SEVERN TRENT WATER
Bridge Management

General Inspection Report
TITTESWORTH (WTW)
(Structure No. AT298)

Jan 2018

Notice

This report was produced by Atkins for SEVERN TRENT WATER for the specific purpose of reporting the findings of the structure inspection.

This report may not be used by any persons other than SEVERN TRENT WATER without Atkins' express permission. In any event, Atkins accepts no liability for any costs, liabilities or losses arising as a result of the use of or reliance upon the contents of this report by any person other than SEVERN TRENT WATER.

Document History

JOB NUMBER: 5161833			DOCUMENT REF: 5161833/2017/18/320/AT298			
A	Final	DA	AJ	PC	PS	Mar 18
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

1. Location and Access to Structure

Structure AT298 is a Severn Trent Water (STW) owned pretensioned concrete beam bridge, located at Tittiesworth Water Treatment Works. The site is managed by STW's operational Team. The structure can be accessed by parking on the access road approach to the works, and walking approximately 50m along the route shown below.

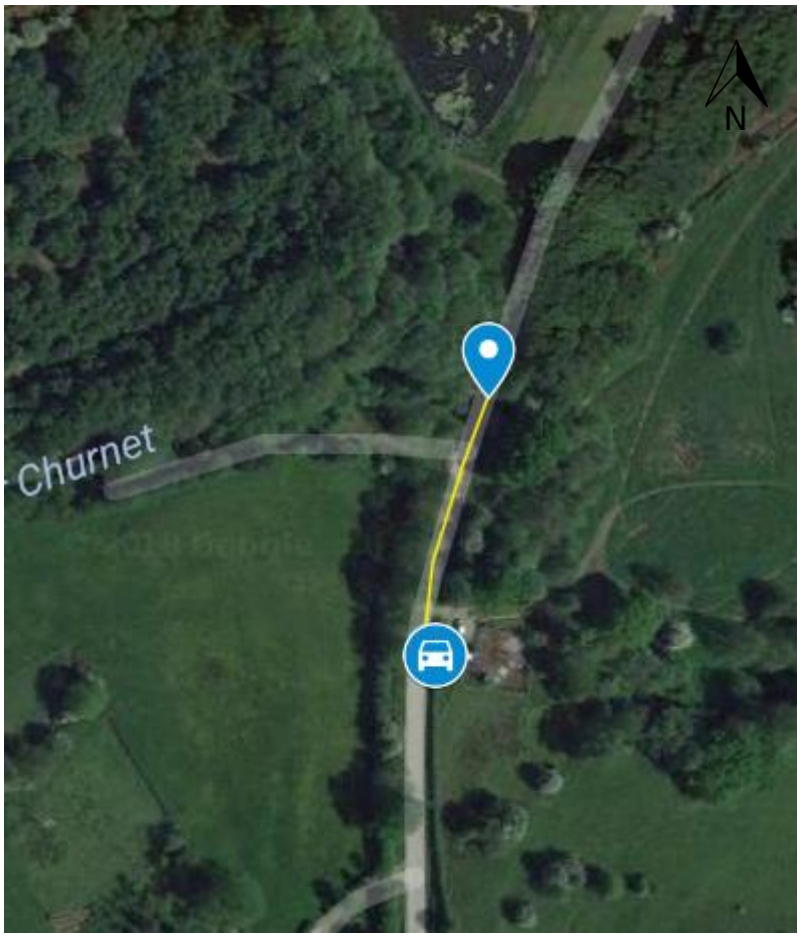

Figure 0: Location and access to AT298

ATKINS

Appendix A – Bridge Inspection Pro forma

BRIDGE INSPECTION

Superficial		X	General		Principal		Special		Form 1 of 1 for this bridge		
Inspector:	AJ DA		Date	29-Jan-2018	Next Inspection Type:	PI			Next Inspection Due Financial Year:	2019	
Bridge Name:	TITTESWORTH (WTW)				Bridge Ref/No:	AT298			Road Ref/No:		
Structures Function:	above:	Works access			below:	River Churnet			Maintaining Authority:	STW	
Map Ref:		O.S.E	399347		O.S.N	358117			Bridge Type Code:	Primary deck element form / Table 2 / Below deck beam	04
Spans 1 of 1	Width (m)	6.94	Length (m)	16.2	Area (m²)	112.4				Primary deck element material / Table 4 / Pretensioned cor	D
All above ground elements inspected?	Yes	X	No		Photographs? Yes	X	No			Secondary deck element form / Table 3 / Slab (no transver	24
Number of Construction forms in Bridge/Span:		BCS crit	28.08		BCS ave	73.00				Secondary deck element material / Table 4 / Reinforced concr	A

Set	No	Element Description	S	Ex	Def	W	P	Cost	Comments / remarks
Deck elements	1	Primary deck element (Table 2)	4	C	M	R	H	£12,000	Refer to multiple defects page
	2	Secondary deck element/s: Transverse beams							
	3	Secondary deck element/s: Element from Table 3							
	4	Half joints							
	5	Tie beam/rod							
	6	Parapet beam or cantilever	2	C	2.1	R	M	£1,000	Chips and spalling to south of west parapet beam
	7	Deck bracing							
Load-bearing Substructure	8	Foundations	1	A					Inaccessible - No evidence of settlement
	9	Abutments (incl arch springing)	1	A					Staining and dampness from expansion joints
	10	Spandrel wall / head wall							
	11	Pier / Column							
	12	Cross head / capping beam							
	13	Bearings	1	A					
	14	Bearing shelf / plinth	1	A					
Durability elements	15	Superstructure drainage							
	16	Substructure drainage							
	17	Waterproofing	4	D	14.2	A	H	£7,000	Possible falure of waterproofing
	18	Movement / expansion joints	3	D	10.12	R	M	£1,000	Moderate leakage to north expansion joint causing staining to abutment
	19	Finishes: deck elements							
	20	Finishes: substructure elements							
	21	Finishes: parapets/safety fences	4	E	4.1	P	M	£2,000	Breakdown of protective paint system to east and west parapets
Safety elements	22	Access / walkways / gantries							
	23	Handrail / parapets / safety fences	2	B	1.1	N		See 21	Surface corrosion to handrails
	24	Carriageway surfacing	2	C	5.1	R	M	£250	Debris and vegetation to east and west edges
	25	Footway / verge / footbridge surfacing							
Other bridge elements	26	Invert / river bed	2	C	7.2	R	L	£750	Rock stone concrete debris to invert causing flow disruption
	27	Aprons							
	28	Fenders / cutwaters / collision prot'n							
	29	River training works							
	30	Revetment / batter paving							
	31	Wing walls	3	C	M	N		£500	Refer to multiple defects page
	32	Retaining walls							
	33	Embankments	3	D	7.1	R	M	£2,500	River flow causing scour to base of south west embankment
	34	Machinery							
Ancillary elements	35	Approach rails / barriers / walls							
	36	Signs							
	37	Lighting							
	38	Services	3	E	14.1	R	M	£6,000	Extensive leakage and stalactites to deck and service trench soffit suggesting failure of waterproofing

S - severity, **Ex** - extent, **Def** - defect
W - work required, **P** - work priority

Inspection date: **29-Jan-2018**

1of 2 pages

MULTIPLE DEFECTS

Element No.	Defect 1			Defect 2			Defect 3			Comments
	S	Ex	Def	S	Ex	Def	S	Ex	Def	
1	3	D	2.1	4	C	2.4	3	C	2.1	Defect 1: Spalling with exposed rebar to beam 17 of 21 with surrounding delamination 600 x 300 x 30 (£4000.0) Defect 2: Area of delamination to beam 18 near midspan (500mm length) and beam 12 at mid span 1m length Defect 3: Beam 9 4m length of spalling with exposed tendons (£4000.0)
31	3	C	3.5	2	C	5.1				Defect 1: Monitor cracks and efflorescence to north west wing walls Defect 2: Vegetation and medium size trees to all wing walls (£500.0)

INSPECTOR'S COMMENTS

This bridge is in poor condition. The general inspection has revealed several areas of moderate and severe concrete defects to the primary deck element which are highly stressed concrete beams. Staining to the abutments suggests failure to the deck expansion joints. Significant debris to the invert was noted, which is likely to have caused the subsequent scour damage to the south west embankment. The wing walls require monitoring to record any worsening of the cracks and efflorescence. There is also significant tree growth around all wing walls which is recommended for removal to prevent any future damage being caused from the root growth.

Name	*D Argles*	Signed	*D Argles*	Date	03 February 2018

ENGINEER'S COMMENTS

This bridge is in poor condition. A principal inspection is recommended to provide more detail to the extent of the defects listed in this general inspection.

Name	*A Jones*	Signed	*A Jones*	Date	03 February 2018

WORK REQUIRED

Ref. No	Suggested Remedial Work	Priority	Estimated Cost	Action/Work ordered
1	Repair the area of spalling with exposed rebar to beam 17 of 21 with surrounding delamination (600 x 300mm x 30mm deep)	H	£ 4,000	
1.2	Repair area of delamination to beam 18 near midspan (500mm length) and beam 12 at mid span 1m length	H	£ 4,000	
1.3	Repair beam 9 with 4m length of spalling and exposed tendons. Check extent of tendon section loss and replace beam if necessary. Consult pre-stressed beam manufacturers for safe repair/removal.	H	£ 4,000	
6	Repair the chips and spalling to the south of west parapet beam	M	£ 1,000	
17	Investigate and possibly replace waterproofing system	H	£ 7,000	
18	Repair north expansion joint that is causing staining to abutment	M	£ 1,000	
21	Apply new protective paint system to east and west parapets	M	£ 2,000	
24	Remove debris and vegetation from east and west edges of carriageway	M	£ 250	
26	Remove debris from invert that is causing flow disruption	L	£ 750	
31	Remove vegetation and medium size trees from all wing walls	L	£ 500	
33	Repair south west embankment where scour has occurred	M	£ 2,500	
38	Investigate sevice pipes within trench and repair possible leaks	M	£ 6,000	

Appendix B – Photographs



Figure 1: GA Photo - Looking north



Figure 2: GA Photo - Looking south



Figure 3: GA Photo - West elevation



Figure 4: GA Photo – Invert looking east



Figure 5: GA Photo - East elevation



Figure 6: GA Photo - Deck soffit looking south



Figure 7: GA Photo - Deck soffit looking north

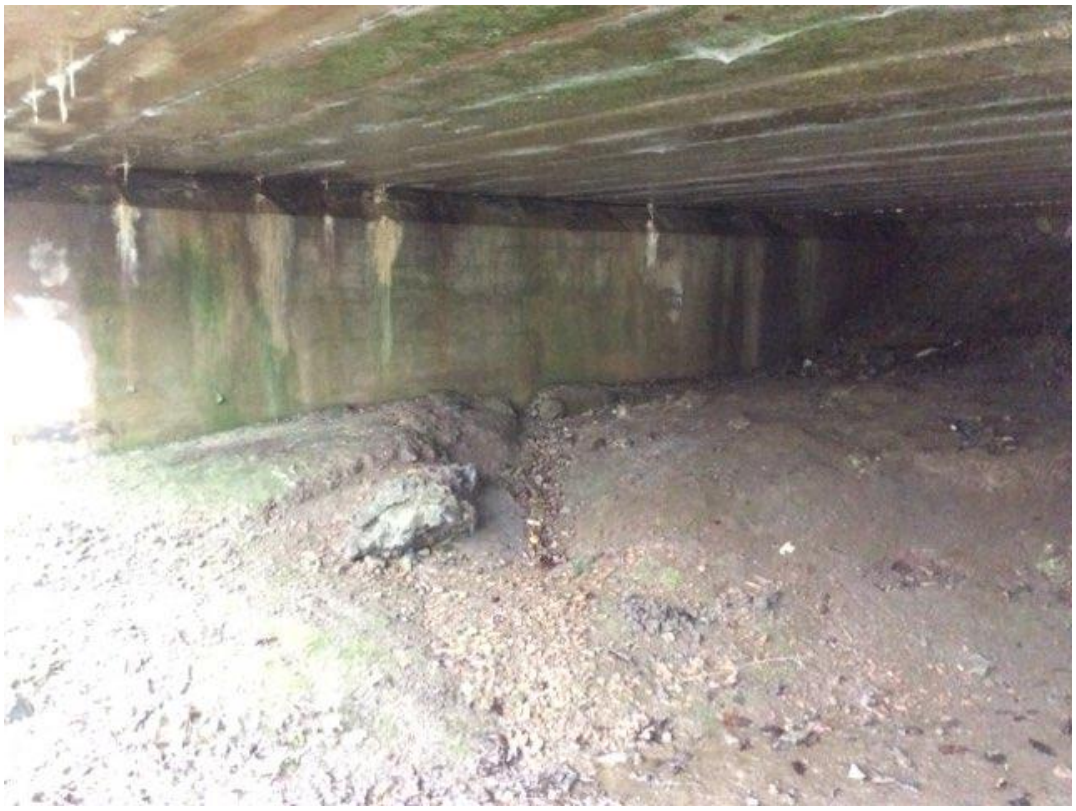

Figure 8: GA Photo - North abutment



Figure 9: GA Photo – footbridge to the east



Figure 10: Primary deck element - Spalling with exposed rebar/tendons to beam 17 of 21 from west with surrounding delamination (600mm x 300mm x 30mm volume of spalling)



Figure 11: Primary deck element - Area of delamination to beam 18 near midspan (500mm length)



Figure 12: Primary deck element - Area of delamination to beam 12 at mid span (1m length)



Figure 13: Primary deck element - Beam 9, 4m length of spalling and exposed tendons



Figure 14: Parapet beam or cantilever – Several isolated chips and spalls to south of west parapet beam



Figure 15: Movement / expansion joints - Moderate leakage to north expansion joint causing staining to abutment



Figure 16: Movement / expansion joints - Moderate leakage to north expansion joint causing staining to abutment



Figure 17: Finishes: parapets/safety fences – Typical breakdown of protective paint system to west parapet



Figure 18: Finishes: parapets/safety fences - Breakdown of protective paint system to east parapet



Figure 19: Carriageway surfacing - Debris and vegetation to west edge



Figure 20: Carriageway surfacing - Debris and vegetation to east edge



Figure 21: Invert / river bed - Rock stone concrete debris to invert causing flow disruption

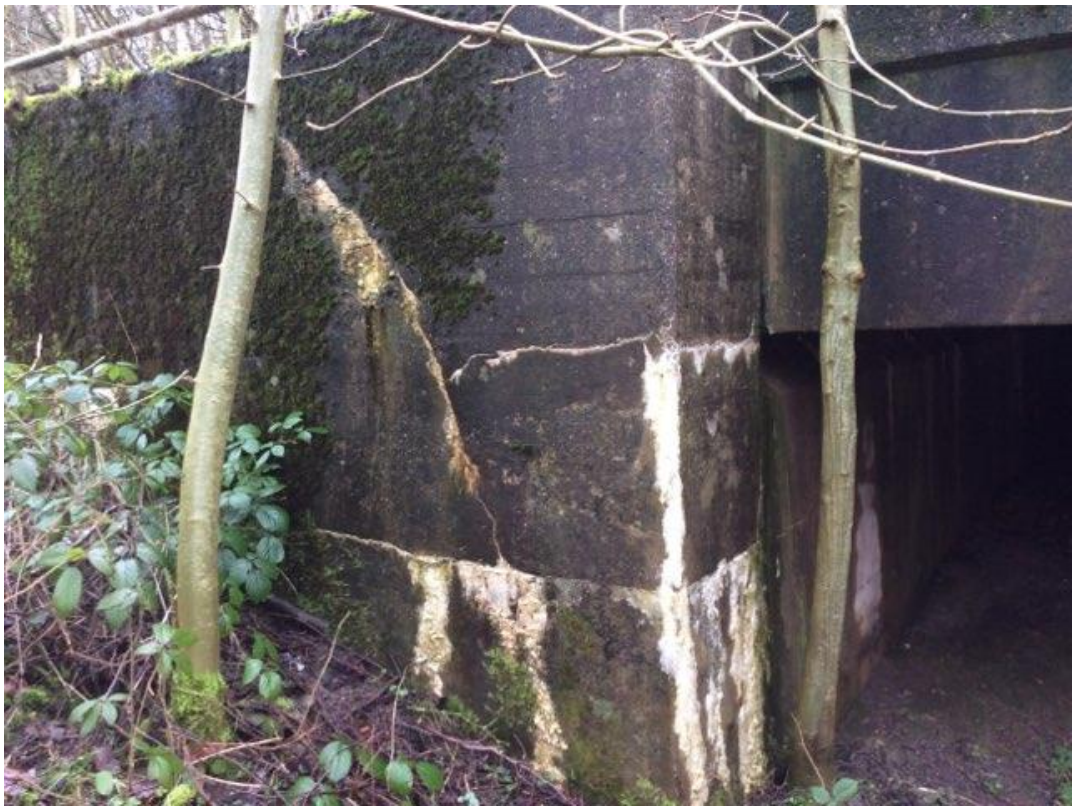

Figure 22: Wing walls – Hairline cracks and efflorescence to north-west wing wall



Figure 23: Wing walls – Vegetation and medium sized trees to all wing walls (north-east)



Figure 24: Wing walls - Vegetation and medium sized trees to all wing walls (north-west)



Figure 25: Embankments - River flow causing scour to base of south-west embankment



Figure 26: Services - Extensive leakage and stalactites to deck and service trench soffit suggesting failure of waterproofing

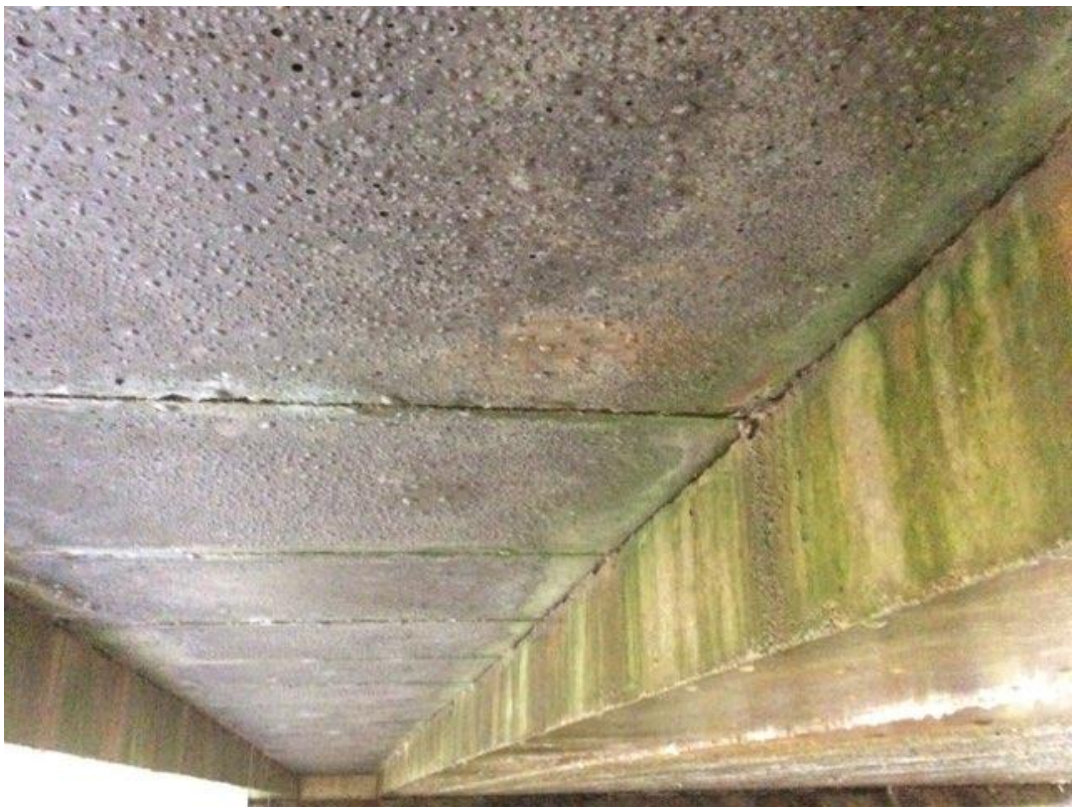

Figure 27: Services – Close-up of extensive leakage to deck and service trench soffit suggesting failure of waterproofing

Appendix C – Principal Bridge Inspection Interval Risk Assessment

Structure Name:	AT298	Structure Key:	-

A - BRIDGES & LARGE CULVERTS	Criteria Number	Criteria	Attribute	Risk Score
A1 Structure Type	A.1.1	Structural form	Simply Supported	2
	A.1.2	Constituent material	Precast Prestressed Concrete	4
	A.1.3	Age of the structure	Not Known	0
	A.1.4	Headroom	Not Known	0
	A.1.5	Span	10m to 25m	1
A2 Environment	A.2.1	Exposure	Moderate (Routes with de-icing salts)	1
	A.2.2	Scour	Scour Susceptible (Scour Risk Rating of 1-4)	PII to remain at 6 years
	A.2.3	Flooding	Low Risk (structure is adjacent to / over waterway with low likelihood of flood damage)	0
A3 Inspection / Assessment	A.3.1	Level of visual accessibility during a General Inspection	All parts of the structure visible from a distance (including the use of binoculars)	2
	A.3.2	Likelihood of latent defects going unnoticed during a Principal Inspection	High likelihood of latent defects occurring without any visible secondary effects	0
	A.3.3	Assessment	Not Known	0
A4 Condition	A.4.1	Condition - Inspector's opinion	Poor	PII to remain at 6 years
	A.4.2	Condition Performance Indicator (Average Score)	Poor (40-65)	0
	A.4.3	Condition Performance Indicator (Critical Element Score)	Very Poor (0-40)	PII to remain at 6 years
	A.4.4	Signs of Concrete Deterioration including TSA, AAR, ASR and ACR	No	3
A5 Consequences	A.5.1	Applied loading	Other / Not known	0
	A.5.2	Route supported	Access / Minor Route	4
	A.5.3	Obstacle crossed	River / Canal	2
	A.5.4	Potential failure mode	Brittle Failure (Concrete, masonry, timber)	0

Note: "PII to remain at 6 Years" means that irrespective of the final adjusted risk score the nature of the attribute requires the interval between Principal Inspections to be 6 Years

Assessment Category	Actual Risk Score	Maximum possible Risk Score	Weighting %	Adjusted Risk Score
Structure Score	7	13	25	13.5
Environment Score	-	11	20	-
Inspection Score	2	11	15	2.7
Condition Score	-	16	15	-
Consequence Score	6	14	25	10.7
			Total Risk Score	26.9

Comments and Recommendation for PI Interval

Due to the total risk score, BD63 and IAN 171, with support spreadsheet, states that the PBI interval cannot be extended beyond 6 years.

	Name	Signature	Date
Prepared	D Argles	*D Argles*	03/02/2018
Authorised	A Jones	*A Jones*	03/02/2018
TAA Agreement			