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	C016

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter, Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	15/08/2011
Span 6									

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 6						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	C015
ABOVE DECK	DECK JOINTS	PIER 5					G	3		No deck joints visible	
		PIER 6					G	3		No deck joints visible.	
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC	

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 6
PIER 7
SPAN 7

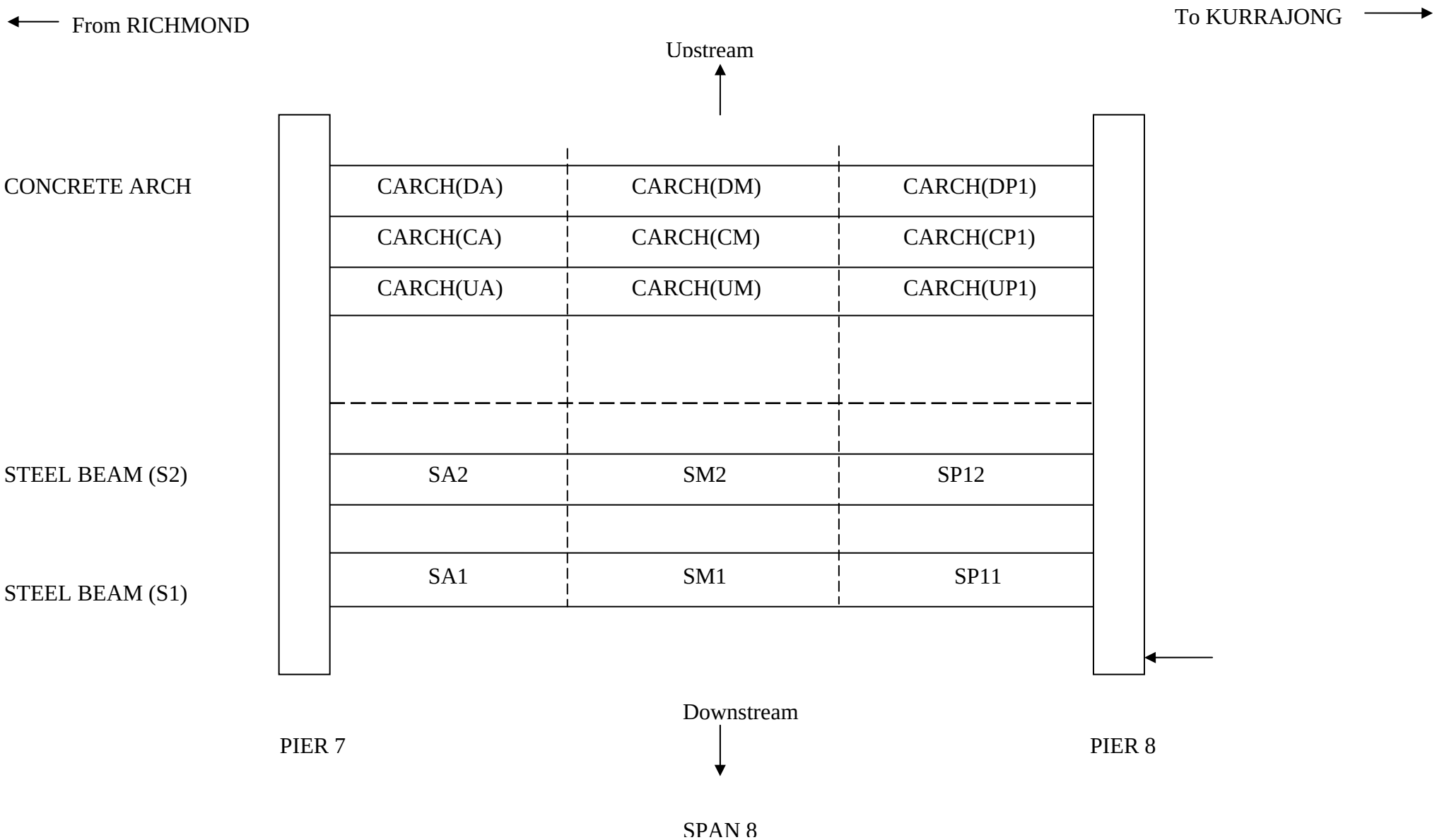
Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter, Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	15/08/2011
Span 7									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SA1		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A090
			SM1		F	G	G	1	Nil	Ditto	
			SP11		F	G	G	1	Nil	Ditto	
		S2	SA2		F	G	G	1	Nil	Ditto	A090
			SM2		F	G	G	1	Nil	Ditto	
			SP12		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	A089
		S2			F	G	G	1	Nil	Ditto	A089
	CONCRETE ARCH	CARCH(D)	DA				G	1	N/A	Minor cracking to exposed edges.	
			DM				G	1	N/A	CARCH Has minor old crack top of arch full width.	A088
			DP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CA				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH Has minor old crack top of arch full width.	A088
			CP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UA				G	1	N/A	Ditto	
			UM				G	1	N/A	CARCH Has minor old crack top of arch full width.	A088
			UP1				G	1	N/A	Minor cracking to exposed edges.	
	BEARINGS	PIER 6	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	A087
				DS	F		G	2	Nil	Dito	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 7	HS	US	F		F	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	
				DS	F		F	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	
	PIER 6						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter, Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	15/08/2011
Span 7									

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 7						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A086
ABOVE DECK	DECK JOINTS	PIER 6					G	3		No deck joints visible	
		PIER 7					G	3		No deck joints visible.	
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC has crack.	B015

COMMENTS


From RICHMOND
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Upstream
CONCRETE ARCH
CARCH(DA)
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CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 7
PIER 8
SPAN 8

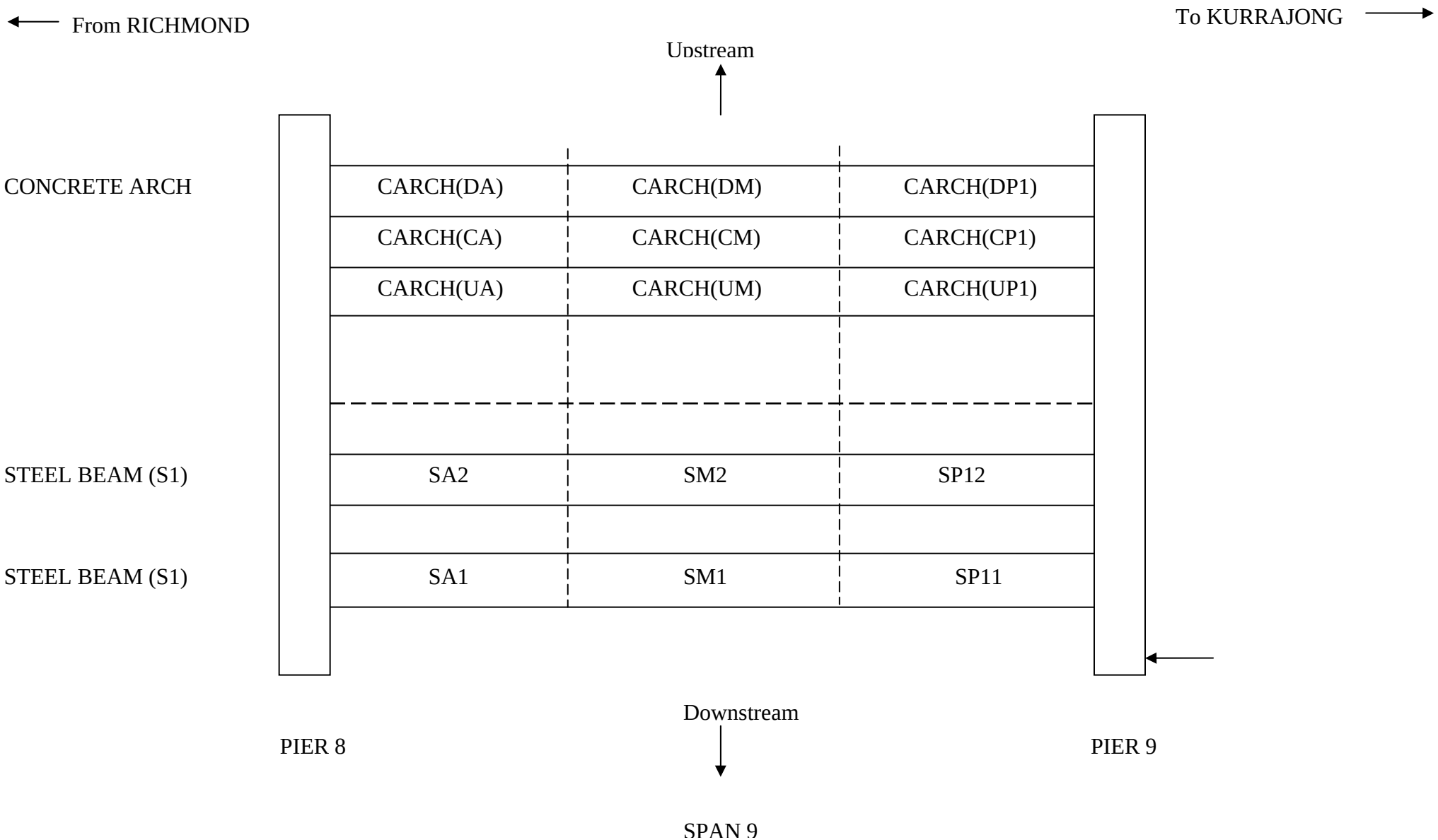
Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter, Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch &steel arch	Date:	15/08/2011
Span 8									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SA1		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A076
			SM1		F	G	G	1	Nil	Ditto	A078
			SP11		F	G	G	1	Nil	Ditto	
		S2	SA2		F	G	G	1	Nil	Ditto	A076
			SM2		F	G	G	1	Nil	Ditto	A079
			SP12		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	A077
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DA				G	1	N/A	Minor cracking to exposed edges.	
			DM				G	1	N/A	CARCH no significant crack	
			DP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CA				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH no significant crack	
			CP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UA				G	1	N/A	Ditto	
			UM				G	1	N/A	CARCH no significant crack	
			UP1				G	1	N/A	Minor cracking to exposed edges.	
	BEARINGS	PIER 7	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	A080
				DS	F		G	2	Nil	Ditto	A084,A085
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 8	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	
	PIER 7						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A081,A082,A083

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Peter, Hamid & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch &steel arch	Date:	15/08/2011
Span 8									

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 8						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	
ABOVE DECK	DECK JOINTS	PIER 7					G	3		No deck joints visible	
		PIER 8					G	3		No deck joints visible.	
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC has crack.	

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S1)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 8
PIER 9
SPAN 9

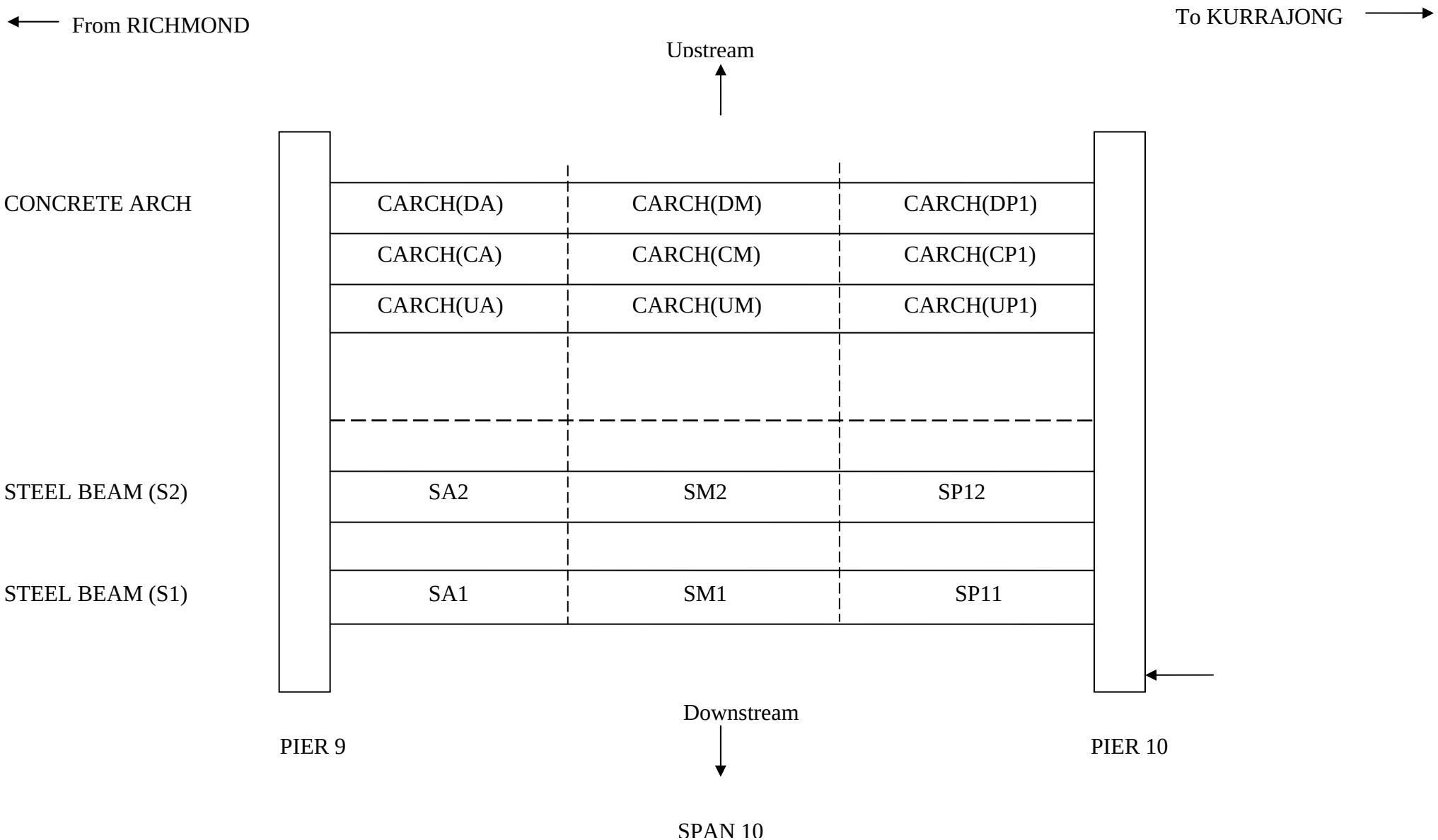
Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 9									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SA1		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A058
			SM1		F	G	G	1	Nil	Ditto	A063
			SP11		F	G	G	1	Nil	Ditto	
		S2	SA2		F	G	G	1	Nil	Ditto	A059
			SM2		F	G	G	1	Nil	Ditto	A066
			SP12		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DA				G	1	N/A	Minor cracking to exposed edges. Old repairs.	A065
			DM				G	1	N/A	CARCH no significant crack expos corroded reo.	A062
			DP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CA				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH no significant crack but old crks.	A064
			CP1				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UA				G	1	N/A	Ditto	
			UM				G	1	N/A	CARCH no significant crack	
			UP1				G	1	N/A	Minor cracking to exposed edges.	
	BEARINGS	PIER 8	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	A060
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 9	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound no visible cracks.	
	PIER 8						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A061
											A071-A075

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 9									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 9						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	B020
ABOVE DECK	DECK JOINTS	PIER 8					G	3		No deck joints visible	
		PIER 9					G	3		Exp deck joints visible.	B016, B018
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC has crack.	B023,B024

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 9
PIER 10
SPAN 10

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 10									

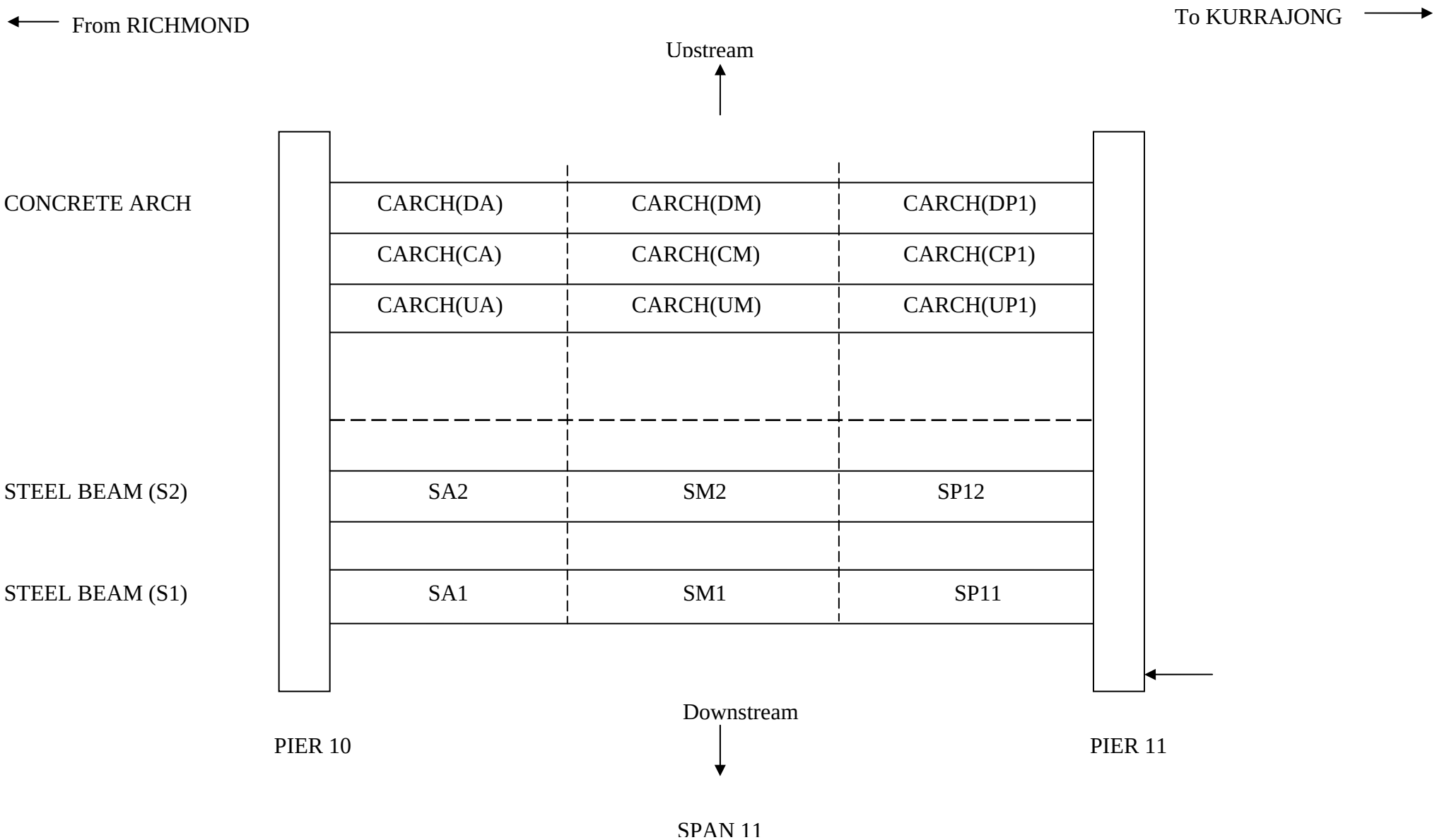
					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP9		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A034
			SM1		F	G	G	1	Nil	Ditto	A048
			SP10		F	G	G	1	Nil	Ditto	
		S2	SP9		F	G	G	1	Nil	Ditto	A035
			SM2		F	G	G	1	Nil	Ditto	A049
			SP10		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	A050
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DP9				G	1	N/A	Minor cracking to exposed edges. Old repairs. Corroding reo	A041,A042
			DM				G	1	N/A	CARCH minor old arch crack	A044
			DP10				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CP9				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH minor old arch crack	A045
			CP10				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UP9				G	1	N/A	Minor cracking to exposed edges. Old spall and corroded reo	A052
			UM				G	1	N/A	CARCH minor old arch crack	A046,A047
			UP10				G	1	N/A	Minor cracking to exposed edges and spalls corroded reo	A043
	BEARINGS	PIER 9	HS	US	F		F	2	Nil	Steelwork requires clean up and nuts to be fully engaged	
				DS	F		F	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	A038-A040
				DS			G	2	N/A	Ditto	
		PIER 10	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	A054
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 10									

				DS			G	2	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound minor visible cracks.	A051
	PIER 9						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	

Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 10						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A053
ABOVE DECK	DECK JOINTS	PIER 9					G	3		No deck joints visible	
		PIER 10					G	3		No deck joints visible.	
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC	

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 10
PIER 11
SPAN 11

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 11									

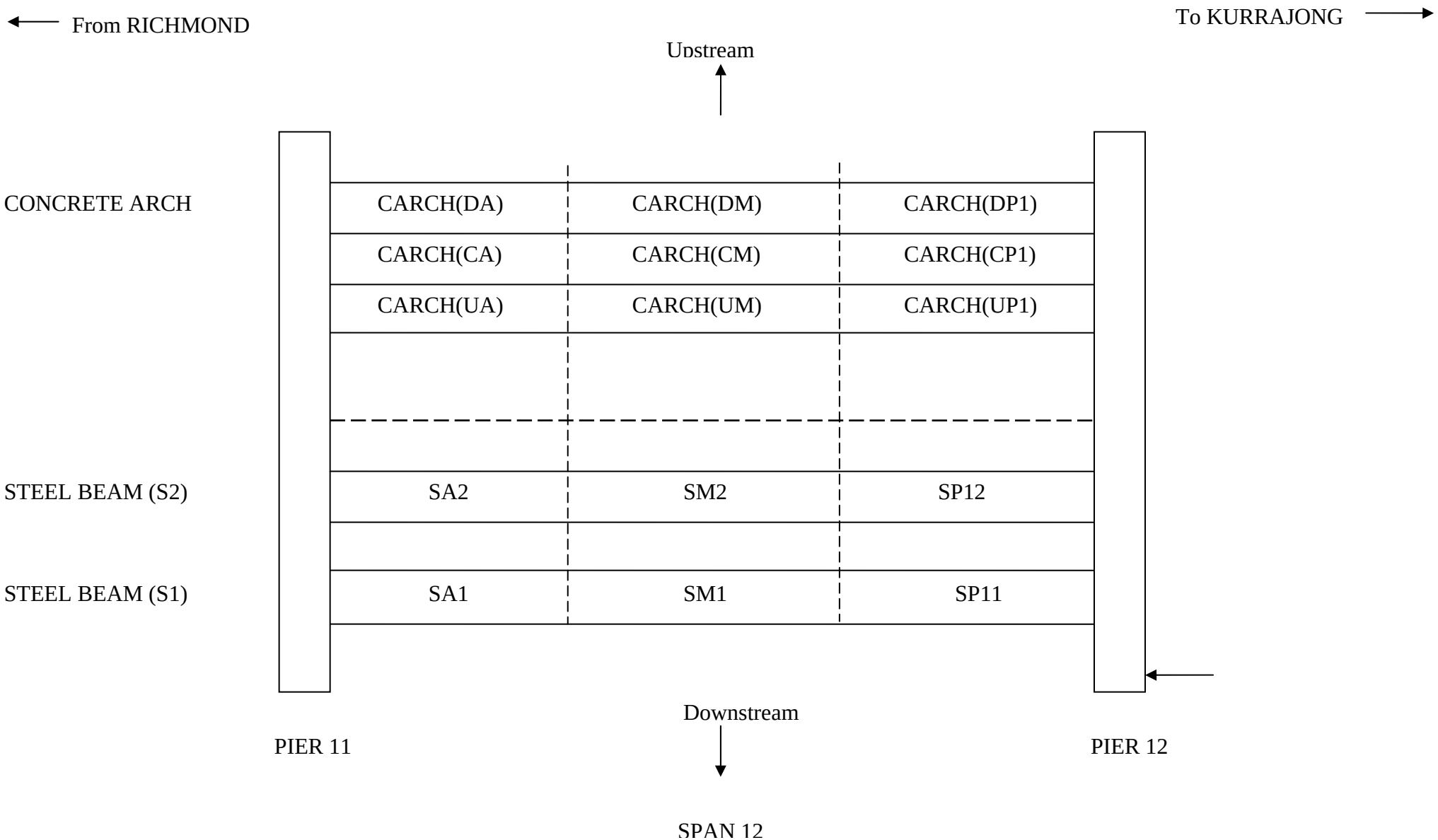
					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP10		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A032
			SM1		F	G	G	1	Nil	Ditto	
			SP11		F	G	G	1	Nil	Ditto	
		S2	SP11		F	G	G	1	Nil	Ditto	
			SM2		F	G	G	1	Nil	Ditto	
			SP11		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Ditto	
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DP10				G	1	N/A	Minor cracking to exposed edges. Old repairs. Corroding reo	
			DM				G	1	N/A	CARCH no significant cracks	
			DP11				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CP10				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH no significant cracks	
			CP11				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UP10				G	1	N/A	Minor cracking to exposed edges. Old spall and corroded reo	
			UM				G	1	N/A	CARCH no significant cracks	
			UP11				G	1	N/A	Minor cracking to exposed edges and spalls corroded reo	
	BEARINGS	PIER 10	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	A033
				DS			G	2	N/A	Ditto	
		PIER 11	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS	F		G	1	N/A	Ditto	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound minor visible cracks.	

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 11									

	PIER 10						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A028
											A027

				Condition						
Location	Member	Section	Element	Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 11					G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A037
										A029-A031
										B083
ABOVE DECK	DECK JOINTS	PIER 10				G	3		No deck joints visible	
		PIER 11				G	3		No deck joints visible.	
	HANDRAILS & POSTS		US			F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS			F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE					G	4		Good AC except minor area of failure. Longitudinal joint has step	B025,B026

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 11
PIER 12
SPAN 12

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 12									

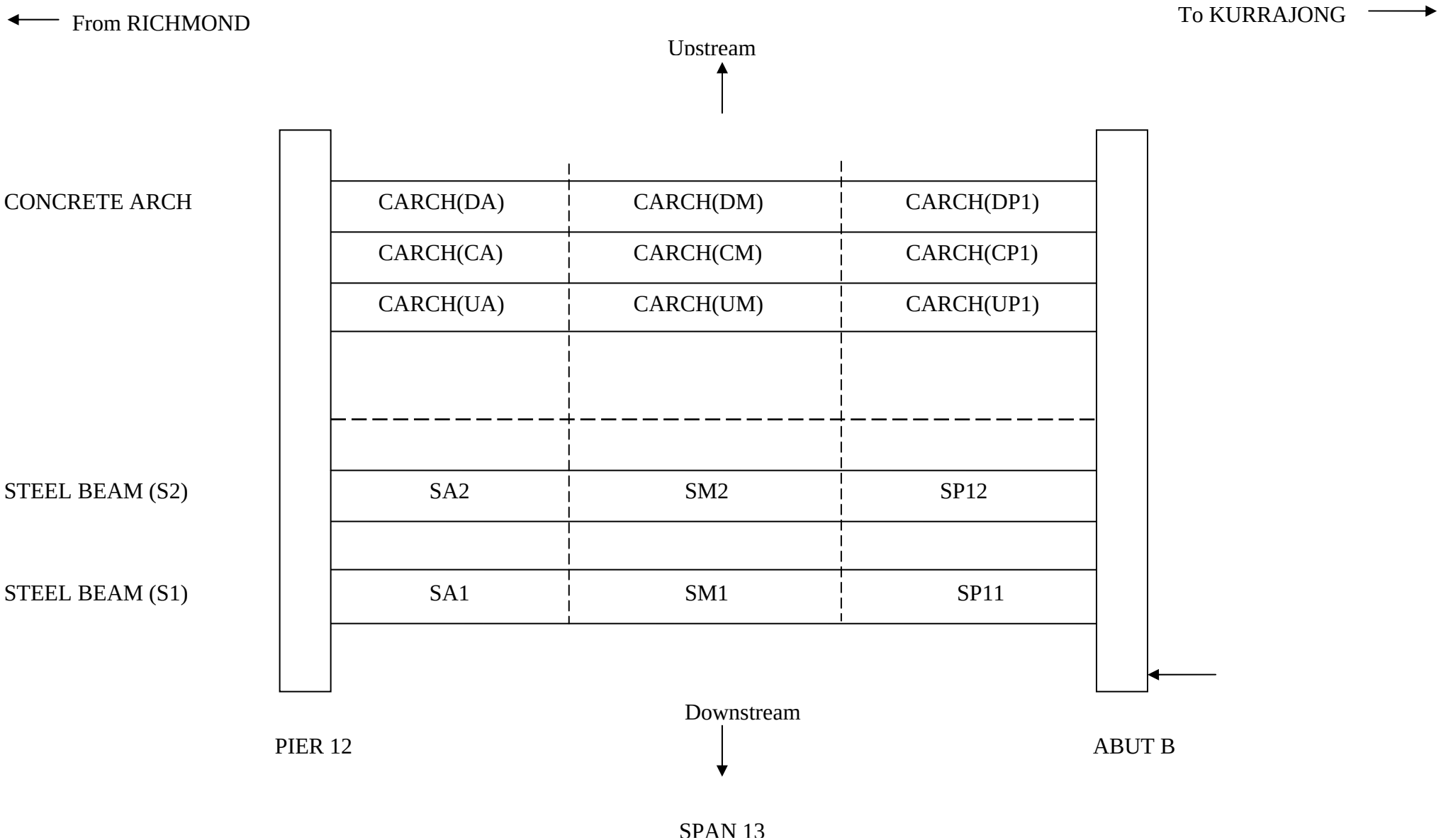
					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP11		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	A003
			SM1		F	G	G	1	Nil	Ditto	
			SP12		F	G	G	1	Nil	Ditto	
		S2	SP11		F	G	G	1	Nil	Ditto	A004,A005
			SM2		F	G	G	1	Nil	Ditto	A020
			SP12		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Arch bracing starting to show breakdown in paint.	
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DP11				G	1	N/A	Minor cracking to exposed edges.	
			DM				G	1	N/A	CARCH no significant cracks	
			DP12				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CP11				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH no significant cracks	
			CP12				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UP11				G	1	N/A	Ditto	
			UM				G	1	N/A	CARCH no significant cracks	
			UP12				G	1	N/A	Minor cracking to exposed edges and spalls corroded reo	
	BEARINGS	PIER 11	HS	US	F		G	2	Nil	Steelwork requires clean up and nuts to be fully engaged	A006
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		PIER 12	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	
				DS	F		G	2	Nil	Ditto.	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	
				DS	F		G	1	N/A	Ditto	

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	11/08/2011
Span 12									

	DECK SLAB							G	3	N/A	Deck slab between steel archs appears sound minor visible cracks.	A007
	PIER 11							G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	A011
												A09,A010
												A012

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	PIER 12						G	2	N/A	Has various surface cracking not significant. Plus internal drainage failure	
ABOVE DECK	DECK JOINTS	PIER 11					G	3		No deck joints visible	
		PIER 12					G	3		No deck joints visible.except crack to AC	B028
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC	

COMMENTS


From RICHMOND
To KURRAJONG
Upstream
CONCRETE ARCH
CARCH(DA)
CARCH(DM)
CARCH(DP1)
CARCH(CA)
CARCH(CM)
CARCH(CP1)
CARCH(UA)
CARCH(UM)
CARCH(UP1)
STEEL BEAM (S2)
SA2
SM2
SP12
STEEL BEAM (S1)
SA1
SM1
SP11
Downstream
PIER 12
ABUT B
SPAN 13

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	19/08/2011 & 20/10/2011
Span 13									

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
BELOW DECK	SBEAM	S1	SP12		F	G	G	1	Nil	Arch beams starting to show breakdown in paint.	
			SM1		F	G	G	1	Nil	Ditto	
			SAB		F	G	G	1	Nil	Ditto	
		S2	SP12		F	G	G	1	Nil	Ditto	
			SM2		F	G	G	1	Nil	Ditto	
			SAB		F	G	G	1	Nil	Ditto	
	BRACING	S1			F	G	G	1	Nil	Arch bracing starting to show breakdown in paint.	
		S2			F	G	G	1	Nil	Ditto	
	CONCRETE ARCH	CARCH(D)	DP12				G	1	N/A	Minor cracking to exposed edges.	
			DM				G	1	N/A	CARCH 3mm wide crack with telltales that have broken or glue fail	C002-C009
			DAB				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(M)	CP12				G	1	N/A	Ditto	
			CM				G	1	N/A	CARCH 3mm wide crack with telltales that have broken or glue fail	C002-C009
			CAB				G	1	N/A	Minor cracking to exposed edges.	
		CARCH(U)	UP12				G	1	N/A	Minor cracking to exposed edges.	
			UM				G	1	N/A	CARCH 3mm wide crack with telltales that have broken or glue fail	C002-C009
			UAB				G	1	N/A	Minor cracking to exposed edges.	
	BEARINGS	PIER 12	HS	US	F		G	2	Nil	Steelwork requires clean up	
				DS	F		G	2	Nil	Ditto	
			AB	US			G	2	N/A	CARCH typ surface cracking no significance.	
				DS			G	2	N/A	Ditto	
		ABUT B	HS	US	F		G	2	Nil	Steelwork requires cleanup and remedial paint work.Tighten nuts.	
				DS	F		G	2	Nil	Ditto	
			COL	US			G	2	N/A	Concrete cols sound surface fines washed away exposing c /aggr.	

Bridge No:	429	Bridge Name:	Bridge over Hawkesbury River			Inspected by:	Anu & Jeff		
Road No:	184	Location:	North Richmond	Year built:	1905&1966	Span Type:	Conc Arch & steel arch	Date:	19/08/2011 & 20/10/2011
Span 13									

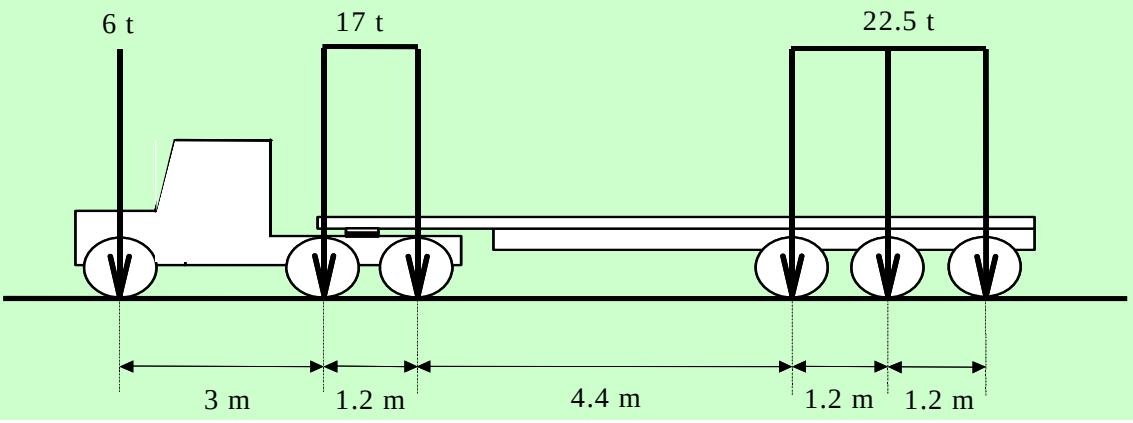
				DS	F	F	F	1	N/A	Concrete cols sound surface fines washed away exposing c /aggr	
	DECK SLAB						G	3	N/A	Deck slab between steel archs appears sound .	

					Condition						
Location	Member	Section	Element		Paint	Joint	Structural	Structural Significance	Section Loss	Comments	Photo
	ABUT B						G	2	N/A	Has various surface cracking that may or may not indicate the	
										Abutment is moving outwards creating the wide crack in middle of	
										The arch.	
ABOVE DECK	DECK JOINTS	PIER 12					G	4		No joint crk visisble covered by AC	
		ABUT B					G	4		Minor crack to settlement area behind AB	B029, B030
											C039,C040
	HANDRAILS & POSTS		US				F	4		Barrier rails mounted on kerb Fair. Handrails to footpath Fair. Corroding wire mesh and rails.	
			DS				F	4		Barrier rails mounted on kerb Fair. Handrails Corroding wire mesh and rails.	
	WEARING SURFACE						G	4		Good AC	

COMMENTS

Appendix C- Vehicle Configurations

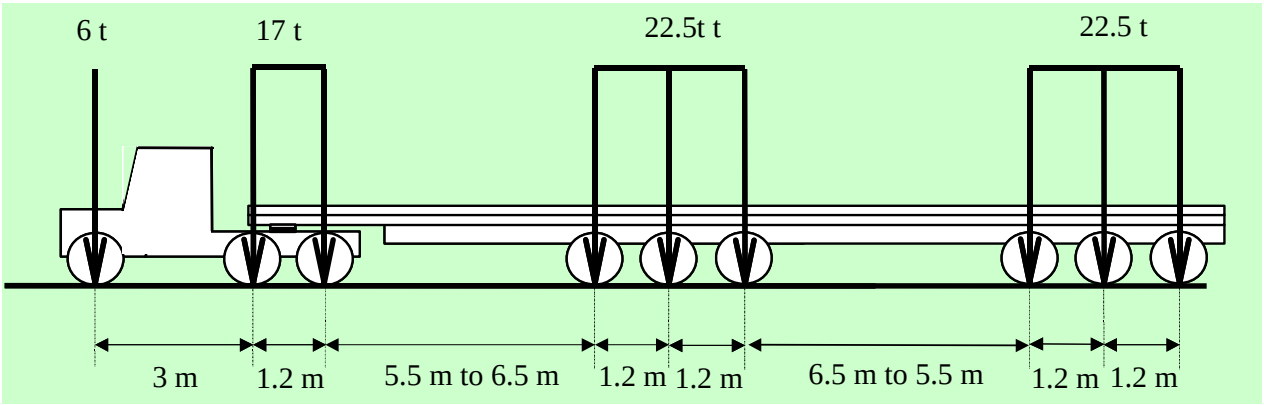
GENERAL ACCESS HIGHER MASS LIMIT (HML) VEHICLE



Semi-Trailer 45.5t

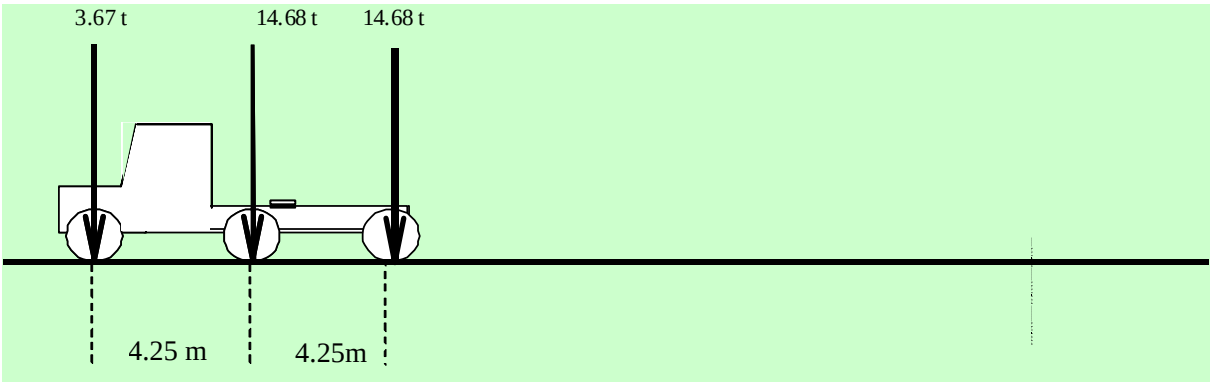
HML ST45.5t is a 1,2,3 axle configured six axle articulated* vehicle with GVM 45.5 tons.

RESTRICTED HIGHER MASS LIMIT VEHICLE



HML BD68t is a 1,2,3 & 3 axle configured nine-axle vehicle with GVM 68 tons

HS20, MS18 Design Vehicle (DMR 1948)



HS20, MS18 Standard Truck with GVM 33t

Appendix D- Bridge Structural Condition States Form

Type of Material: Concrete

	Structural Condition
State	Description
Good	Minor cracks and spalls, but without affecting strength and/or serviceability. No evidence of corrosion. Requires no remedial work.
Fair	Noticeable defects in critical areas but structural strength and/or serviceability satisfactory. Requires regular inspection and/or some remedial work.
Poor	Significant defects in critical areas, spalls and corrosion are prevalent in critical areas, affecting strength and/ or serviceability. Requires remedial work.
Very Poor	Major defects in critical areas. Structural functioning grossly inadequate, affecting strength and/ or serviceability. Requires immediate remedial work.

Type of Material: Steel

	Structural Condition
State	Description
Good	Little or no corrosion. Protective coating may be chalking. Connection details sound. No exposure of metal, functioning as intended.
Fair	Evidence of surface or freckled rust. Protective coating not effective. Minor cracking at non-critical location. Some exposure of metal but no loss of section, structural functioning satisfactorily. Requires regular inspection.
Poor	Surface pitting and failure of protective coating. Significant cracking in non-critical locations and minor cracking at critical location. Connections need attention. Considerable section loss affecting the strength and/or serviceability. Requires remedial work.
Very poor	Advanced corrosion. Connections not effective. Significant cracking at critical location. Section loss sufficient to reduce strength and/or serviceability. Requires immediate remedial work.

Type of Material: Timber

	Structural Condition
State	Description
Good	Minor decay, splitting, cracking or crushing, but without affecting strength and/or serviceability. No loose bolts.
Fair	Some decay, insect infestation, splitting, cracking, loose bolts or crushing but functioning satisfactorily. Requires regular inspection but no remedial work.
Poor	Significant decay, insect infestation, splitting, cracking or loose bolts and not functioning satisfactorily. Requires remedial work.
Very poor	Advanced deterioration. Structural function grossly inadequate. Requires extensive remedial work.