

Town of Rowley

Bridge Inventory Evaluation

JUNE 2019

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1. Introduction

The purpose of this report is to evaluate the bridge inventory of the Town of Rowley and provide a prioritized list of structures recommended for repair or replacement. This report also provides cost estimates for prioritized repairs one 1-year, 5-year, and 10-year time horizons to help plan for capital bridge improvements. These recommendations are based on the state of the bridge inventory as of December 2018 as observed in the field.

2. Background

The federal government created the National Bridge Inspection Standards (NBIS) in 1968 which established requirements for the inspection of all bridges including frequency, personnel qualifications, inspection reports, and inspection procedures. The NBIS apply to all structures defined as bridges.

2.1 Bridge definitions

The Federal Highway Administration (FHWA) defines a bridge as:

"A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening."

A culvert is defined as:

"A structure designed hydraulically to take advantage of submergence to increase hydraulic capacity. Culverts, as distinguished from bridges, are usually covered with embankment and are composed of structural material around the entire perimeter although some are supported on spread the streambed serving as the bottom of the culvert. Culverts may qualify to be considered "bridge" length."

Structures meeting the above criteria are generally referred to as "NBI structures". Any structures not meeting the above criteria are considered "non-NBI structures". Non-NBI structures are outside the jurisdiction of the NBIS.

Massachusetts defines a bridge as any structure greater than 10 feet in length using the same measurement criteria as in NBIS. Structures greater than 10 feet in length but less than 20 feet in length have the designation as BRI as the bridge category code. Structures greater than 4 feet in length but less than 10 feet in length are considered culverts regardless of actual structure type. These structures are designated as CUL structures. BRI or CUL refers to the Bridge Category Code.

2.2 Inspection Requirements

According to the NBIS, bridges must be inspected every 24 months unless conditions warrant a more frequent inspection interval or written permission is obtained to extend the interval to a maximum of 48 months. Certain data must be collected during each inspection and reported to the Federal Government for bridges in the NBI.

Under Massachusetts General Laws (M.G.L.) Chapter 85 Section 35, MassDOT is required to determine the safe load carrying capacity of all municipally owned bridges. This cannot be determined without a bridge inspection and therefore MassDOT is responsible for the inspection

of all municipally owned NBI structures. Inspection findings are provided in the form of hard copy reports. MassDOT however, is not responsible for the regular inspection of non-NBI structures.

According to Section 8 of the MassDOT Bridge Inspection Handbook, MassDOT will inspect non-NBI structures as staffing levels permit. NBI structures and MassDOT owned structures are given priority over municipally owned structures.

Below is a link to the MassDOT Bridge Inspection Handbook for further information:

http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/BridgeInspectionHandbook.aspx

2.3 Inspection Reports

The inspection reports contain a description of each structure and an evaluation of each component of the structure including deck, superstructure, substructure, approaches, stream channel, etc. Each component is given a numerical Condition Rating as well a description of any deficiencies. The deficiencies are categorized by severity and urgency of repair. The reports will also contain pictures and summaries of the deficiencies noted.

2.3.1 Condition Ratings

The condition of each bridge component is rated on a scale of 0-9 with 9 being the best rating and 0 being the poorest rating. In general, a rating of 7-9 indicates the component is in "good" condition, a rating of 5-6 indicates the component is in "fair" condition and a rating of 0-4 indicates the component is in "poor" condition. Refer to an inspection report for a more detailed description of each numerical rating.

2.3.2 **Deficiency Definitions**

Structure components exhibiting deficiencies are categorized first by the severity of the deficiency and second by the urgency of the repair required. The categories of deficiencies are "Minor", "Severe/Major". "Critical Structural", and "Critical Hazard". Refer to an inspection report for a more detailed description of each category. The urgency of repairs are defined by "Immediate", "ASAP", and "Prioritize". The definitions of each are below and also on each inspection report:

Immediate (I) – Inspectors immediately contact District Bridge Engineer (for MassDOT) and receive further instruction.

ASAP (A) – Action should be initiated by Responsible Party (owner) upon receipt of the Inspection Report.

Prioritize (P) – Shall be prioritized by Responsible Party (owner) and repairs scheduled when funds/manpower is available.

2.3.3 Inspection Types

2.3.3.1 Routine Inspections

Routine inspections are used to determine the general condition of a structure. They are "handson" inspections, meaning each component is inspected up close.

2.3.3.2 Underwater Inspections

Underwater inspections are performed on substructures units in water. Depending on water depth, a dive team may be required to assess the condition of the substructure. These inspections should be performed every 36 to 60 months.

2.3.3.3 Fracture Critical Inspections

Fracture Critical Inspections are performed on structures containing fracture critical members. Fracture Critical Members are defined as steel members in tension or with a tension element, whose failure would be expected to cause a portion or the entire structure to collapse. These inspections are performed at the same time as the routine inspections following procedures specific to each bridge. The procedures are kept on file for each bridge by MassDOT.

2.3.3.4 Special Member Inspections

Special member inspections are performed when a major bridge component (deck, superstructure, substructure) has an overall rating of 4 or lower. If the overall rating is a 4, the inspection frequency of the entire structure is reduced to 12 months. If the overall rating is 3, the inspection frequency is reduced to 6 months.

2.3.3.5 Freeze/Thaw Inspections

According to the MassDOT Bridge Inspection Manual, freeze/thaw inspections are performed yearly to evaluate exposed concrete elements and ensure deteriorated concrete does not fall onto a travelled way.

3. Town of Rowley Bridge Inventory3.1 List of Town Owned Bridges

Below are tables listing all Town owned bridges in order by structure identification number (Table 1) and overall worst to best condition (Table 2).

Table 1: By Structure Number

Town ID No.	MassDOT Bridge No.	Feature Carried	Feature Intersected	Structure Material	Structure Type	Hydraulic Opening	Overall Condition
1		Bennett Hill Rd.	N/A	Stone	Single Culvert	24" dia.	6
2		Boxford Rd.	N/A	Pipe (Metal)	Single Culvert	30" dia.	6
3		Boxford Rd.	N/A	Pipe (Metal)	Single Culvert	30" dia.	6
4		Boxford Rd.	N/A	Pipe (Poly)	Single Culvert	24" dia	6
5		Bradford St.	N/A	Pipe (Clay)	Single Culvert	24" dia.	6
6		Central St.	N/A	Granite Slabs/30" CMP at outlet	Single Culvert	48" W x 30" H	6
7		Central St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	5
8		Central St.	N/A	Pipe (Metal)	Single Culvert	36" dia.	6
9		Christopher Rd.	N/A	Pipe (Metal)	Single Culvert	36" dia.	7
10		Cross St.	N/A	Concrete/Granite	Slab	63" W x 48" H	7
11		Cross St.	N/A	Pipe (Metal)	Single Culvert	24" dia.	6
12		Daniels Rd.	N/A	Pipe (Metal)	Single Culvert	24" dia.	5
13		Dodge Rd.	N/A	Pipe (Clay)	Single Culvert	28" W x 15" H	3
14		Dodge Rd.	N/A	Pipe (Metal)	Single Culvert	24" dia.	7
15		Dodge Rd.	N/A	Pipe (Metal)	Double Culvert	2 - 12" dia.	5
16	R11005	Dodge Rd.	Mill River	Concrete	Arch-Deck		7
17	R11002	Glen St.	Mill River	Concrete	Arch-Deck		4
18		Haverhill St.	N/A	Pipe (Metal)	Single Culvert	24″ dia	5
19		Haverhill St.	N/A	Pipe (HDPE)	Single Culvert	18" dia	6
20		Haverhill St.	N/A	DS Pipe (Metal) US pipe (Plastic)	Single Culvert	24″ dia	5
21		Haverhill St.	N/A	Concrete	Single Culvert	24" dia	4
22		Haverhill St.	N/A		Single Culvert		
23		Haverhill St.					
24		Haverhill St.	N/A	Concrete	Single Culvert	30" dia.	5
25		Haverhill St.	Mill River	TBD	TBD	TBD	

Good

5

Town ID No.	MassDOT Bridge No.	Feature Carried	Feature Intersected	Structure Material	Structure Type	Hydraulic Opening	Overall Condition
26		Hillside St.	N/A	Pipe (Metal)	Single Culvert	36" dia.	7
27		Hillside St.	N/A	Pipe	Single Culvert	Could not measure	4
28		Independent St.	Ox Pasture Brook		Opened Bottom Arch	44" W x 24" H	4
29		Newbury Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	7
30		Newbury Rd.	N/A	Pipe (Metal)	Single Culvert	12" dia.	7
31		Newbury Rd.	N/A	Pipe (Metal)	Single Culvert	unknown	5
32		Pleasant St.	N/A	not visible	Single Culvert	Could not measure	5
33		Prospect St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	8
34		School St.	N/A	Masonry/ Concrete	Single Culvert	50" W x 50" H	6
35		Summer St.	N/A	Pipe (Concrete/ Clay)	Single Culvert	24" dia. Clay @ inlet, 36" dia. Conc. @ outlet	7
36		Turcotte Mem. Dr.	N/A	Pipe (Concrete)	Double Culvert	2 - 46" dia.	8
37		West Ox Pasture Ln.	N/A	Pipe (Poly)	Single Culvert	12" dia.	8
38		Wethersfield St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	5
39	R11008	Wethersfield St.	Mill River	Concrete	Frame		8
40	R11009	Wethersfield St.	Batchelder Brook	Concrete	Frame		7
41		Wethersfield St.	N/A				
42		Wilkes Rd.	N/A	Pipe (Concrete)	Double Culvert	2-15" dia.	8
43		Spencer Knowles Rd.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	8
44		Wethersfield St.	N/A	Pipe (Poly)	Single Culvert	14" dia.	6
45		Haverhill St.	N/A		Single Culvert	12" est.	6
46		Haverhill St.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	6
47		Boxford Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	5
48		Boxford Rd.	N/A	Pipe (Poly)	Single Culvert	24″ dia	6
49		Wilkes Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	6
50		Cindy Ln.	N/A	Pipe (Concrete)	Triple Culvert	3 - 30" dia.	7
51	R11007	Glen St. Ext.	Mill River	Masonry	Arch-Deck		7
52	R11006	Mill Rd.	Mill River	Steel	Girder		4

Table 2: By Condition Rating, worst to best

Town ID No.	MassDOT Bridge No.	Feature Carried	Feature Intersected	Structure Material	Structure Type	Hydraulic Opening	Overall Condition
13		Dodge Rd.	N/A	Pipe (Clay)	Single Culvert	28" W x 15" H	3
17	R11002	Glen St.	Mill River	Concrete	Arch-Deck		4
21		Haverhill St.	N/A	Concrete	Single Culvert	24" dia	4
27		Hillside St.	N/A	Pipe	Single Culvert	Could not measure	4
28		Independent St.	Ox Pasture Brook		Opened Bottom Arch	44" W x 24" H	4
52	R11006	Mill Rd.	Mill River	Steel	Girder		4
7		Central St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	5
12		Daniels Rd.	N/A	Pipe (Metal)	Single Culvert	24" dia.	5
15		Dodge Rd.	N/A	Pipe (Metal)	Double Culvert	2 - 12″ dia.	5
18		Haverhill St.	N/A	Pipe (Metal)	Single Culvert	24" dia	5
20		Haverhill St.	N/A	DS Pipe (Metal) US pipe (Plastic)	Single Culvert	24" dia	5
24		Haverhill St.	N/A	Concrete	Single Culvert	30" dia.	5
31		Newbury Rd.	N/A	Pipe (Metal)	Single Culvert	unknown	5
32		Pleasant St.	N/A	not visible	Single Culvert	Could not measure	5
38		Wethersfield St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	5
47		Boxford Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	5
1		Bennett Hill Rd.	N/A	Stone	Single Culvert	24" dia.	6
2		Boxford Rd.	N/A	Pipe (Metal)	Single Culvert	30" dia.	6
3		Boxford Rd.	N/A	Pipe (Metal)	Single Culvert	30" dia.	6
4		Boxford Rd.	N/A	Pipe (Poly)	Single Culvert	24" dia	6
5		Bradford St.	N/A	Pipe (Clay)	Single Culvert	24" dia.	6
6		Central St.	N/A	Granite Slabs/30" CMP at outlet	Single Culvert	48" W x 30" H	6
8		Central St.	N/A	Pipe (Metal)	Single Culvert	36" dia.	6
11		Cross St.	N/A	Pipe (Metal)	Single Culvert	24" dia.	6
19		Haverhill St.	N/A	Pipe (HDPE)	Single Culvert	18" dia	6
34		School St.	N/A	Masonry/ Concrete	Single Culvert	50" W x 50" H	6
44		Wethersfield St.	N/A	Pipe (Poly)	Single Culvert	14" dia.	6
45		Haverhill St.	N/A		Single Culvert	12" est.	6
46		Haverhill St.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	6

Good

7

Poor

48Boxford Rd.N/APipe (Poly)Single Culvert24" dia49Wilkes Rd.N/APipe (Concrete)Single Culvert12" dia.9Christopher Rd.N/APipe (Metal)Single Culvert36" dia.10Cross St.N/AConcrete/GraniteSlab63" W x 48" H14Dodge Rd.N/APipe (Metal)Single Culvert24" dia.16R11005Dodge Rd.Mill RiverConcreteArch-Deck26Hillside St.N/APipe (Metal)Single Culvert36" dia.	6 6 7 7 7 7 7 7 7 7 7 7 7
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14Dodge Rd.N/APipe (Metal)Single Culvert24" dia.16R11005Dodge Rd.Mill RiverConcreteArch-Deck26Hillside St.N/APipe (Metal)Single Culvert36" dia.	7 7 7
16R11005Dodge Rd.Mill RiverConcreteArch-Deck26Hillside St.N/APipe (Metal)Single Culvert36" dia.	7 7
26 Hillside St. N/A Pipe (Metal) Single Culvert 36" dia.	7
	7
29 Newbury Rd. N/A Pipe (Concrete) Single Culvert 12" dia.	
30Newbury Rd.N/APipe (Metal)Single Culvert12" dia.	7
35 Summer St. N/A Pipe (Concrete/ Single Culvert 24" dia. Clay @ Clay) inlet, 36" dia. Conc. @ outlet	7
40 R11009 Wethersfield St. Batchelder Concrete Frame Brook	7
50Cindy Ln.N/APipe (Concrete)Triple Culvert3 - 30" dia.	7
51 R11007 Glen St. Ext. Mill River Masonry Arch-Deck	7
33Prospect St.N/APipe (Concrete)Single Culvert24" dia.	8
36Turcotte Mem. Dr.N/APipe (Concrete)Double Culvert2 - 46" dia.	8
37West Ox Pasture Ln.N/APipe (Poly)Single Culvert12" dia.	8
39R11008Wethersfield St.Mill RiverConcreteFrame24" dia.	8
42 Wilkes Rd. N/A Pipe (Concrete) Double Culvert 2-15" dia.	8
43 Spencer Knowles Rd. N/A Pipe (Concrete) Single Culvert 24" dia.	8
22 Haverhill St. N/A Single Culvert	
23 Haverhill St. Batchelder Brook	
25 Haverhill St. Mill River TBD TBD TBD	
41 Wethersfield St. N/A	

3.2 Functionally Obsolete/Structurally Deficient Bridges

The FHWA tracks bridges considered Functionally Obsolete or Structurally Deficient.

3.2.1 Definitions

Functionally Obsolete – This term describes a structure that is not suitable for its current use. There are a number of reasons a bridge may be functionally obsolete including shoulder width, lane width, barrier type, approach geometry, etc.

Structurally Deficient – This term describes a bridge with a rating of a major component (deck, superstructure, substructure) of a 4 or below. Bridge owners typically make repairs to structurally deficient bridges as soon as possible so they can be removed from the list.

3.3 Overview of Town Owned NBI Bridges (Span length > 20 ft.)

All NBI bridges owned by the Town are inspected on a regular basis by MassDOT with condition ratings reported to the federal government. The evaluations below are based on information contained in the latest available MassDOT Inspection Report.

R-11-005 Dodge Road over Mill River



R-11-008 Wethersfield Street over Mill River







BRIDGE TYPE	Arch-deck with concrete	BRIDGE TYPE	Concrete frame
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	Concrete Parapet	UPSTREAM	Concrete Parapet
DOWNSTREAM	Concrete Parapet	DOWNSTREAM	Concrete Parapet
OVERALL CONDITION	7	OVERALL CONDITION	8
NOTES	See MassDOT Inspection Report	NOTES	See MassDOT Inspection Report

R-11-009 Wethersfield Street over Batchelder Brook



BRIDGE TYPE	Concrete frame
WEARING SURFACE	Asphalt
RAILING TYPE	
UPSTREAM	Metal Bridge Railing
DOWNSTREAM	Metal Bridge Railing
OVERALL CONDITION	7
NOTES	See MassDOT Inspection Repo

NOTES See MassDOT Inspection Report

3.4 Overview of Town Owned non-NBI Bridges (Span length between 10 ft. and 20 ft.)

All non-NBI bridges owned by the Town should be inspected on a regular basis by MassDOT. Because the condition of these structures is not required to be reported to the federal government, these structures are inspected if MassDOT resources are available. The evaluations below are based on information contained in the latest available MassDOT Inspection Report.

R-11-002 Glen Street over Mill River



R-11-007 Glen Street Extension over Mill River







BRIDGE TYPE	Arch-deck with concrete	BRIDGE TYPE	Masonry Arch
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	Concrete Parapet	UPSTREAM	None
DOWNSTREAM	Concrete Parapet	DOWNSTREAM	None
OVERALL CONDITION	4	OVERALL CONDITION	7
NOTES	See MassDOT Inspection Report	NOTES	See MassDOT Inspection Report.

R-11-006 Mill Road over Mill River



BRIDGE TYPE	Steel Girder
WEARING SURFACE	Asphalt
RAILING TYPE	Concrete parapet with chain link fence
OVERALL CONDITION	4
UPSTREAM DOWNSTREAM	None None
NOTES	See MassDOT Inspection Report

3.5 **Overview of other Town Owned Structures**

Structures with span lengths less than 10 ft. are considered culverts and are not inspected by MassDOT. VHB visited each structure and the evaluations below are based on field assessments of each structure. Approximate street address shown in (_)

1. Bennett Hill Road (22)





2. Boxford Road (38)





BRIDGE TYPE	Single culvert-Stone	BRIDGE TYPE	Single culvert with metal pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	Wood	UPSTREAM	None
DOWNSTREAM	None	DOWNSTREAM	None
OVERALL CONDITION	6	OVERALL CONDITION	6
NOTES:	Difficult access due to vegetation	NOTES:	Clean culvert of sediment, and
IMMEDIATE NEEDS	Remove vegetation from channel		channel of debris and vegetation.
		IMMEDIATE NEEDS	Culvert is almost full of sediment, dry laid stone headwalls satisfactory

3. Boxford Road (238)



4. Boxford Road (326)







BRIDGE TYPE	Single culvert with metal pipe	BRIDGE TYPE	Single culvert with poly pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM DOWNSTREAM	None None	UPSTREAM DOWNSTREAM	None None
OVERALL CONDITION	6	OVERALL CONDITION	6
NOTES:	SDS headwall has 5" +/- tree growing on top. Both stone headwalls have loose or settled stones.	NOTES:	Plastic pipe is generally in a good condition, but damaged in upstream end. No headwalls. Loose stone laid on downstream
IMMEDIATE NEEDS	Clean debris from channel; remove tree at downstream headwall; rebuild both headwalls.	IMMEDIATE NEEDS	end. Clear vegetation and debris; monitor undermining at pipe ends.

5. Bradford Street (53)



6. Central Street (23)







BRIDGE TYPE WEARING SURFACE **RAILING TYPE** UPSTREAM DOWNSTREAM **OVERALL CONDITION** NOTES:

Single culvert with clay pipe	E
Asphalt	WEARI
	WEARI
	R
Wood	
None	
6	DC
Un-grouted masonry headwall and channel outlet. Inlet headwall is failing (un-grouted stone). Pipe is half filled with sediment. Pavement	OVERALI

is in poor condition.

BRIDGE TYPE	Single Culvert with granite slabs/30" CMP at outlet
WEARING SURFACE	Asphalt
RAILING TYPE	
UPSTREAM DOWNSTREAM	Guardrail Wood
OVERALL CONDITION	6
NOTES:	Rusting and section loss at inlet. Partial collapsing of outlet headwall (missing stones). Flooding issues due to heavy rain.

IMMEDIATE NEEDS

7. Central Street (151)



8. Central Street (293)

BRIDGE TYPE	Single culvert with concrete pipe	BRIDGE TYPE	Single culvert with metal pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	None	UPSTREAM	None
DOWNSTREAM	Wood	DOWNSTREAM	None
OVERALL CONDITION	5	OVERALL CONDITION	6
NOTES:	Headwall at outlet is leaning. Inlet at pond on private property.	NOTES:	Corrosion and section loss for first 5' of pipe. Headwalls are concrete.
IMMEDIATE NEEDS	Grout stones at outlet headwall. Remove debris.	IMMEDIATE NEEDS	

9. Christopher Road (47)



10. Cross Street (12)







BRIDGE TYPE	
WEARING SURFACE	
RAILING TYPE	
UPSTREAM	
DOWNSTREAM	
OVERALL CONDITION	
NOTES:	

Single culvert with metal pipe	
Asphalt	WE
Maria	
None	
None	
7	OVER
Vertical crack appears in downstream headwall. Inlet is on private property.	

S	BRIDGE TYPE
A	WEARING SURFACE
	RAILING TYPE
V	UPSTREAM
V	DOWNSTREAM
7	ERALL CONDITION
Ν	NOTES:
S	

Slab with concrete/granite Asphalt Wire Wood

**00

Masonry abutment with granite slab. Last 5' at downstream end is concrete abutments and slab.

IMMEDIATE NEEDS

11. Cross Street (84)

12. Daniels Road (25)

BRIDGE TYPE	
WEARING SURFACE	
RAILING TYPE	
UPSTREAM	
DOWNSTREAM	
OVERALL CONDITION	

BRIDGE TYPE	Single culvert with metal pipe	BRIDGE TYPE	Single culvert with metal pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE UPSTREAM	None	RAILING TYPE UPSTREAM	None
DOWNSTREAM	None	DOWNSTREAM	Wood
OVERALL CONDITION	6	OVERALL CONDITION	5
NOTES:	Some crushing of pipe appears at outlet (could have been at construction). Grouted masonry appears at inlet; dry stacked masonry appears at outlet.	NOTES:	Bank erosion appears at downstream. Downstream headwall and wingwall appear to have collapsed.
IMMEDIATE NEEDS	musoni y appears at outlet.	IMMEDIATE NEEDS	Rebuild downstream headwall and wingwall.

13. Dodge Road (22)



Sin	BRIDGE TYPE
Asp	WEARING SURFACE
	RAILING TYPE
Noi	UPSTREAM
Noi	DOWNSTREAM
3	OVERALL CONDITION
Apj anc Dej	NOTES:

IMMEDIATE NEEDS

Single culvert with clay pipe	
Asphalt	WEAR
	F
None	
None	D
3	OVERAL
Appears headwall, wingwalls, and pipe have collapsed at outlet. Depression occurs in road above	
pipe.	IMME
Replace	

BRIDGE TYPE	
WEARING SURFACE	
RAILING TYPE	
UPSTREAM	
DOWNSTREAM	
OVERALL CONDITION	
NOTES:	

14. Dodge Road (77)

Single culvert with metal pipe

Asphalt

None None

7

Riprap slope at inlet, perched outlet. Minor erosion of outlet bank.

15. Dodge Road (149)

BRIDGE TYPE WEARING SURFACE RAILING TYPE UPSTREAM DOWNSTREAM

IMMEDIATE NEEDS

NOTES:

Double culvert with metal pipe	BR
Asphalt	WEARING
None None	RAI I DOV
5	OVERALL C
Gaps in stones at inlet and outlet. Perched outlet, bottom of pipe with 100% section loss for approx. 3' (water does not flow out end of pipe)	

BRIDGE TYPE	
WEARING SURFACE	
RAILING TYPE UPSTREAM DOWNSTREAM	
OVERALL CONDITION	
NOTES:	

18. Haverhill Street (43)

Single culvert with metal pipe Asphalt

Metal guardrail Metal guardrail

5

Downstream end of pipe is rusted with minor section loss. Wingwalls are spalled and cracked. Upstream pipe is not visible. Headwall condition is poor with spalling and sink hole behind.

IMMEDIATE NEEDS

Rebuild upstream headwall

19. Haverhill Street (62)



20. Haverhill Street (89)







BRIDGE TYPE	Single culvert with HDPE pipe Asphalt	BRIDGE TYPE	Single culvert with metal pipe (downstream) and plastic pipe (upstream)
RAILING TYPE UPSTREAM DOWNSTREAM	Metal guardrail None	WEARING SURFACE RAILING TYPE	Asphalt
OVERALL CONDITION	6	UPSTREAM DOWNSTREAM	Metal guardrail None
NOTES:	Pipe is in a good condition. Downstream stone headwall is	OVERALL CONDITION	5
IMMEDIATE NEEDS	in a good condition. Concrete upstream headwall has some spalling. Clean debris at portals.	NOTES:	Upstream headwall in fair condition with some spalling. Roadway drains directly over headwall. Downstream headwall has minor spalling.
		IMMEDIATE NEEDS	Repair upstream headwall

21. Haverhill Street (223)

22. Haverhill Street (112)



BRIDGE TYPE	Single culvert with concrete	BRIDGE TYPE	Single culvert with metal pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	Metal guardrail	UPSTREAM	None
DOWNSTREAM	None	DOWNSTREAM	None
OVERALL CONDITION	4	OVERALL CONDITION	
NOTES:	Upstream headwall is in a good condition. Downstream headwall has failed.	NOTES:	Upstream (N) is very heavily vegetated. Access is limited to obtain info on the culvert.
IMMEDIATE NEEDS	Rebuild downstream headwall.		Channel appears to drop upon entering upstream. Could not find downstream portal.
		IMMEDIATE NEEDS	Clear vegetation up stream for better access. Scope upstream portal.

23. Haverhill Street over Batchelder Brook (312)



24. Haverhill Street (713)







BRIDGE TYPE	Single culvert with HDPE pipe	BRIDGE TYPE	Single culvert with concrete
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	Metal guardrail	UPSTREAM	Metal guardrail
DOWNSTREAM	Metal guardrail	DOWNSTREAM	Metal guardrail
OVERALL CONDITION		OVERALL CONDITION	5
NOTES:	Culvert completely submerged.	NOTES:	Upstream pipe submerged in
IMMEDIATE NEEDS	Re-inspect during lower flow period.		water, not visible. Mortared stone headwall is in a good condition. Downstream pipe is 90% full. Stone headwall has failed.

IMMEDIATE NEEDS

Repair downstream headwall.

25. Haverhill Street over Mill River (851) 26. Hillside Street (60)









BRIDGE TYPE	TBD	BRIDGE TYPE	Single culvert with metal pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE UPSTREAM DOWNSTREAM	Metal guardrail Metal guardrail	RAILING TYPE UPSTREAM DOWNSTREAM	None None
OVERALL CONDITION		OVERALL CONDITION	7
NOTES:	Due to high water and heavy debris, culvert was not visible at either end.	NOTES:	Concrete headwall and wingwalls at inlet. Masonry at outlet. Floods frequently.
IMMEDIATE NEEDS	Revisit culvert during period of low flow to better identify.	IMMEDIATE NEEDS	

27. Hillside Street (170)



Brook (40)

BRIDGE TYPE	
WEARING SURFACE	
RAILING TYPE	
UPSTREAM	
DOWNSTREAM	
OVERALL CONDITION	
NOTES:	

Single culvert with pipe	
Asphalt	WE
None	
None	
4	OVER
Inlet and outlet headwalls have completely collapsed.	
Rebuild headwalls.	

BRIDGE TYPE Opened bottom arch EARING SURFACE Asphalt RAILING TYPE UPSTREAM Guardrail DOWNSTREAM Guardrail RALL CONDITION 4 NOTES: Erosion appears behi

28. Independent Street over Ox Pasture

Erosion appears behind headwall and wing at inlet and outlet. Partial collapse of upstream wingwalls. Un-grouted masonry. Fills up during heavy rain but no overtopping.

IMMEDIATE NEEDS

Reconstruct headwall and wingwall; remove debris.

29. Newbury Road (164)



30. Newbury Road (204)

BRIDGE TYPE
WEARING SURFACE
RAILING TYPE
UPSTREAM
DOWNSTREAM
OVERALL CONDITION

NOTES:

Single culvert with concrete pip	De BRII
Asphalt	WEARING
None None	RAIL U DOWI
7	OVERALL CO
Inlet is steel grate and drop inle Outlet to riprap apron and field Asphalt on top is rutted and patched.	

BRIDGE TYPE	Single culvert with metal pipe	
WEARING SURFACE	Asphalt	
RAILING TYPE		
UPSTREAM	None	
DOWNSTREAM	None	
OVERALL CONDITION	7	
NOTES:	Un-grouted masonry headwall and wingwalls at inlet and outlet. (drying during field visit)	

IMMEDIATE NEEDS

31. Newbury Road (259)



BRIDGE TYPE	Single culvert with metal pipe	BRIDGE TYPE	Single culvert
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	None	UPSTREAM	Wood
DOWNSTREAM	None	DOWNSTREAM	None
OVERALL CONDITION	5	OVERALL CONDITION	5
NOTES:	Inlet headwall is missing. Outlet headwall is not visible. Riprap slopes around outlet.	NOTES:	Headwall at outlet has collapsed. Inlet is partially blocked with sediment.
IMMEDIATE NEEDS	Uncover inlet and outlet.	IMMEDIATE NEEDS	Repair headwall and remove sediment.

32. Pleasant Street (49)

33. Prospect Street (35)

<image>

34. School Street (36)

STAT Y	
	BRIDGE TYPE
	WEARING SURFACE
	RAILING TYPE
	UPSTREAM
	DOWNSTREAM
	OVERALL CONDITION

NOTES:

IMMEDIATE NEEDS

Single culvert with concrete pipe Asphalt Low stone parapet Low stone parapet 8 Grouted masonry headwall and wings.

ре	BRIDGE TYPE	Single culvert with masonry/ concrete
	WEARING SURFACE	Asphalt
	RAILING TYPE	
	UPSTREAM	Wood
	DOWNSTREAM	Wood
	OVERALL CONDITION	6
d	NOTES:	Headwall at inlet is leaning outwards. Some need of repointing. Cracks in asphalt.
		Densir sidevelle deventreers

IMMEDIATE NEEDS

Repair sidewalk, downstream side.

35. Summer Street (67)



36. Turcotte Memorial Drive (8)



YPE Sin pip	BRIDGE
ACE As	WEARING SUR
YPE	RAILING
EAM No	UPST
EAM Wo	DOWNST
TION 7	OVERALL COND
TES: Mir	N

Single culvert with concrete/clay pipe	
Asphalt	

ne ood

nor erosion appears behind inlet wingwall. Additional 15" dia. Conc. Pipe at outlet from nearby drop inlet.

BRIDGE TYPE
WEARING SURFACE
RAILING TYPE
UPSTREAM
DOWNSTREAM
OVERALL CONDITION
NOTES:

IMMEDIATE NEEDS

Double culvert with concrete pipe Asphalt

Wood guardrail Wood guardrail

8

North pipe is blocked with debris.

37. West Ox Pasture Ln. (45)

38. Wethersfield Street (256)



BRIDGE TYPE

RAILING TYPE UPSTREAM DOWNSTREAM

OVERALL CONDITION

NOTES:

IMMEDIATE NEEDS

Single culvert with poly pipe	
Compacted Stone	WE
None None	
8	OVER
Recently installed structure. Riprap slopes.	

Sing	BRIDGE TYPE
Aspl	WEARING SURFACE
	RAILING TYPE
Woo	UPSTREAM
Woo	DOWNSTREAM
5	OVERALL CONDITION
No p	NOTES:

IMMEDIATE NEEDS

Single culvert with concrete pipe

Asphalt

Wood guardrail Wood guardrail

No pointing at outlet. Dislodged stones at inlet headwall, no pointing.

Remove trees behind headwall; rebuild inlet headwall.

41. Wethersfield Street

Culvert is being replaced in 2018.

42. Wilkes Road (29)



BRIDGE TYPE	Double culvert with concrete pipe
WEARING SURFACE	Asphalt
RAILING TYPE	
UPSTREAM	Conc. Parapet with metal rail
DOWNSTREAM	Conc. Parapet with metal rail
OVERALL CONDITION	8
NOTES:	Pipes at base of back-to-back retaining walls are supporting road.

43. Spencer Knowles Road (28)



44. Wethersfield Street







BRIDGE TYPE WEARING SURFACE RAILING TYPE UPSTREAM DOWNSTREAM

VERALL CONDITION

NOTES:

IMMEDIATE NEEDS

Single culvert with concrete pipe
Asphalt
Conc. Parapet with metal rail
Conc. Parapet with metal rail
8
Minor cracks appear in parapet.

S	BRIDGE TYPE
A	WEARING SURFACE
	RAILING TYPE
Ν	UPSTREAM
Ν	DOWNSTREAM
6	OVERALL CONDITION
D	NOTES:
0	

Single culvert with poly pipe Asphalt

None None

6

Drains wetlands area. Dip in road over pipe. Un-grouted stones for headwall.

45. Haverhill Street (414)



BRIDGE TYPE	Single culvert	BRIDGE TYPE	Single culvert with concrete pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE UPSTREAM DOWNSTREAM	None Metal guardrail	RAILING TYPE UPSTREAM DOWNSTREAM	Metal guardrail Metal guardrail
OVERALL CONDITION	6	OVERALL CONDITION	6
NOTES:	Downstream (N) portal is submerged in water; headwall fair; upstream portal appears to be CB.	NOTES:	Upstream (N) portal is submerged in water; headwall fair; downstream pipe is about 1/2 full of heavy debris.
	Clean DS channel.	IMMEDIATE NEEDS	Clean debris from pipe and DS channel.

46. Haverhill Street (908)

47. Boxford Road (139)



48. Boxford Road (151)







BRIDGE TYPE	Single culvert with concrete pipe	BRIDGE TYPE	Single culvert with poly pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	None	UPSTREAM	None
DOWNSTREAM	None	DOWNSTREAM	None
OVERALL CONDITION	5	OVERALL CONDITION	6
NOTES:	DS Stone headwall has large tree and roots growing over it.	NOTES:	Pipe is in a good condition, no headwall downstream.; upstream headwall meets satisfactory.
IMMEDIATE NEEDS	Remove tree at DS headwall and		neduwali meets satisfactory.
	re-set stones. Clean channel of debris.	IMMEDIATE NEEDS	Clear vegetation and debris. Pipe is in a good condition, no headwall downstream.; upstream headwall meets satisfactory.

49. Wilkes Road (5)



BRIDGE TYPE	Single culvert with concrete pipe	BRIDGE TYPE	Triple culvert with concrete pipe
WEARING SURFACE	Asphalt	WEARING SURFACE	Asphalt
RAILING TYPE		RAILING TYPE	
UPSTREAM	None	UPSTREAM	Wood guardrail
DOWNSTREAM	Wood	DOWNSTREAM	Wood guardrail
OVERALL CONDITION	6	OVERALL CONDITION	7
NOTES:	Debris appears at inlet and no headwall. Stone headwall at outlet.	NOTES:	Vegetation growing between pipes and on slopes.
IMMEDIATE NEEDS	(Dry during field visit) Remove debris from inlet.	IMMEDIATE NEEDS	Remove vegetation growing between pipes.

50. Cindy Lane (5)

Recommendations for Prioritized Repairs

The recommended repairs have been prioritized and categorized into 1-year, 5-year, and 10-year time horizons. In addition, deficiencies that do not affect the structural integrity of the structure yet still should be repaired are prioritized but fall into the category of completed as able.

4.1 Repairs to be Completed Within a Year

It is recommended that the structure running beneath Dodge Road be replaced as soon as possible. The road exhibits a large depression over the structure which has been filled/patched multiple times. The depression indicates that the structure has at least partially collapsed. It is recommended that the structure be replaced with a HDPE or concrete pipe of a diameter that matches the hydraulic capacity of the existing structure. It is also recommended that MassDOT standard headwalls are installed at each end of the pipe. Please refer to the attached excerpts from the Construction Standards in Appendix C.

Priority	Town	MassDOT	Feauture	Feature	Recomended	Conceptual
	ID No	Bridge No.	Carried	Intersected	Repair	Cost Estimate
1	13		Dodge Rd.	N/A	Replace structure	\$34,400

4.2 Repairs to be Scheduled Within 5 Years

The structures listed below are in poor condition and should be considered for repair/ replacement. Both structures are greater than 10' in length but less than 20' and therefore qualify for funding under MassDOT's current Small Bridge Program. This program reimburses municipalities up to \$500,000 per year to repair/replace small bridges. Municipalities must submit an application demonstrating the need for the funds with application deadlines twice a year on April 1 and October 1. The program is slated to last 5 years and began in October 2016. These bridges were put into the 5-year time horizon category to take advantage of this funding source.

Bridge R-11-002:

This structure is a concrete arch and was given the following condition ratings from the most recent MassDOT inspection – Superstructure: 4, Substructure: 4, meaning the entire structure is in poor condition. In addition to the condition of the structure itself, undermining of one of the abutments was noted. This means soil has been washed away from beneath the bridge footing. The concrete appears to be crumbling and in poor condition. Major cracks with efflorescence was observed meaning water is flowing through the concrete.

Bridge R-11-006:

This structure consists railroad tracks embedded in a concrete slab on masonry abutments and was given the following condition ratings from the most recent MassDOT inspection – Deck: 5, Superstructure: 4, Substructure: 6, meaning the superstructure is in poor condition. This structure is located on a dead-end unpaved road therefore failure of this structure completely cuts off property access for some residents. It is anticipated that the existing substructures could be rehabilitated, and the superstructure should be replaced.

Priority	Town ID No	MassDOT Bridge No.	Feauture Carried	Feature Intersected	Recomended Repair	Conceptual Cost Estimate
1	17	R11002	Glen St.	Mill River	Replace with a precast concrete span	\$796,000
2	52	R11006	Mill Rd.	Mill River	Replace with a precast concrete span	\$488,000

4.3 Repairs to be Scheduled Within 10 Years

It is recommended that the structure listed below be replaced. The wingwalls are failing and there are signs of bank erosion behind the wingwalls. This will eventually lead to erosion of the roadway. Some stones have been dislodged from the dry stacked masonry abutments. The superstructure which appears to consist of granite slabs exhibits cracks. The structure is especially important since it is located near the entrance to the DPW yard and sees heavy truck traffic.

The recommendation to replace this structure in the next 10 years is based on the assumption that funding for the project would need to come from the town's funds (i.e. no state funding) and it will take some time to plan for and save the funds required for the replacement project.

Priority	Town	MassDOT	Feauture	Feature	Recomended	Conceptual
	ID No	Bridge No.	Carried	Intersected	Repair	Cost Estimate
1	28		Independent St.	Ox Pasture Brook	Replace with a precast concrete span	\$400,000

4.4 Repairs to be Scheduled as Funds/Labor Available

It is recommended that the following list of repairs be completed as funding/town labor forces are available. These deficiencies do not affect the structural integrity of the structure but can impact the performance of the pipe or culvert. In some cases, the roadway which crosses the structure can be subject to erosion where failing headwalls are located close to the edge of the roadway. The repairs are prioritized according to the condition rating given to each.

Repair/Rebuild Headwalls:

It is recommended that where applicable, the headwalls are repaired/replaced in accordance with MassDOT standard construction details shown Appendix C. These could be completed by town forces or by a contractor.

Clear Vegetation/Debris:

Vegetation/debris near the structure inlets and outlets should be removed as recommended below. Vegetation/debris in the stream bed can limit flow and lead to potential flooding issues. When removing debris (such as rocks, logs, and other) care should be taken to not disturb or alter the natural stream bed. Trees growing near the inlets and outlets should be removed. The tree roots can damage the structure headwalls over time. This work can be completed with town forces.

Priority	Town ID No	MassDOT Bridge No.	Feauture Carried	Approximate Street Address	Recomended Repair	Conceptual Cost Estimate
1	21		Haverhill St.	223 Haverhill St.	Rebuild downstream headwall	\$7,300
1	27		Hillside St.	170 Hillside St.	Rebuild headwalls	\$18,800
2	7		Central St.	151 Central St.	Grout stones at outlet headwall. Remove debris	\$2,900
2	12		Daniels Rd.	25 Daniels Rd.	Rebuild downstream headwall and wingwall	\$14,200
2	18		Haverhill St.	43 Haverhill St.	Rebuild upstream headwall	\$7,300
2	20		Haverhill St.	89 Haverhill St.	Rebuild upstream headwall	\$7,300
2	24		Haverhill St.	713 Haverhill St.	Rebuild upstream headwall	\$9,400
2	31		Newbury Rd.	259 Nebury Rd.	Uncover inlet and outlet	\$1,200
2	32		Pleasant St.	49 Pleasant St.	Repair headwall, remove sediment	\$12,300
2	38		Wethers-field St.	256 Wethers-field St.	Remove trees behind headwall, rebuild inlet headwall	\$9,000

Priority	Town ID No	MassDOT Bridge No.	Feauture Carried	Approximate Street Address	Recomended Repair	Conceptual Cost Estimate
2	47		Boxford Rd.	139 Boxford Rd.	Remove tree at downstream headwall and re- set stones. Clean channel of debris	\$10,400
3	1		Bennett Hill Rd.	22 Bennett Hil Rd.	Remove vegetation from channel	\$1,700
3	2		Boxford Rd.	38 Boxford Rd.	Clean culvert of sediment, and channel of debris and vegetation.	\$4,400
3	3		Boxford Rd.	238 Boxford Rd.	Clean debris from channel, remove tree at downstream headwall, rebuild both headwalls.	\$22,800
3	4		Boxford Rd.	326 Boxford Rd.	Clear vegetation and debris	\$4,400
3	19		Haverhill St.	62 Haverhill St.	Clean debris	\$2,900
3	34		School St.	36 School St.	Repair sidewalk, downstream side	\$5,800
3	45		Haverhill St.	414 Haverhill St.	Clean debris from downstream channel	\$2,900
3	46		Haverhill St.	908 Haverhill St.	Clean debris from pipe and dowstream channel	\$2,900
3	48		Boxford Rd.	151 Boxford Rd.	Clear vegetation and debris	\$4,400
3	49		Wilkes Rd.	5 Wilkes Rd.	Remove debris from inlet	\$2,900
3	50		Cindy Ln.	5 Cindy Lane	Remove vegetation growing between pipes	\$2,900

Appendix A

MassDOT Bridge Inspection Reports

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 24

2-DIST B.I.N.	STR	UCTU		S INSPE					PORT $\[\]$	BI	R. DE	PT. N	10.
04 8BK			ΙΝΙΤ	IAL ROUTINE A	ARCH & SP		МЕМВЕ	R			R-1 1	-002	2
CITY/TOWN			8STI	RUCTURE NO.			11-	Kilo. POINT	41-STATUS	90-R	OUTIN	NE INS	P. DATE
ROWLEY				R11002-8E	SK-MUN	-BRI		000.080	A:OPEN	J	UN	20,	2016
07-FACILITY CARRIED			MEMORIAL NAME/LOCAL NAME 27-			7-YR BUILT	106-YR REBUIL	T YR I	REHAE	B'D (NC	ON 106)		
HWY GLEN ST								1850	0000		(0000)
06-FEATURES INTERSECTED				26-FUNCTIONAL	CLASS		DIST. BRII	DGE INSPEC	TION ENGINEER	Г. <mark>G.</mark> We	eil		
WATER MILL RIVE	R			Rural Loca	1								
43-STRUCTURE TYPE				22-OWNER Town	21-MAINTA Town	AINER	TEAM LEA	ADER M.		J MGR / Incorp	orated		
111 : Concrete Arc	:h - D	eck		Agency	Agency				51	meorp	oraccu	L	
107-DECK TYPE N:Not applicable				weather Sunny	TEMP. (air) 20°		TEAM ME A. GO		J. MACKEN	ZIE			
ITEM 58		1	ITE	M 59			1		M 60				
	Ν					4					4		
DECK	0	DEF		ERSTRUCTUI	KE .		DEF		TRUCTURE				DEF
1. Wearing surface	6	-		h/Arch Ring		4	M-P		outments	Dive	Cur	4	
2. Deck Condition	N	-	2. Key	stone Area		N	-	a. Pec	estals Ige Seats	N	N N		-
3. Spandrel Fill	Н	-	3. Str	ingers		Ν	-		kwalls	N	N		-
4. Curbs	Ν	-	4. Flo	orbeams		Ν	-		astwalls	N	5		M-P
5. Median	N	-	5. Spa	andrel Walls		4	M-P		gwalls oe Paving/Rip-Rap	N	4		M-P
6. Sidewalks	N	-	6. Spi	ing Lines		4	M-P	g. Poi	• • •	N	N		-
7. Parapets	5	M-P		phragms/Cross	Framos	N		h. Foo	tings	Ν	5		S-P
•	N							<u>i. Pile</u>		N	N 4		- S-P
8. Railing		-		nn Plt's, Gusset	ts & Angle	s 'N N		<u>j.</u> Sco k. Set	ur tlement	N	4 N		<u> </u>
9. Anti Missile Fence	N	-	9. Pin	& Hangers				<i>I.</i>		N	N		-
10 Drainage System	N	-	10 Ma	sonry Joints		N	-	<i>m.</i>		N	N		-
11 Lighting Standards	N	-	11 Ri	vets & Bolts		Ν	-		ers or Bents			N	
12 Utilities	5	M-P	12 W	elds		Ν	-	a. Peo b. Cap	estals	N	N N		-
13 Deck Joints	N	-	13 De	formation/Flatt	ening	Ν	-	c. Col		N	N		-
14	N	_	14 Me	ember Alignmer	nt	N	_		ns/Webs/Pierwalls		N		-
15				int/Coating		N		e. Poi f. Foo		N	N N		-
	N N	-		intooating			-	g. Pile		N	N		_
16	IN	-	16			Ν	-	h. Sco	ur	Ν	N		-
	E	w	Year	Painted		Ν			lement	N	N		-
CURB REVEAL (In millimeters)	N	N		ISION DAMAGE:		lain		j. k.		<u>N</u>	N		-
					-			3. Pi	e Bents			N	
APPROACHES		DEF		(X) Minor ()	Moderate (, , 38		a. Pile	Caps	N	N		-
a. Appr. pavement condition	6	_	LOAD	DEFLECTION:	Please exp	olain		b. Pile		N	N		-
b. Appr. Roadway Settlement	7	-	None	(X) Minor ()	Moderate () Sev	vere ()		gonal Bracing izontal Bracing	N N	N N		-
c. Appr. Sidewalk Settlement	N	-	LOAD	VIBRATION:	Please exp	olain		e. Fas		N	N		-
d.	N	-	None	(X) Minor ()	Moderate () Sev	vere()		RMINING (Y/N) If	YES ple	ease e	xplain	Y
OVERHEAD SIGNS	(Y/N)	Ν	A	rantura Critia-I	Mombor	(Y/N)	N	COLL	SION DAMAGE:				
(Attached to bridge)	()			racture Critical	wember:	(1/19)	N	-		Modera	te () Sev	ere ()
	N 1	DEF	—										
a. Condition of Welds		-	——					I-60 (Di	ve Report): N	<i>I-6</i>	0 (This	Repor	t): 4
b. Condition of Bolts	<u>N</u>	-											
c. Condition of Signs	N	-	Any C	Cracks: (Y/N)	N			93B-	J/W (DIVE) Insp		00	/00/0	000
X=UNKNOWN				PLICABLE		u_u_			SSIBLE		D-1		OVED

PAGE 2 OF 24

CITY/	TOWN	J			B.I.	N. BR. DEPT. NO.	8STRI	ICTU	REN	0		INSPECTION		ATE
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_								JZ-0L	JN-1					
ITTR	EM 61				5	ITEM 36 TRAFFIC SA	FETY 36	COND		DEF	ACCESS	BILITY	(Y/N	N/P)
-	NNE				Ŭ	A. Bridge Railing	1	5		M-P			Needed	
СНА	NNE	L PROTECTIO	V			B. Transitions	0	4		M-P	Lift Bucke	t	N N	N N
			Dive	Cur	DEF	C. Approach Guardrail	0	2		S-A	Boat		Y	Y
1.Ch	annel	Scour	N	6	-	D. Approach Guardrail Ends	0	6		-	Waders		Y	Y
2.Em	bankr	nent Erosion	N	5	M-P	WEIGHT POSTING	Not A	nnlion			Inspector	50	N	N
3.Del			N	N		Н	3		Single	X	Rigging		N	N
	getatio	n	N	7		Actual Posting N	N	N	Ν		Staging		N	Ν
	-	11				Recommended Posting N		N	Ν]	Traffic Co	ntrol	Ν	Ν
5.Uti			N	N	-					/2222	RR Flagge	r	Ν	Ν
· · ·		Slope Protection	N	Ν	-	Waived Date: 00/00/0000		L		/0000	Police		Ν	Ν
7.Ag	gradat	ion	N	Ν	-	At bridg	e S	Othe N	er Adva	nce S	Other:			
8.Fer	nder S	ystem	Ν	Ν	-	(Y=Yes,N=No,							Ν	Ν
						NR=NotRequired)			٦ŀ		TOTAL H	IOURS		8
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Date:		00/00/0000				Request for Rating of Relating	(1/14).						,	
					him ai	REASON: Never rated.								
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1 30	100	100 Da	.0	0/00	/0000									
						CONDITION R	ATING	GU	IDE	(For	Items 58, 59, 6	0 and 61)		
	CODE	CONDITION				DEFECTS								
	N	NOT APPLICABLE	_											
G	9	EXCELLENT			t condition.									
G	8	VERY GOOD			em noted.									
G F	7 6	GOOD	_		inor probler	show some minor deterioration.								
F	5	FAIR				I elements are sound but may have minor se	ction loss.	cracking	ı. spallir	na or scour.				
P	4	POOR			•	ss, deterioration, spalling or scour.		9						
P	3	SERIOUS	L	oss of s	section, det	erioration, spalling or scour have seriously a	fected prin	nary struc	ctural c	omponents.	Local failures are	possible. Fatigue	cracks	
						cks in concrete may be present. ion of primary structural elements. Fatigue o	racks in ste	eel or she	ear crao	cks in concre	ete may be preser	t or scour may hav	e	
С	2	CRITICAL				re support. Unless closely monitored it may		•		•				
С	1	"IMMINENT" FAILURE				or section loss present in critical structural co raffic but corrective action may put it back in			us verti	cal or horizo	ntal movement af	ecting structure sta	ablility.	
	0	FAILED	0	Out of se	ervice - bey	ond corrective action.								
						DEFICIENCY REP			21111)E				
DEFI	CIENC	Y: A defect in a str	ucture	that re	quires corre									
CATE	GORI	ES OF DEFICIEN	CIES		-									
					r in nature, ge	nerally do not impact the structural integrity of the br rring, Clogged drainage, etc.	dge and coul	d easily be	e repaired	I. Examples in	clude but are not limit	ed to: Spalled concrete	e, Minor p	ot
						ensive in nature and need more planning and effort is ble settlement, Considerable scouring or undermining								
						ble settlement, Considerable scouring or undermining								
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URG	ENCY	OF REPAIR:												
I = Im	mediate		ately co	ntact Dis	strict Bridge In	spection Engineer (DBIE) to report the Deficiency an	to receive for	urther instr	ruction fro	om him/her].				
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$\mathbf{r} = \mathbf{r}$	ioritize-	louan pe buorinized p	y Distric	CI IVIAINTE	enance Engine	er or the Responsible Party (if not a State owned brid	iye) and repa	urs made v	when tun	us anu/or man	power is available].			

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE _3 OF _24

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	-				quires correct	ve action.								
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S=	Sever	e/Major Defici	iency - Defic and c	iencies whick corroded reba	h are more exten ars, Considerable	sive in nature and need more p settlement, Considerable scot	planning and effort to repair uring or undermining, Mode	Examples include ate to extensive co	but are not limite rrosion to structu	ed to: Mode iral steel wi	rate to major th measurable	deterioration loss of secti	in concrete, on, etc.	Exposed
C-S	6= Cri	tical Structura	al Deficien	cy - A defi integr	iciency in a struct ity of the bridge.	ural element of a bridge that p	ooses an extreme unsafe co	ndition due to the fa	ailure or imminer	t failure of	the element w	hich will affe	ct the structu	ıral
C-I	H= Cr	itical Hazard 1	Deficiency	Example	ency in a compon es include but are ailing, etc.	ent or element of a bridge that not limited to: Loose concrete	t poses an extreme hazard o hanging down over traffic o	r unsafe condition r pedestrians, A ho	to the public, but le in a sidewalk	does not in that may ca	npair the struc use injuries to	tural integrit	y of the bridg , Missing sec	e. tion of
-	GENC Immed	CY OF REPAI		V contact Dis	trict Bridge Inen	ction Engineer (DBIE) to report	rt the Deficiency and to room	ive further instructi	on from him/hor					
A =	ASAP	- [Action/F	Repair should be	initiated by	District Maintena	nce Engineer or the Responsit	ole Party (if not a State own	ed bridge) upon rec	eipt of the Inspec	tion Report	-			
	Priori	tize- [Shall be	prioritized by D		-	or the Responsible Party (if no		repairs made whe		-	avallable].			

ROWLEY	8BK	R-11-002	R11002-8BK-MUN-BRI	JUN 20, 2016
CITY/TOWN		BR. DEPT. NO.		INSPECTION DATE

The approaches are North and South. The elevations are West and East. The Mill River flows from West to East.

JENERAL REMARKS

he structure is a concrete arch deck bridge. (See sketches #1, #2 & #3) There is a 18" outside diameter itility line in the arch ring underside at spring line which is obstructing channel vertical clearance. Both the Jorth approach and South approach have weight posting restriction signs for 2.5 tons at closest intersections. There are no weight posting signs at the structure.

TEM 58 - DECK

tem 58.1 - Wearing surface

he bituminous wearing surface of the bridge has random areas of transverse cracking. The Southeast dge of pavement has small patched areas and tire wear. (See photo #1)

tem 58.7 - Parapets

he East and West concrete parapets have up to 40% loss of paint coating. The Northwest top section of he parapet is spalled up to 11'-1" long x 12" deep x 3" high with no exposed rebar. (See photos #2 & #3)

tem 58.12 - Utilities

here is a 18" utility pipe in the arch ring that spans between spring lines approximately 62" from South ascia. The pipe ends are grouted into the arch ring in areas up to 40" wide x 35" high. Both grouted vatches have widespread deterioration with spalls and delaminated areas. There is a crack in both grout vatches that propagates continuously through the arch ring. (See photos #4 & #5)

NPPROACHES

<u>Approaches a - Appr. pavement condition</u>

The North approach pavement has areas of map cracking. (See Photo #6)

TEM 59 - SUPERSTRUCTURE

tem 59.1 - Arch/Arch Ring

The arch/arch ring has widespread map cracking with evidence of leakage and efflorescence. The arch ring inderside approximately 62" from South fascia has a crack up to +/- 1/4" that starts at the spring line utility ripe grouted patch and continues across the arch ring to the other spring line utility pipe grouted patch. There are cracks up to +/- 1/4" that have propagated off of the main spring line to spring line crack. The irch ring areas near the utility pipe grouted areas have spalled/delaminated up to 20" high x 4" deep. (See rhotos #7- #8, #12 & #13)

he utility pipe has steel cable supports embedded in the arch ring crown and the concrete around the upports are spalled. (See photo #9)

tem 59.5 - Spandrel Walls

The South spandrel wall near West parapet base has a large spalled area that extends into the Southwest vingwall. Both the East and West spandrel walls have random cracks with efflorescence. (See photo #10)

CITY/TOWN			-	INSPECTION DATE
ROWLEY	8BK	R-11-002	R11002-8BK-MUN-BRI	JUN 20, 2016

he spring line between South breastwall and arch ring has signs of active leakage. The South spring line lear East fascia has a spalled area up to 3' long x 4" wide x 1" deep with efflorescence. (See photo #11)

The South spring line near West fascia is spalled up to 65" long x 21" high x 1" deep. (See photo #15)

⁻he North spring line near West fascia is cracked up to 51" long x 1/4" thick. (See photo #12)

So the North and South spring lines generally have cracking with efflorescence and active leakage at the pint. (See photo #12)

TEM 60 - SUBSTRUCTURE

tem 60.1 - Abutments tem 60.1.d - Breastwalls

Approximately up to 10' from the West fascia both the North and South breastwalls have widespread map racking with light to moderate efflorescence and signs of active leakage and delamination. (See photos 13 & #14)

The South breastwall near West fascia has a spall up to 65" long x 21" high x 1" deep with no exposed ebar that extends around the fascia into the Southwest wingwall. (See photo #15)

he South breastwall approximately 7'-4" from West fascia has a crack at the utility pipe patch area that extends down the full height (68") of the breastwall that is up to 1/4" wide and propagates down into the poting. (See photo #13)

Both the North and South breastwall construction joints have hair line cracks with evidence of active eakage and efflorescence. Additionally, both breastwalls have moderate abrasion up to 3' above top of poting.

tem 60.1.e - Wingwalls

The Northeast and Southeast wingwalls have cracks at construction joints with moderate efflorescence. See photos #24 & #25)

The Southwest wingwall has a spall up to 44" long x 81" high x 9" deep with no exposed rebar. (See photo ¹16)

he Northwest wingwall end has a cracked/broken section with spalled concrete at ground level. (See photo ¹17)

tem 60.1.f - Slope Paving/Rip-Rap

he Northeast, Southeast and Northwest embankments have minimal rip-rap protection.

he Southwest embankment has bituminous slope pavement due to failed embankment. The pavement is racked/spalled of at the waterline. (See photo #18)

tem 60.1.h - Footings

So the North and South footings have areas of exposure that extends up to +/- 26" below the bottom of poting and +/- 33" horizontally undermining the footing due to channel scour. (See chart #1)

OWLET	ODN	R-11-002		JUN 20, 2016
OWLEY	8BK	R-11-002	R11002-8BK-MUN-BRI	JUN 20, 2016
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3oth the North and South footings have areas of exposure that extend up to +/- 26" below the bottom of the poting and up to +/- 33" horizontal undermining of the footing due to channel scour. Measurements taken long both the North and South footing for scour are provided in attached table. (See chart #1)

SubStructure Undermining Notes

.arge areas of undermining were found below the North abutment footing. Starting at West fascia for up to /- 26' (See chart #1 for measurements).

SubStructure Scour Notes

See Item 60.1.j.

TEM 61 - CHANNEL AND CHANNEL PROTECTION

tem 61.2 - Embankment Erosion

The Southwest embankment in front of Southwest wingwall is paved with bituminous concrete and the nottom of the embankment at water level is undermining the pavement. (See photo #16)

he Southeast embankment in front of the Southeast wingwall has a tree with its roots fully exposed and 'ery minimal vegetation. (See photo #24)

RAFFIC SAFETY

tem 36a - Bridge Railing

30th the East and West parapets act as the bridge rail. The Northwest top of parapet is spalled up to 11'-1" vide x 12" deep x 3" high. (See photo #3)

tem 36b - Transitions

3 oth Northeast and Northwest transitions do not connect to parapet they are terminated before the parapet vith steel posts. (See Photos #19 & #20).

The Southeast and Southwest transition rails are two steel wire cables on concrete posts that are fastened of the bridge rail. (See photo #21)

tem 36c - Approach Guardrail

The Southwest approach guardrail run has (3) damaged concrete posts with areas up to 100% section loss if rebar. The posts are bent/broken with lateral displacements up to 2'. (See photos #22)

tem 36d - Approach Guardrail Ends

3oth the Southeast and Southwest approach guardrail ends are two steel wire cables burried in the ground. See photo #23)

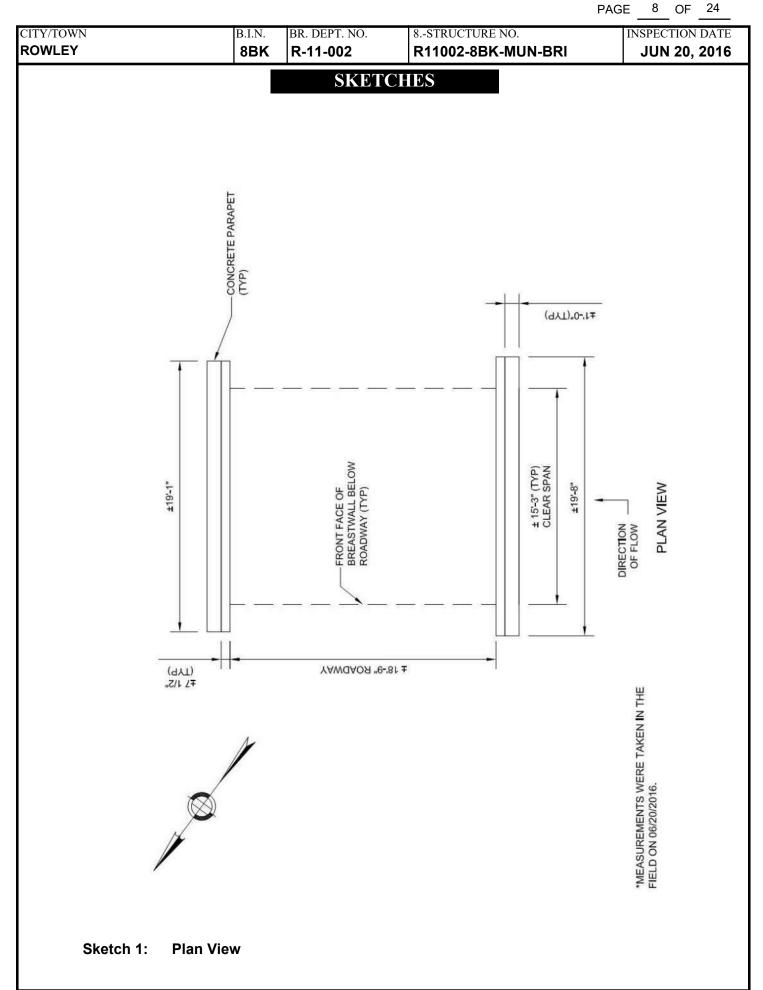
The Northwest approach guardrail end at access road terminates without a proper end condition. (See photo #19)

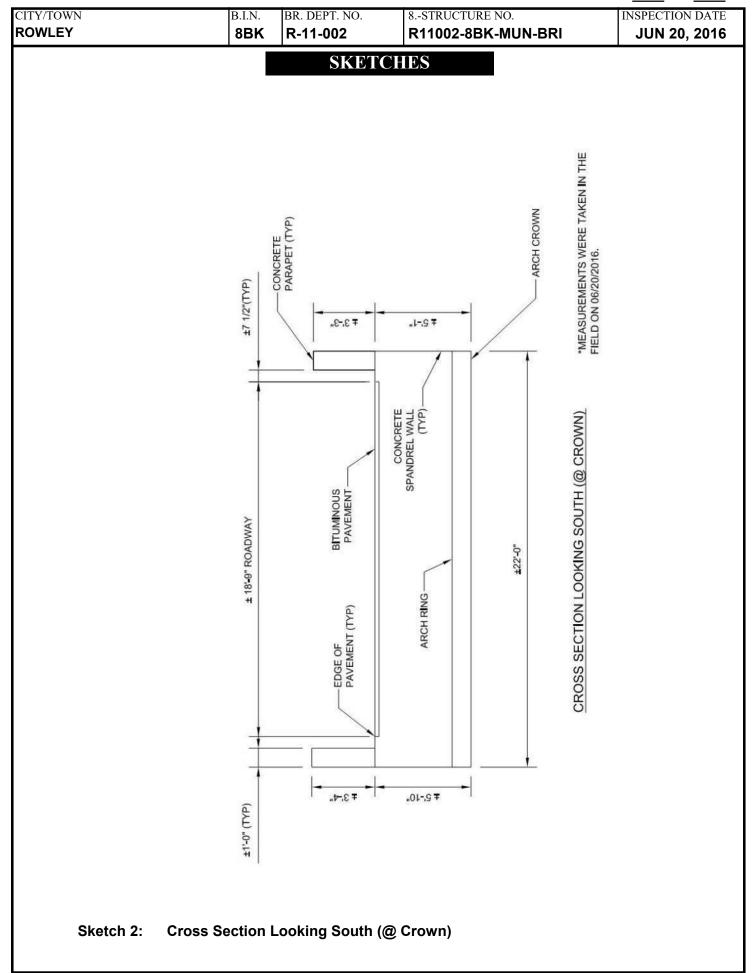
<u>sketch / Chart / Photo Log</u>

- Sketch 1 : Plan View
- Sketch 2 : Cross Section Looking South (@ Crown)
- Sketch 3 : West Elevation

PAGE 7	7 OF	24
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CITY/TOWN ROWLEY		B.I.N. 8 BK	BR. DEPT. NO. R-11-002	8STRUCTURE NO. R11002-8BK-MUN-BRI	INSPECTION DAT JUN 20, 2016
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Photo 5 :	North Approach Pav			ack Propagating into Arch	
hoto 7 :	Northwest Arch/Arch				
vhoto 8 :				ch to Utility Patch with Cracks F	Propagating off Main
'hoto 9 :	Typical Utility Suppo	ort Emb	edded in Arch wi	th Spall	
'hoto 10 :				pet Extending into Southwest W	
hoto 11 :				_ine Spall with Active Leakage	and Efflorescence
hoto 12 :				Spall with Active Leakage	
hoto 13 :				florescence and Active Leakage	9
hoto 14 :	Northwest Breastwa				
hoto 15 :			ascia Spalled Co	oncrete that Extends into South	west wingwall
'hoto 16 : 'hoto 17 :	Southwest Wingwall		d/Prokon Soatio		
² hoto 17 :	Northwest Wingwall			is Cracked/Deteriorated	
'hoto 19 :				t to Bridge Rail (Parapet)	
'hoto 20 :				with Bridge Rail (Parapet)	
?hoto 21 :	Southeast Transition				
'hoto 22 :				Rail and Concrete Posts Bent/I	Broken with up to
	100% Loss of Section				
'hoto 23 :	Southwest Approach	h Two \	Nire Cable Steel	Guardrail Buried End	
'hoto 24 :	Southeast Wingwall				
'hoto 25 :	Northeast Wingwall				



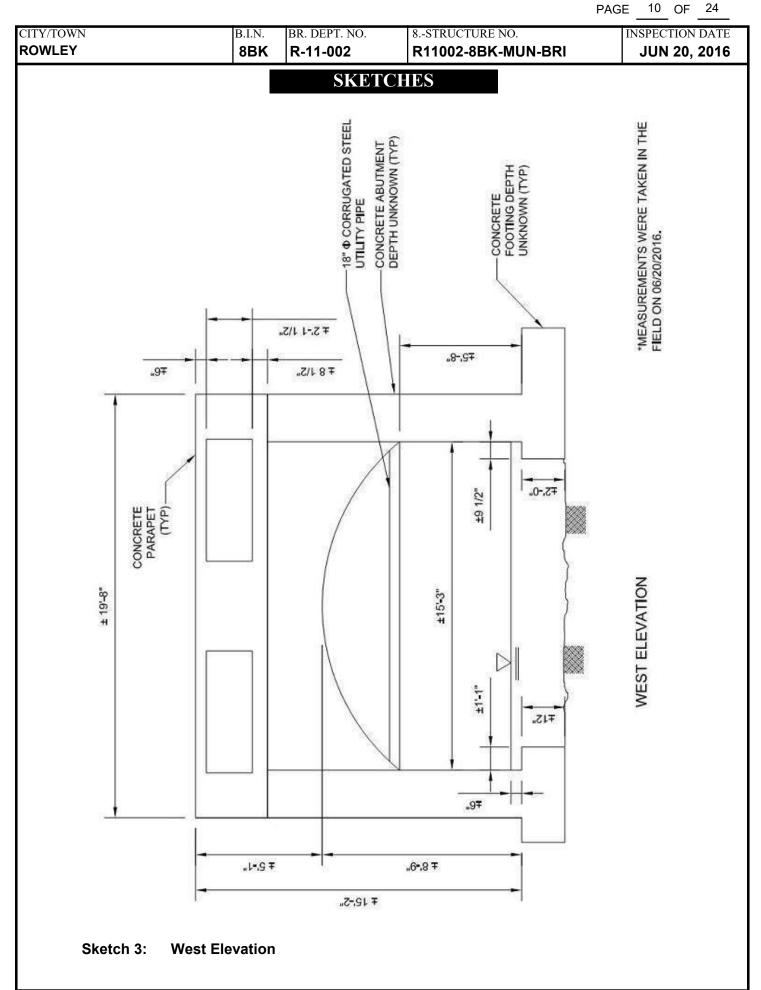


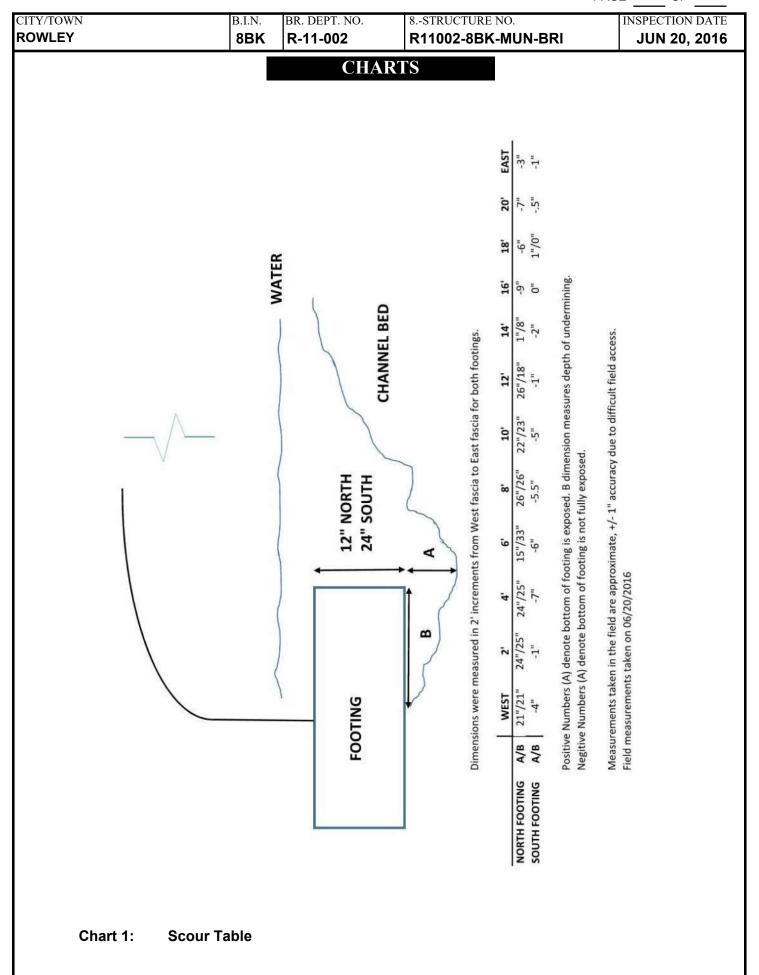
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OF

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Photo 1: Bridge Wearing Surface Transverse Cracking with Tire Wear





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Photo 3: West Bridge Rail (Parapet) with Northwest Top Concrete Section Spalled



Photo 4: South Spring Line Utility Patch Spall with Crack

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Photo 5: North Spring Line Utility Patch Spall with Crack Propagating into Arch





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Photo 7: Northwest Arch/Arch Ring Crack Propagating from Utility Patch



Photo 8: West Arch Underside Crack from Utility Patch to Utility Patch with Cracks Propagating off Main Crack

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Photo 9: Typical Utility Support Embedded in Arch with Spall



Photo 10: Southwest Spandrel Wall Spall Under Parapet Extending into Southwest Wingwall

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CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
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Photo 11: South Spring Line near East Fascia Spring Line Spall with Active Leakage and Efflorescence





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CITY/TOWN ROWLEY	B.I.N. 8 BK	BR. DEPT. NO. R-11-002	8STRUCTURE NO. R11002-8BK-MUN-BRI	INSPECTION DATE JUN 20, 2016
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Photo 13:	Southwest Br Leakage	eastwall Map C	racking with Efflorescence and	d Active
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Photo 15:	South Breast	wall at West Fas	cia Spalled Concrete that Exte	ends into

Photo 15: South Breastwall at West Fascia Spalled Concrete that Extends into Southwest Wingwall





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CITY/TOWN ROWLEY				

Photo 17: Northwest Wingwall Cracked/Broken Section





CITY/TOWN ROWLEY	B.I.N. 8 BK	BR. DEPT. NO. R-11-002	8STRUCTURE NO. R11002-8BK-MUN-BRI	INSPECTION DATE JUN 20, 2016
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Photo 19: Northwest Transition Rail Does Not Connect to Bridge Rail (Parapet)



Photo 20: Northeast Transition Rail Does Not Connect with Bridge Rail (Parapet)

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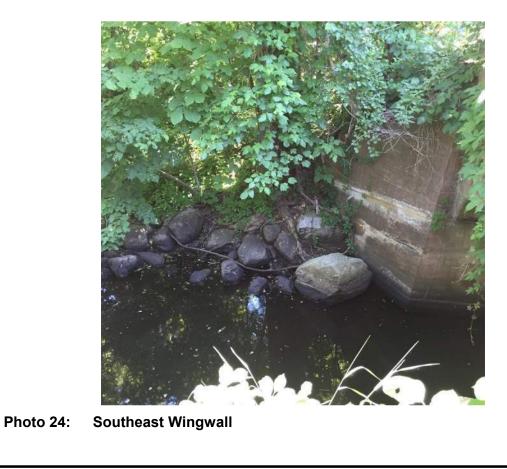
Photo 21: Southeast Transition Two Steel Wire Transition Rail



Photo 22: Southwest Approach Two Wire Cable Steel Rail and Concrete Posts Bent/Broken with up to 100% Loss of Section

CITY/TOWN ROWLEY	B.I.N. 8 BK	BR. DEPT. NO. R-11-002	8STRUCTURE NO. R11002-8BK-MUN-BRI	INSPECTION DATI JUN 20, 2010
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Photo 23: Southwest Approach Two Wire Cable Steel Guardrail Buried End



CITY/TOWN ROWLEY		B.I.N. 8 BK	BR. DEPT. NO. R-11-002	8STRUCTURE NO. R11002-8BK-MUN-BRI	INSPECTION DATE JUN 20, 2016
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MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 8

2-DIST B.I.N. B7X 04

ROUTINE ARCH INSPECTION

STRUCTURES INSPECTION FIELD REPORT

BR. DEPT. NO. R-11-005

CITY/TOWN ROWLEY		8STRUCTURE NO.				Kilo. POINT	41-STATUS	90-ROUTI	NE INSI	P. DATE
	ROWLEY			R11005-B7X-MUN-NBI			A:OPEN	SEP	13, 2	2017
07-FACILITY CARRIED		MEMORIAL NA	ME/LOCAL NA	ME	1	27-YR BUILT	106-YR REBUILT	YR REHAI	3'D (NO	ON 106)
HWY DODGE ROAD						2009	0000		0000)
06-FEATURES INTERSECTED		26-FUNCTIONA	L CLASS		DIST. BRI	DGE INSPECT	ION ENGINEER T.	G. Weil		
WATER MILL RIVER		Urban Lo	cal							
43-STRUCTURE TYPE		22-OWNER	21-MAINTA	INFR	TEAMIE	ADER P. Bu	rko			
111 : Concrete Arch - I	Deck	Town Agency	Town	III VER		IDEK F. DU				
107-DECK TYPE		WEATHER	TEMP. (air)		TEAM MI					
N : Not applicable		Clear	27°	С	A. PO	WER				
ITEM 58	7	ITEM 59		_	7	ITEM	[60			
DECK	DEF	SUPERSTRUCT	URE	7	DEF	SUBST	RUCTURE	7		DEF
1. Wearing surface 8	-	1. Arch/Arch Ring		7	M-P	1. Abu	Itments	Dive Cur	7	
2. Deck Condition N	-	2. Keystone Area		N		a. Pede		N N		-
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		4. Floorbeams		N		c. Back		N N N 7	-	-
	-				-	e. Wing		N 7	1	-
5. Median N		5. Spandrel Walls		8			Paving/Rip-Rap	N 8] [-
6. Sidewalks N	-	6. Spring Lines		8	-	g. Point	•	N N		-
7. Parapets N	-	7. Diaphragms/Cro	ss Frames	Ν	-	h. Footi	ngs	N H	$\left\{ \right. \right\}$	-
8. Railing 8	-			e N	-	<u>i</u> Piles i Scou	r	N N N N	-	-
o. Raining	_	8. Conn Plt's, Guss	sets & Angle	s N		k. Settle		N 8		-
9. Anti Missile Fence N	_	9. Pin & Hangers				<i>I.</i>		N N		-
10 Drainage System 8	-	10 Masonry Joints		Ν		т.		N N		
11 Lighting Standards N	-	11 Rivets & Bolts		Ν	-	2. Pier	rs or Bents		7	
12 Utilities H	-	12 Welds		N	-	a. Pede	stals	N N N N	-	-
13 Deck Joints N	-	13 Deformation/Fla	attening	7	-	— b. Caps c. Colui	nns	N N	-	-
14 N		14 Member Alignm	-	7			s/Webs/Pierwalls	N 7		-
	-			N	- <u>-</u>	e. Point	-	N N N H	-	
- IN	-	15 Paint/Coating				f. Footi g. Piles	ng	N H	-	-
16 N	-	16		Ν	-	h. Scou	r	N 8		-
N	e	Year Painted		N		i. Settle		N 8		-
	S	rear Painteo		IN		<i>j.</i>		N N		-
(In millimeters)	175	COLLISION DAMAGE	E: Please exp	lain		<i>k.</i>	D 4 .	N N		-
APPROACHES	255	None (X) Minor () Moderate () Se	vere ()		Bents	1 1	N	
	DEF		D/	lei-		a. Pile C	Caps	N N	$\left\{ \right\}$	-
a. Appr. pavement condition 8	_	LOAD DEFLECTION:				b. Piles	onal Bracing	N N N N	-	-
b. Appr. Roadway Settlement 8		None (X) Minor () Moderate () Se	vere ()		ontal Bracing	N N		-
c. Appr. Sidewalk Settlement	-	LOAD VIBRATION:	Please exp	lain		e. Faste	ners	N N		-
d. N	-	None (X) Minor () Moderate () Se	vere ()		MINING (Y/N) If Y	ES please e	xplain	N
OVERHEAD SIGNS (Attached to bridge) (Y/N)	N	Any Fracture Critic	al Member:	(Y/N)	N		ON DAMAGE: X) Minor () M	loderate () Seve	ere ()
a. Condition of Welds										Γ
b. Condition of Bolts	-					I-60 (Dive	Report): N	I-60 (This	Report	t): 7
c. Condition of Signs	-		\ <u>N</u>					[
		Any Cracks: (Y/N) N			93B-U/	W (DIVE) Insp	00	/00/00	000
		1				1				

														PAG	GE	OF _	8
CITY/ ROV					В.І.І В7		BR. DEPT. NO. R-11-005		STRU			NO. MUN-N	RI		INSPECTION SEP 1		
_	EM 61						TEM 36 TRAFFIC		TY					CESSIB		(Y/I	
CHA	NNE	L &			8		Bridge Railing		36 1	COND		DEF				Needeo	
CHA	NNE	L PROTECTION	V				Transitions		1	7	-	-		Bucket		N	N
			Dive	Cur D	EF		Approach Guardrail		1	7	-	M-P	Lado	-		N N	N N
1.Ch	annel	Scour	N	8	-		Approach Guardrail End	s	1	7		-	Boat	-		Y	Y
		nent Erosion	N	8	-		IGHT POSTING		lot Ar	nling				ector 50		N.	N
3.De			N	8	-	VV L		н	lot Ap 3 3		bie Singl	e X	Rigg			N	N
	getatio	'n	N	7	_	Act	tual Posting	N	N	N	Ν		Stag	ing		Ν	N
5.Uti	-		N	N		Re	commended Posting	N	N	N	Ν		Traff	fic Contr	rol	Ν	N
		Slope Protection	N	N	-		ived Date: 00/00/0000		MT Da			0/0000		lagger		N	N
· · ·	gradat	•	N	7	-	vva		oridge	WI Da			/ance	Polic			Ν	N
	nder S		N	N			ns In Place E	V	V	E		W	Othe	er:		N	N
o.rei	luer 3	ystem	IN		-	(Y= NR=	Yes,N=No, =NotRequired)										
						Leg	jibility/						тот	TAL HO	DURS		8
						CLE	CARANCE POSTING	Ν			S		PLA	NS	(Y/I	N): [Y
						No		ft	in	ft		in meter	_		(-	' L	-
<u>STRE</u>	AM FL	<u>OW VELOCITY:</u>					ual Field Measurement		0			0	(V.C	C.R.)	(Y/N):	Ν	
Tidal () High	n() Moderate() L	ow (X) None ()	POS	-	oridge	<u> </u>	A	dvar	•	ТАРЕ	E#:]	
ITEM 61	(Dive R	eport): N ITEM 61	(This	Report):	8		ns In Place N Yes,N=No,		3	N		S	Listo	f field tos	ts performed		
93b-l	J/W IN	SP. DATE: 00	/00/0	0000		Leg	=Not Required) jibility/ ibility						21310	i neiù les	is performed		
RATI						(To b	e filled out by DBIE)		Г		7	If YE	S pleas	e give pr	iority:		
-		rt (Y/N): Y				Requ	uest for Rating or Rera	ting (Y	′/N):	Ν		HIG	GH()	MEDIUM () LOW ()	
Date:		11/01/2013				REA	SON:										
		on data at time of e : 7 I 60: 8 Dat		ng rating 9/09/20	•												
							CONDITION	RAT	ING	GUI	IDE	(For	Items 5	8, 59, 60 a	and 61)		
	CODE	CONDITION					DEFEC	TS									
	N	NOT APPLICABLE															
G	9			cellent co													
G	8	VERY GOOD GOOD		problem		ns											
F	6	SATISFACTORY					ome minor deterioration.										
F	5	FAIR					nts are sound but may have min	or sectio	n loss, c	cracking	l, spal	lling or scour.					
Р	4	POOR					erioration, spalling or scour.										
Р	3	SERIOUS					on, spalling or scour have seriou concrete may be present.	sly affect	ed prima	ary strue	ctural	components.	Local fai	lures are po	ossible. Fatigue	cracks	
с	2	CRITICAL					primary structural elements. Fation ort. Unless closely monitored it									e	
С	1	"IMMINENT" FAILURE					on loss present in critical structu ut corrective action may put it ba				us ve	rtical or horizo	ntal move	ement affec	ting structure sta	blility.	
	0	FAILED	OL	ut of servio	e - bey	ond cori	rective action.										
							DEFICIENCY R	EPO	RTIN	NG (GU	DE					
					es corre	ective ad	ction.										
		ES OF DEFICIENC			nature, ge	enerally de	o not impact the structural integrity of	the bridge a	and could	easily be	e repair	red. Examples inc	lude but a	re not limited	to: Spalled concrete	e, Minor p	ot
							o not impact the structural integrity of f gged drainage, etc. n nature and need more planning and e										
							n nature and need more planning and e ment, Considerable scouring or under										
		ll Structural Deficie al Hazard Deficienc	ey - 🛓	deficiency xamples inc	in a com clude but	pe. conent or	lement of a bridge that poses an extre element of a bridge that poses an ext mited to: Loose concrete hanging dow	reme hazaı	rd or unsa	afe condit	ion to 1	the public, but doe	es not impa	air the structu	ral integrity of the b	ridge.	f
URG	FNCY	OF REPAIR:	b	ridge railing	, eiC.												
	mediate		tely con	tact District	Bridge In	spection	Engineer (DBIE) to report the Deficien	cy and to r	eceive fu	rther instr	ruction	from him/her].					
A = A P = Pr	SAP- •ioritize-			-			ngineer or the Responsible Party (if no Responsible Party (if not a State own			- · ·				ailable1			
1 - 11	ioi iuze-	Louisin pe buouinsed p	, District	. mainteridili			i coponoibio i arty (ii not a otate owin	sa briuge) i	and repair	s made v		anao ana/or many	onor is dv	anubioj.			

PAGE	3	OF	8

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
ROWLEY	B7X	R-11-005	R11005-B7X-MUN-NBI	SEP 13, 2017

According to design plans:

Approaches and abutments are East and West. Elevations are South and North. Two spans precast concrete reinforced archs, numbered from West to East. Each arch has four sections numbering from South to North. Aill River flows South to North.

TEM 59 - SUPERSTRUCTURE

tem 59.1 - Arch/Arch Ring

here is hairline cracking in all 4 sections of Spans 1 and 2 at the crown area. (Photo 1)

here is hairline cracking on the north face of Section 4 and south face of Section 1 in both spans at the rown. (Photo 2)

Span 1, Section 3: spall measuring: 8" Diameter x 1" deep located at the eastern half of arch, 4' from the rown area. (Photo 3)

tem 59.14 - Member Alignment Section 3 in Span 1 is misaligned 3/4" lower than Section 4 at midspan. (Photo 4)

TEM 60 - SUBSTRUCTURE

tem 60.1 - Abutments

tem 60.1.d - Breastwalls

t few sporadic vertical hairline cracks were present in east and west breastwalls.

tem 60.2 - Piers or Bents

tem 60.2.d - Stems/Webs/Pierwalls

t few sporadic minor cracks were present on the east and west face of the pierwall.

TEM 61 - CHANNEL AND CHANNEL PROTECTION

tem 61.4 - Vegetation

/egetation growing at upstream end effecting flow.

tem 61.7 - Aggradation

/linor aggradation in Span 1 restricting flow.

RAFFIC SAFETY

tem 36a - Bridge Railing 3oth sides - Type " T101 Modified Bridge Rail with type "ss" guardrail.

tem 36b - Transitions

Continuation of type "ss" guardrail.

Continuation of type "ss" guardrail.

Southwest approach guardrail- Minor scrapes and dents (Photo 5).

Jortheast approach guradrail shows minor scrapes and dents near buried end treatment. (Photo 6)

Several spacer blocks are loose and misaligned. (Photo 7)

tem 36d - Approach Guardrail Ends

lorthwest, southwest and southeast, have boxing glove ends.

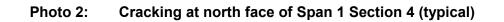
Southwest end treatment has minor damage. (Photo 8)

⁻he northeast has a buried end with minor scrapes and dents. (Photo 6).

<u>hoto Log</u>

- Photo 1 : Cracking at Span 1 Section 4 intrados. (Typical throughout both spans)
- Photo 2: Cracking at north face of Span 1 Section 4 (typical)
- Photo 3 : Spall at Span 1 Section 3: 8" Diameter x 1" deep.
- Photo 4 : Span 1, Section 3/Section 4 interface: Section 3 is 3/4" lower than Section 4 at crown.
- Photo 5 : Southwest approach guardrail minor scrapes and dents.
- Photo 6 : Northeast guardrail has minor scrapes and dents near buried end treatment.
- Photo 7 : Northwest guardrail end with loose misaligned spacer block.
- Photo 8 : Southwest boxing glove end treatment has minor damage.

TY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DAT
OWLEY	B7X	R-11-005	R11005-B7X-MUN-NBI	SEP 13, 201
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Photo 1: Cra	cking at S	pan 1 Section 4	intrados. (Typical throughout	both
spa	ns)			
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CITY/TOWN ROWLEY	B.I.N. B7X	BR. DEPT. NO. R-11-005	8STRUCTURE NO. R11005-B7X-MUN-NBI	INSPECTION DATE SEP 13, 2017
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Photo 3: Spall at Span 1 Section 3: 8" Diameter x 1" deep.



Photo 4: Span 1, Section 3/Section 4 interface: Section 3 is 3/4" lower than Section 4 at crown.

CITY/TOWN ROWLEY	B.I.N. B7X	BR. DEPT. NO. R-11-005	8STRUCTURE NO. R11005-B7X-MUN-NBI	INSPECTION DATE SEP 13, 2017
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Photo 5: Southwest approach guardrail minor scrapes and dents.



Photo 6: Northeast guardrail has minor scrapes and dents near buried end treatment.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DAT
ROWLEY	B7X	R-11-005	R11005-B7X-MUN-NBI	SEP 13, 201
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Photo 7: Northwest guardrail end with loose misaligned spacer block.





National Bridge Element Inspection

09/13/2017

Thomas G. Weil

Patrick Burke

Adam Power

Mass. Highway Dept.

BDEPT#	R-11-005	Date
B.I.N.	B7X	District Bridge Inspection Eng'r
Item 8	R11005-B7X-MUN-NBI	Inspecting Agency
Span Group	1	Team Leader
Town	Rowley	Team
District	4	Member(s)

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4
144	Re Conc Arch	feet	2	49.000	%	47.000	2.000		
Notes :			•						
> 1080	Delamination/Spall/Patched Area	feet	2	1.000	%		1.000		
Notes :	•								
> 1120	Efflorescence/Rust Staining	feet	2	1.000	%		1.000		
Notes :	•							•	·
> 1130	Cracking (RC and Other)	feet	2	10.000	□ %	10.000			
Notes :			•						
210	Re Conc Pier Wall	feet	2	28.000	%	28.000			
Notes :	•								·
> 1130	Cracking (RC and Other)	feet	2	5.000	<u>%</u>	5.000			
Notes :	•								
215	Re Conc Abutment	feet	2	56.000	%	56.000			
Notes :			•						
> 1130	Cracking (RC and Other)	feet	2	5.000	%	5.000			
Notes :	•						•	•	
330	Metal Bridge Railing	feet	2	102.000	%	102.000			
Notes :									

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 29

2-DIST B.I.N. 04 8BL

STRUCTURES INSPECTION FIELD REPORT INITIAL ROUTINE & SPECIAL MEMBER INSPECTION

BR. DEPT. NO. **R-11-006**

				INE & SPEC		-1115			Een			\- 1	-006
CITY/TOWN ROWLEY			85	STRUCTURE NO. R11006-8B		יםם			. POINT	41-STATUS A:OPEN			NE INSP. DAT
									,			•	
07-FACILITY CARRIED HWY MILL RD				MEMORIAL NAME	/LOCAL NA	AME			r built 1850	106-YR REBUILT 1900	YRI		3'D (NON 106))000
06-FEATURES INTERSECTED				26-FUNCTIONAL C	LASS		DIST. B	RIDGE	E INSPECTI	ON ENGINEER	T. G.	Weil	
WATER MILL RIVE	R			Urban Loca	al								
43-STRUCTURE TYPE 302 : Steel Stringe	r/Gird	er		Town	21-MAINTA Town Agency		TEAM I	LEADE	R M. Scott	PRO.	J MGR	STV	Incorporated
107-DECK TYPE 1 : Concrete Cast-i	n-Pla	се	WEATHER TEMP. (air) TEAM MEMBE Overcast 17°C J. MACKI										
ITEM 58			Πη	'EM 59]		ITEM	60			
DECK	5			PERSTRUCTUR		4				RUCTURE		6	
	F				L	N	DE	F	1. Abu		Dive	Cur	DEF
1.Wearing surface	5	M-P		tringers loorbeams		N			a. Pedes		N	N	6
2.Deck Condition	5	M-P		loor System Bracir	20	N		$- \ $	b. Bridge		N	5	M-F
3.Stay in place forms	N	-			ig	N	-		c. Backw		N	H	-
4.Curbs	N	-		irders or Beams russes - General		4 N	S-	r _	d. Breast e. Wingw		N	6 5	M-F
5.Median	N	-	-	. Upper Chords	N	N	· -	-	-	Paving/Rip-Rap	Ν	N	-
6.Sidewalks	Ν	-		. Upper Chords	N	_	-	-	g. Pointii	·	N N	N N	-
7.Parapets	Ν	-			N	-	-	—	h. Footin j. Piles	ys	N	N	-
8.Railing	2	S-A	c. Web Members N d. Lateral Bracing N						j. Scour		Ν	Ν	-
9.Anti Missile Fence	Ν	-	e. Sway Bracings N					—	k. Settler	nent	N	N N	-
10.Drainage System	Ν	-		Portals	N	_	-		m.		N	N	-
11.Lighting Standards	N	-		End Posts	N	_	-		2. Piers	s or Bents			Ν
12.Utilities	N	_		in & Hangers		N	ı⊢-		a. Pedes	tals	Ν	N	-
13.Deck Joints	N			onn Plt's, Gussets	& Angles				b. Caps c. Colum	ns	N	N	-
14.	N			over Plates	a Angles	N				/Webs/Pierwalls	N	N	-
14.		-		earing Devices		н	-		e. Pointir	-	N	N	-
-	N	-		Diaphragms/Cross	Frames	N			f. Footin g. Piles	g	N	N	-
16.	Ν	-		Rivets & Bolts	rianes	N			h. Scour		N	N	
E		w		Welds		N	-		i. Settler	nent	N	N	- -
CURB REVEAL (In millimeters)	1	Ν		Member Alignment	+	6			j. k.		N N	N N	-
· · · · ·				Paint/Coating	•	N		—	3. Pile	Bents			N
APPROACHES		DEF	14.			N	-	—	a. Pile Ca	ips	Ν	N	-
a. Appr. pavement condition	5	M-P		1] []		b. Piles	al Bracing	N N	N N	-
b. Appr. Roadway Settlement	5	M-P	Yea	ar Painted	Ν				-	ntal Bracing	N	N	-
c. Appr. Sidewalk Settlement	Ν	-	сог	LISION DAMAGE: F	Please exp	lain			e. Fasten	ers	Ν	N	
d.	Ν	-			Moderate () Se	vere ()	UNDERM	INING (Y/N) If	/ES ple	ease e	xplain N
OVERHEAD SIGNS (Attached to bridge)	Y/N)	N	No	one (X) Minor ()	Please exp Moderate (Please exp) Se	evere ()		DN DAMAGE:	Nodera	te () Severe (
a Condition of Wolds	N	DEF			Moderate (vere ()		<u>Please explain</u>			
a. Condition of Welds	N	-							None (X) Minor () I	Nodera	te () Severe (
b. Condition of Bolts	N	-	Any	Fracture Critical I	Member:	(Y/N)	Ν		I-60 (Div	e Report): N	<i>I</i> -6	0 (This	Report):
c. Condition of Signs	Ν	-	Any	Cracks: (Y/N)	Ν				93B-U/V	V (DIVE) Insp		00	/00/0000

PAGE 2 OF 29

CITY/	TOWN	1			B.I.	N.	BR. DEPT. NO.	8STRU	JCTUR	E NO.		INSPECTIO	DN D	ATE
ROV	VLEY	•			8E	SL.	R-11-006	R1100)6-8B	L-MUN-B	RI	JUN 9), 20	16
TTPL	EM 61						TEM 36 TRAFFIC S	AFFTY			ACCESSIE	RILITY	(Y/N	N/P)
					6			36	COND	DEF	neelssn		Needed	,
-	NNE NNE	L & L PROTECTION	J			Α.	Bridge Railing	0	2	S-A	Lift Bucket		N	N
CIIA			v			В.	Transitions	0	N	-	Ladder		Ν	N
			Dive	Cur	DEF	<u>C.</u>	Approach Guardrail	0	N	-	Boat		Ν	N
1.Ch	annel	Scour	Ν	Ν	-	D.	Approach Guardrail Ends	0	Ν	-	Waders		Y	Υ
2.Em	bankn	nent Erosion	Ν	6	-	WE	EIGHT POSTING	Not A	oplicat	ole X	Inspector 50)	Ν	N
3.Del	bris		Ν	Ν	-					ingle	Rigging		Ν	N
4.Ve	getatio	n	Ν	6	-	Ac	tual Posting	NN	Ν	Ν	Staging		Ν	N
5.Uti	lities		N	N	-	Re	commended Posting	NN	N	Ν	Traffic Cont	rol	N	N
6 Rin	-Ran/	Slope Protection	Ν	6			aived Date: 00/00/0000			0/00/0000	RR Flagger		N	N
· ·	gradat		N	N		vva	At bri	_ · ·		Advance	Police		N	N
	•					Sig	gns in Place N	S	N	S	Other:			
8.Fer	nder S	ystem	Ν	Ν	-		Yes,N=No,						Ν	N
						Leg	gibility/ ' '				TOTAL H	OURS		8
							sibility							•
							EARANCE POSTING	E	ft	W in meter	PLANS	(Y/N	۷):	N
						No		0		0				
		OW VELOCITY:					tual Field Measurement sted Clearance	0		0	(V.C.R.)	(Y/N):	Ν	
Tidal () High	() Moderate () Lo	ow (🗙	() Nor	ne ()		At bri		Ac	lvance W	TAPE#:			
ITEM 61	(Dive R	eport): N ITEM 61	(This	Repo	rt): 6	(Y=	eYes,N=No,	VV			List of field tes	sts performed		
93b-l	J/W IN	SP. DATE: 00	/00/	0000)	Leg	R=Not Required)				List of new les	sis performed.		
RATI	NC						sibility				.			
		rt (Y/N): N					be filled out by DBIE) uest for Rating or Rerati		Y		S please give pr GH () MEDIUM)	
-						Req	uest for Rating of Refati	ng (1/N).	•)	
Date:		00/00/0000				REA	SON: Never rated							
	•	on data at time of e : - 160: - Dat		•	•									
							CONDITION F		GUII		Items 58, 59, 60			
	CODE	CONDITION					DEFECT		001		nems 56, 59, 60	and 61)		
	N	NOT APPLICABLE	_				DEFECT	3						
G	9	EXCELLENT	- F	vcellen	t condition.									
G	8	VERY GOOD			em noted.									
G	7	GOOD	_		inor proble	ns.								
F	6	SATISFACTORY			•		some minor deterioration.							
F	5	FAIR	_				ents are sound but may have minor	section loss,	cracking,	spalling or scour.				
Р	4	POOR	Ac	dvance	ed section lo	oss, det	terioration, spalling or scour.							
Р	3	SERIOUS					on, spalling or scour have seriously concrete may be present.	/ affected prim	nary struc	tural components.	Local failures are p	ossible. Fatigue o	cracks	
-	-		Ac	dvance	d deteriora	tion of p	primary structural elements. Fatigu						•	
С	2	CRITICAL					port. Unless closely monitored it ma		•	•			bliliter	
С	1	"IMMINENT" FAILURE					ion loss present in critical structural ut corrective action may put it back					sung suuclure sta	Jillity.	
	0	FAILED	0	ut of se	ervice - bey	ond cor	rrective action.							
							DEFICIENCY RE	PORTI	NG G	UIDE				
DEFI	CIENC	Y: A defect in a stru	icture	that re	quires corr	ective a	action.							
-		ES OF DEFICIENC												
							do not impact the structural integrity of the ogged drainage, etc.							
S= Se	vere/M	ajor Deficiency - Deficiency	ficienci d corroc	es whic ded reba	h are more ex ars, Considera	tensive in able settle	in nature and need more planning and effo ement, Considerable scouring or undermin	ort to repair. Exar hing, Moderate to	mples inclu o extensive	de but are not limited t corrosion to structural	o: Moderate to major de steel with measurable le	eterioration in concre oss of section, etc.	te, Expos	ed
				A def	iciency in a st	ructural e	element of a bridge that poses an extreme							
		al Hazard Deficienc	y - 4	A deficie Example	ency in a com es include but	ponent o	or element of a bridge that poses an extrem limited to: Loose concrete hanging down c	ne hazard or uns	afe conditio	on to the public, but do	es not impair the structu	ral integrity of the br	idge.	f
115 6		05 050 4/2			ailing, etc.			•						
		OF REPAIR:	tely or -		trict Bridge -	enactio-	Engineer (DBIE) to conart the Definition	and to receive f	urther inst-	ction from him/hor				
I = Im A = A	mediate SAP-		-		-		Engineer (DBIE) to report the Deficiency Engineer or the Responsible Party (if not a				n Report].			
P = Pr	ioritize-	[Shall be prioritized by	/ Distric	t Mainte	enance Engin	eer or the	e Responsible Party (if not a State owned	bridge) and repa	irs made w	hen funds and/or manp	ower is available].			

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 3 OF 29

B.I.N. 8BL STRUCTURES INSPECTION FIELD REPORT INITIAL ROUTINE & SPECIAL MEMBER INSPECTION

BR. DEPT. NO. **R-11-006**

04 8BL INITI	AL ROUT	INE & SPEC	IAL MEM	BER INS	PEC	TION		R·	11-00	6
CITY/TOWN	8	STRUCTURE NO.	1	1-Kilo. POINT	90-ROU	JTINE IN	SP. DATE 9	3*-SPEC.	MEMB. I	NSP. DATE
ROWLEY		R11006-8BL-N	IUN-BRI	000.000	Ju	n 9, 2	016	Ju	n 9, 20	016
07-FACILITY CARRIED HWY MILL RD		MEMORIAL NAME/	LOCAL NAME		BUILT 850		REBUILT		ab'd (no 0000	N 106)
06-FEATURES INTERSECTED WATER MILL RIVER		26-FUNCTIONAL CI Urban Loca		DIST. BRIDGE	NSPECTI	ON ENG	NEER T	. G. Weil		
43-structure type 302 : Steel Stringer/Girde	r		1-MAINTAINER Fown Agency	TEAM LEADER	M. Scott		PROJ M	GR ST	V Incorpo	rated
107-DECK TYPE 1 : Concrete Cast-in-Place	9	WEATHER TO OVERCAST	TEMP. (air) 17°C	TEAM MEMBE J. MACKI			I			
WEIGHT POSTING Not	Applicable 3S2 Single	X		bridge	Advan		PLAN	IS (Y	′/N):	N
Actual Posting N N		Signs In P (Y=Yes,N=	No,	S	N	S		(
Recommended Posting N N	NN	NR=Not Re Legibility/	equired)				(V.C.)	R.) (Y	′/N):	N
Waived Date: 00/00/0000 EJDM	T Date: 00/00	0/0000 Visibility				/		#:		
RATING		Requ	est for Rating	or Berating (V	/N)·		If YES plea	• •	-	
Rating Report (Y/N): N Date:					////		HIGH ()	MEDIUM	(X) LOV	N ()
Inspection data at time of e 1 58: - 1 59: - 1 60: - 1 62: -	0 0	REASC	ow: <u>Never ra</u>	tea						
SPECIAL MEMBER(S):										
MEMBER CRAC		LOCATION OF CORRO COLLISION DAMAGI			COND PREVIOUS (0-9)		INV. RATING FROM RATII H-20	NG ANALY		iciencies
A ltem 59.4 - Girders or Beams		See remarks i	n commen	ts section	•	4	Not I	Rated	;	S-P
В										
с										
D										
E										
List of field tests performed:							I-58	I-59	I-60	I-62
			(Overa	all Previous C	onditio	1)	-	-	-	-
			(Overa	all Current Co	ndition)		5	4	6	-
DEFICIENCY: A defect in a structure the	nat requires correct	ive action.]
CATEGORIES OF DEFICIENCIES: M= Minor Deficiency - Deficiencies which are holes, Minor corrosion	e minor in nature, gene o of steel, Minor scourir	ally do not impact the structural i g, Clogged drainage, etc.	ntegrity of the bridge and	could easily be repaire	d. Examples	include but a	are not limited to	: Spalled co	ncrete, Minor	pot
S= Severe/Major Deficiency - Deficiencie and corrode	s which are more exten ed rebars, Considerable	sive in nature and need more pla settlement, Considerable scourin	nning and effort to repair. ng or undermining, Moder	Examples include but ate to extensive corros	are not limite on to structu	d to: Modera al steel with	te to major dete measurable los	rioration in c s of section,	oncrete, Expo etc.	osed
C-S= Critical Structural Deficiency -	integrity of the bridge.									
C-II Critical Hazard Dencicity - E	deficiency in a compor kamples include but are idge railing, etc.	ent or element of a bridge that po not limited to: Loose concrete ha	oses an extreme hazard o anging down over traffic o	r unsafe condition to th r pedestrians, A hole in	e public, but a sidewalk ti	does not imp nat may caus	pair the structura se injuries to peo	l integrity of lestrians, Mi	the bridge. ssing section	of
URGENCY OF REPAIR: I = Immediate- [Inspector(s) immediately cont	act District Bridge Inspe	ection Engineer (DBIE) to report to	he Deficiency and to rece	ive further instruction fr	om him/herl					
A = ASAP- [Action/Repair should be initiat	ed by District Maintena	nce Engineer or the Responsible or the Responsible Party (if not a	Party (if not a State owne	d bridge) upon receipt	of the Inspec		vailable1			
X=UNKNOWN				IDDEN/INAC			abioj.	D-	REMO	VED

2-DIST

ROWLET	ODL	R-11-006	R11006-8BL-MUN-BRI	JUN 9, 2016
ROWLEY	8BL	R-11-006	D11006 9DI MUN DDI	JUN 9, 2016
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE

he steel rail stringers are numbered from West fascia to East fascia. The rail at the West fascia is labeled *i*-1 and are numbered across the width of the bridge to the East fascia which is labeled R-20. (See sketchs *i*-1 & #3) The approaches are North and South. The elevations are East and West. The Mill River flows from Vest to East.

JENERAL REMARKS

he structure is a single span stringer bridge with closly spaced 4" to 5" steel rails functioning as the upport beams. (See sketches #1 & #3, and chart #1) The steel rails clear spacing varies 6"+/-1/2" with ricks located between the rails that rest on the top of the bottom flange. The top portion of the steel rails is concrete incased with what appears to be an unreinforced concrete deck. (See sketch #2 & #4) The uperstructure sets on unreinforced concrete bridge seats that was poured on top of masonry stone ibutments. (See sketch #5)

TEM 58 - DECK

tem 58.1 - Wearing surface

The bituminous wearing surface on the bridge has tire wear with minimal crown. (See photo #1)

tem 58.2 - Deck Condition

The deck is an unreinforced 12" slab that partially encases the top 1/3 of steel rails. The East fascia is neavily spalled for up to the full length x full height x 3" depth. (See photo #2) The outside face of steel rail R-20 is exposed near midspan and backfill at the cold joint between the bridge rail concrete base and the ascia is seeping out. (See photo #3)

he deck underside at the East end between R-19 and R-20 near midspan is spalled up to 15" long x 8" vide x 4" deep with signs of active leakage through the deck onto R-19. (See photo #4)

he deck underside between rails is supported by bricks and there are random areas of nissing/deteriorate/damaged bricks.

The West fascia cold joint between fascia and bridge rail concrete base is cracked with some random areas if efflorescene and minor rust staining. The West fascia has a spall up to 2" wide x 7" high x 2.75" deep. See photo #5)

tem 58.8 - Railing

See Item 36.a

NPPROACHES

<u>Approaches a - Appr. pavement condition</u>

The bituminous wearing surface at the South approach has tire wear with minimal crown. (See photo #7)

Approaches b - Appr. Roadway Settlement

he North approach is gravel starting approximately 30' beyond the bridge, and has potholes and tire ettlement at the joint between the bridge pavement and the approach gravel. (See photo #6)

The South approach is paved and has a depression in the Southeast side of road approximately 10 feet rom bridge. (See photo #7)

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tem 59.4 - Girders or Beams

The rails are numbered from the West fascia R-1 to the East fascia R-20. (See sketchs #1 & #3) The rail izes vary from 4" wide to 5" wide. (See chart #1)

he rail ends at the North and South abutments typically have heavy deterioration to the bottom flanges up o +/-50% loss of section.

here are bricks that span between the rails preventing access to the top of the bottom rail, webs and top lange. Visual assessment was used to determine section loss due to inability to accurately measure the psses to the section.

Ref Ref at the bottom flange has heavy rust across the full span with up to 25% loss of bottom flange ection. (See photo #8)

Rail R-2 at the bottom flange has heavy deterioration across the full span with up to 50% loss of bottom lange section. (See photo #9)

R-3 at the bottom flange has surface rust across the full span with up to 10% loss of bottom flange ection.

R-4 at the bottom flange has surface rust across the full span with up to 10% loss of bottom flange ection.

R-5 at the bottom flange has surface rust across the full span with up to 20% loss of bottom flange ection. (See photo #10)

Rail R-6 at the bottom flange has surface rust across the full span with up to 20% loss of bottom flange ection. Near the North abutment the bottom flange has a notch up to 12" long x 1.5" wide x full flange lepth. (See photo #11)

R-7 at the bottom flange has surface rust across the full span with up to 20% loss of bottom flange ection.

R-8 at the bottom flange has surface rust across the full span with up to 10% loss of bottom flange ection.

Reference to the source of the second second

Rails R-10 at the bottom flange has heavy deterioration across the full span with up to 50% loss of bottom lange section. Near the midspan there is loss of section to bottom flange up to 8" long x 1.75" wide x full lange depth. (See photos #13-14)

₹-11 at the bottom flange has heavy deterioration across the full span with up to 50% loss of bottom flange ection. (See photo #15)

R-12 at the bottom flange has heavy deterioration across the full span with up to 35% loss of bottom flange

ROWLEY 8BL R-11-006 R11006-8BL-MUN-BRI JUN 9, 2016	CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
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R-13 at the bottom flange has surface rust across the full span with up to 10% loss of bottom flange ection. Near the South abutment the rail is spliced with a splice plate.

R-14 at the bottom flange has surface rust across the full span with up to 20% loss of bottom flange ection.

R-15 at the bottom flange has surface rust across the full span with up to 20% loss of bottom flange ection.

R-16 at the bottom flange has heavy rust across the full span with up to 25% loss of bottom flange ection. (See photo #18)

R-17, R-18, R-19, and R-20 at the bottom flange has heavy rust across the full span with up to 50% oss of bottom flange section. (See photo #19-22)

tem 59.13 - Member Alignment

he abutments are slightly skewed and the span narrows from the West end (upstream) to the East end downstream).

TEM 60 - SUBSTRUCTURE

tem 60.1 - Abutments

tem 60.1.b - Bridge Seats

he North and South bridge seats appear to be unreinforced concrete that are 8" high x 18" deep.

Bridge seats are generally hidden from view, but there are several full height cracks in the front face of the concrete cap below the bridge seat that clearly extend into the bridge seat. These cracks are defined below.

he South bridge seat has a crack under R-15 that starts at the bridge seat and extends down the concrete ap of the breastwall up to 7/16" wide x full height x full depth. (See photo #23) There is also a crack under -19 that is up to 1/4" wide x full height x full depth. (See photo #24)

he North bridge seat has a crack under R-8 that starts at the bridge seat and extends down the concrete ap of the breastwall up to 1/2" wide x full height x full depth. (See photo #25) There is also a crack under R-3 that is up to 1/2" wide x full height x full depth. (See photo #26)

tem 60.1.d - Breastwalls

The South breastwall has a crack under R-15 that starts at the bridge seat and extends down the concrete ap of the breastwall up to 7/16" wide x full height x full depth. (See photo #23) There is also a crack under R-19 that is up to 1/4" wide x full height x full depth. (See photo #24) The South abutment below rail R-15 he crack in the breastwall has propagated down into the masonry stone abutment and has cracked up to 6" from bottom of the concrete cap with one stone cracked full depth. (See photo #23)

The North breastwall has a crack under R-8 that starts at the bridge seat and extends down the concrete ap of the breastwall up to 1/2" wide x full height x full depth. (See photo #25) There is also a crack under R-3 that is up to 1/2" wide x full height x full depth. (See photo #26)

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he Northeast and Southwest wingwalls are dry laid stones and appear to have some stones that have neen disloged and fallen into the stream. (See photo #27)

he Northwest and Southwest wingwalls are masonry and appear to be in fair condition.

TEM 61 - CHANNEL AND CHANNEL PROTECTION

tem 61.2 - Embankment Erosion

he embankments at the wingwall ends generally have minor erosion.

tem 61.4 - Vegetation

he embankments have heavy vegetation growth.

tem 61.6 - Rip-Rap/Slope Protection

here is minimal riprap protection at the ends of the wingwalls.

RAFFIC SAFETY

tem 36a - Bridge Railing

he bridge railing system is 6"x6" concrete posts with a 2"x12" timber rail spaning the posts.

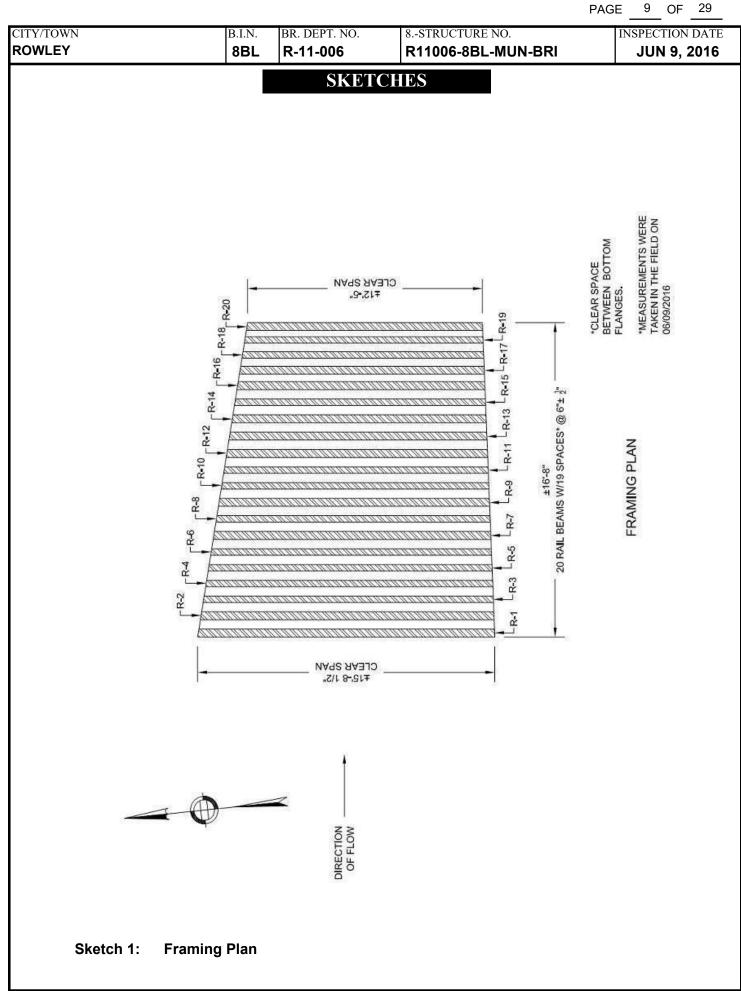
The Southeast bridge rail post concrete base has broken off and if overhanging the Southeast fascia. (See photos #28 & #29)

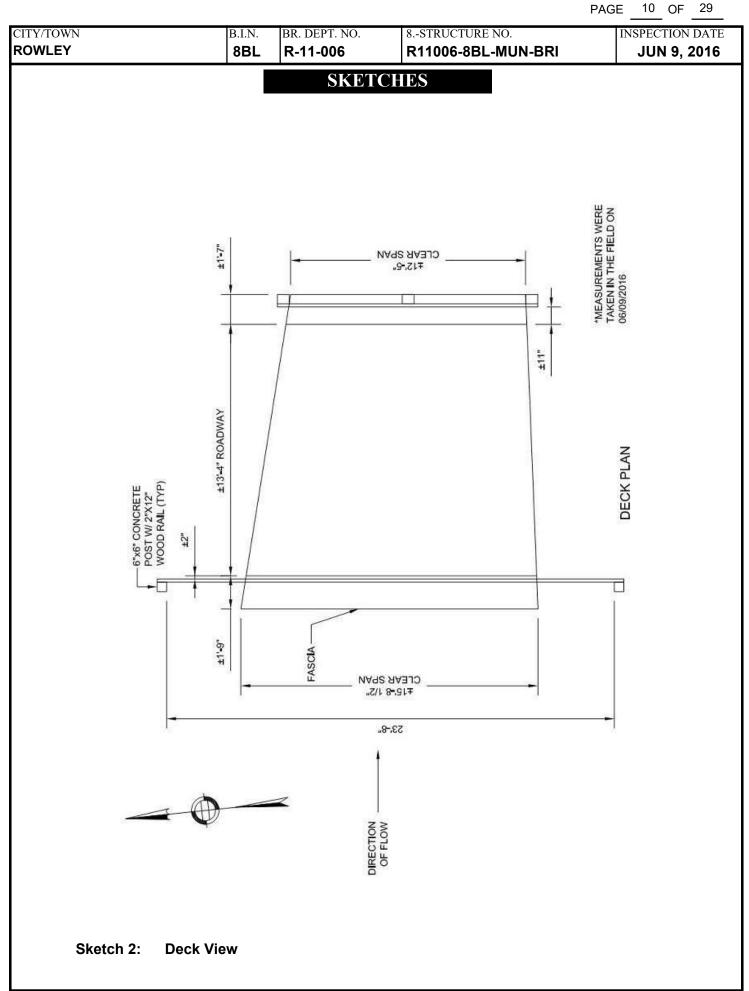
The North bridge rail spans completely over the bridge without any posts on the bridge (approximately +/-:3'-8" between posts). With push of the hand, rail easily deflects a foot or more. Rail has almost no capacity o redirect an errant vehicle. (See photo #30)

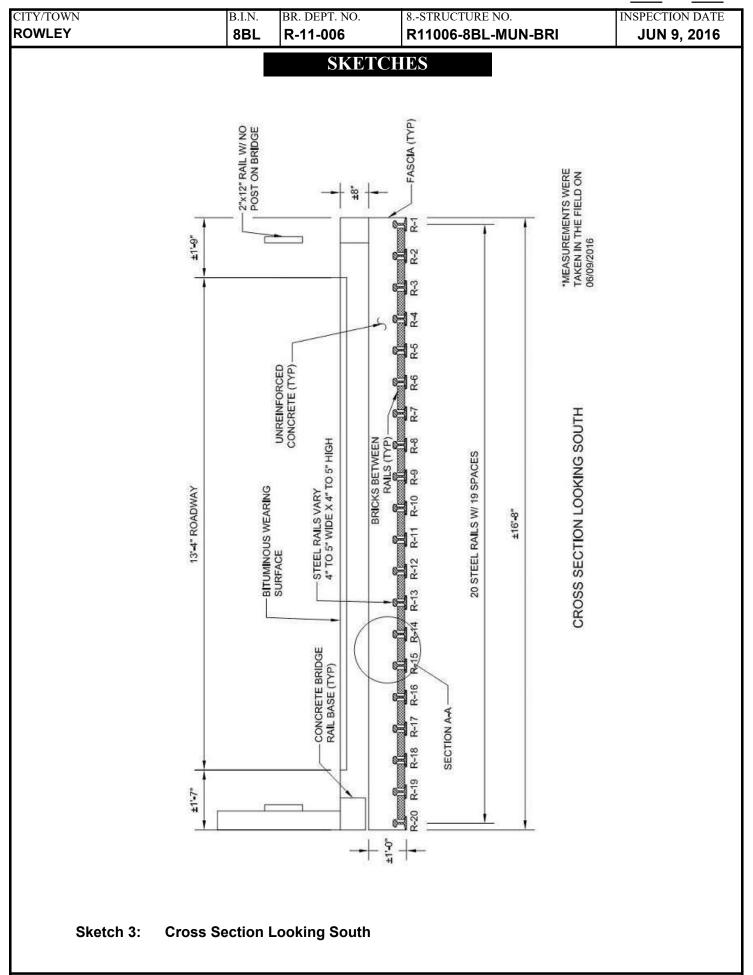
<u>sketch / Chart / Photo Log</u>

- Sketch 1 : Framing Plan
- Sketch 2 : Deck View
- Sketch 3 : Cross Section Looking South
- Sketch 4 : Section A-A
- Sketch 5 : West Elevation
- Chart 1 : Steel Rail Stringer Sizing and Losses
- Photo 1 : Typical Bridge Wearing Surface Tire Wear
- Photo 2 : East Fascia Heavy Spalling
- Photo 3 : East Fascia Spalling with Exposed Outside Face of Rail R-20
- Photo 4 : East Fascia Deck Underside Between Rails R-19 and R-20 Spall
- Photo 5: West Fascia Cold Joint Crack with Efflorescence and Rust Staining
- Photo 6: North Approach (Looking North) at End of Bridge Pavement Gravel Potholes
- Photo 7 : South Approach Pavement Settlement (Looking South) at Southeast Side of Road
- Photo 8: West Fascia Rail R-1 Bottom Flange Typical Span Heavy Rusting
- Photo 9: Rail R-2 Bottom Flange Typical Span Heavy Deterioration
- Photo 10 : Rail R-5 Bottom Flange Typical Span Surface Rusting
- Photo 11: Rail R-6 Bottom Flange Typical Span Surface Rusting and Notched Area
- Photo 12: Rail R-9 Bottom Flange Splice and Splice Plate
- Photo 13: Rail R-10 Bottom Flange Typical Span Heavy Deterioration

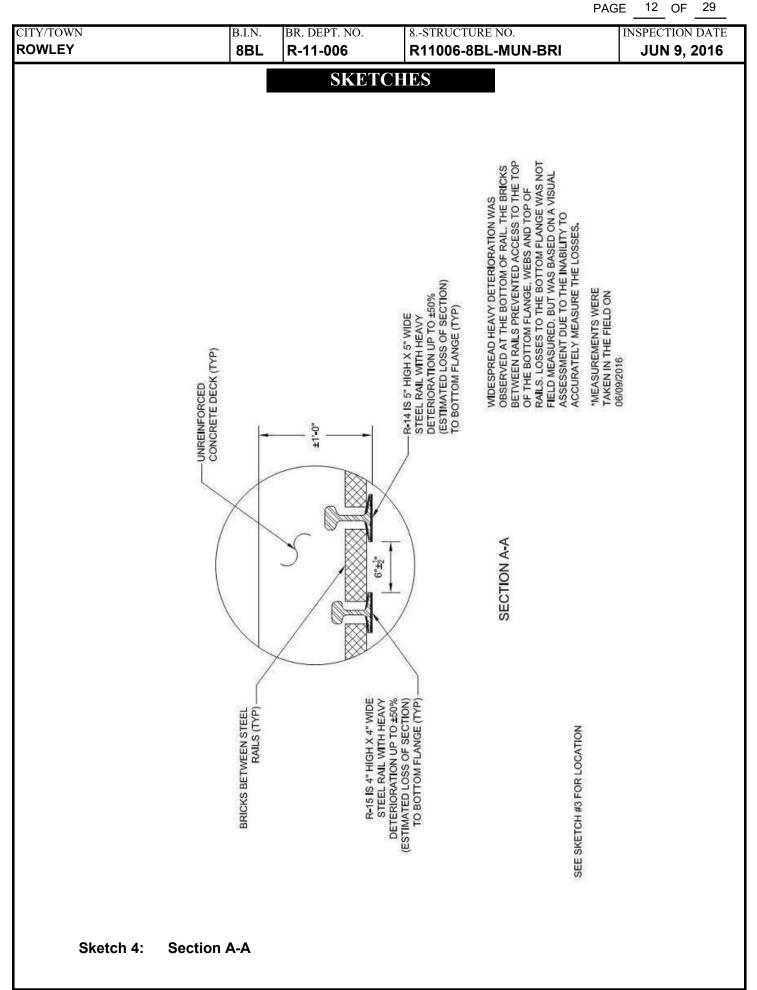
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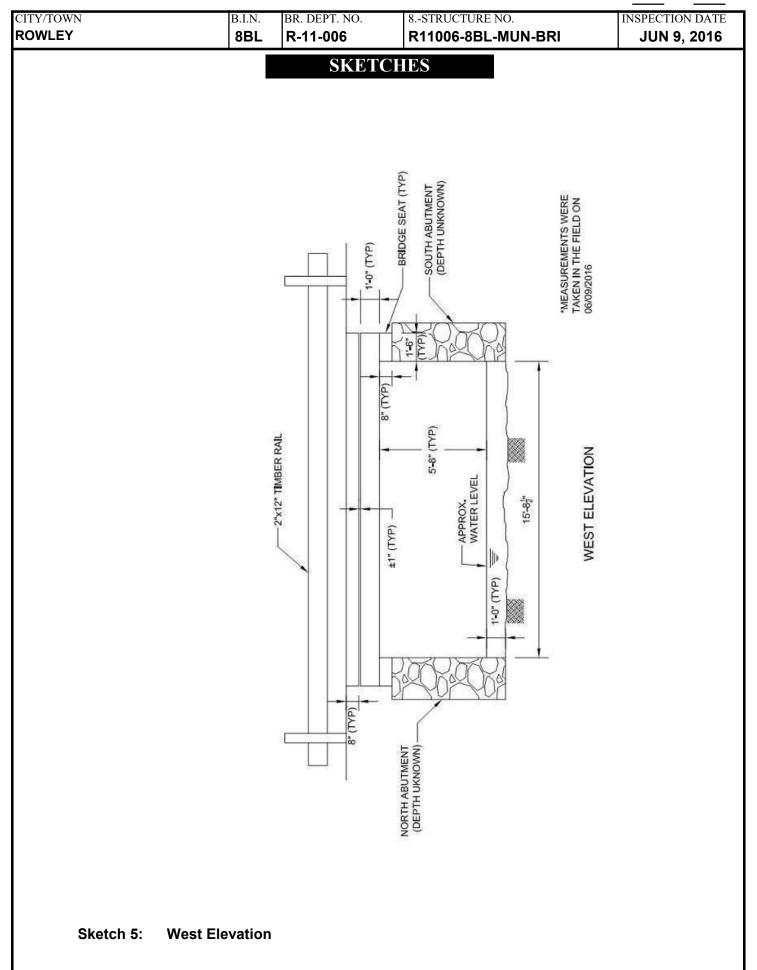






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VISUAL	ESTIMATEL	J PERCEINT SEI	CTION LOSS OF RAIL BOT	OM FLANGES ALONG FULL LENGTH OF BEAN	//KAIL
	Rail #	Width (in)	% Losses		
	R-1	5.00	± 25		
	R-2	5.00	± 50		
	R-3	4.00	± 10		
	R-4	4.00	± 10		
	R-5	4.25	± 20		
	R-6	4.00	± 20		
	R-7	5.00	± 20		
	R-8	4.00	± 10		
	R-9	5.00	± 20		
	R-10	4.00	± 50		
	R-11	4.00	± 50		
	R-12	5.00	± 35		
	R-13	5.00	± 10		
	R-14	5.00	± 20		
	R-15	4.00	± 20		
	R-16	5.00	± 25		
	R-17	5.00	± 50		
	R-18	4.00	± 50		
	R-19	4.00	± 50		
	R-20	5.00	± 50		

Chart 1: Steel Rail Stringer Sizing and Losses

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Photo 1: Typical Bridge Wearing Surface Tire Wear





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Photo 3: East Fascia Spalling with Exposed Outside Face of Rail R-20





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Photo 5: West Fascia Cold Joint Crack with Efflorescence and Rust Staining



Photo 6: North Approach (Looking North) at End of Bridge Pavement Gravel Potholes

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Photo 7: South Approach Pavement Settlement (Looking South) at Southeast Side of Road





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Photo 9: Rail R-2 Bottom Flange Typical Span Heavy Deterioration





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Photo 11:	Rail R-6 Botto Area	om Flange Typic	al Span Surface Rusting and N	otched
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Photo 13: Rail R-10 Bottom Flange Typical Span Heavy Deterioration





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Photo 15: Rail R-11 Bottom Flange Typical Span Heavy Deterioration





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Photo 17: Rail R-12 at North End Bottom Flange Splice and Heavy Deteriorated Splice Plate





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Photo 19:	Rail R-17 Bot	tom Flange Typi	ical Span Heavy Deterioration	





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Photo 21: Rail R-19 Bottom Flange Typical Span Heavy Deterioration with Active Leakage





CITY/TOWN ROWLEY	B.I.N. 8BL	BR. DEPT. NO. R-11-006	8STRUCTURE NO. R11006-8BL-MUN-BRI	INSPECTION DATE JUN 9, 2016
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Photo 23: South Abutment Cracked Stone Below Rail R-15



Photo 24: South Abutment Concrete Bridge Seat Full Depth Crack Under Rail R-19

CITY/TOWN ROWLEY	B.I.N. 8BL	BR. DEPT. NO. R-11-006	8STRUCTURE NO. R11006-8BL-MUN-BRI	INSPECTION DATE JUN 9, 2016
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Photo 25: North Abutment Concrete Bridge Seat Crack Below Rail R-8





CITY/TOWN ROWLEY	B.I.N. 8 BL	BR. DEPT. NO. R-11-006	8STRUCTURE NO. R11006-8BL-MUN-BRI	INSPECTION DAT JUN 9, 2016
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Photo 27: Northeast Wingwall Disloged Stones





CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
ROWLEY	8BL	R-11-006	R11006-8BL-MUN-BRI	JUN 9, 2016
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Photo 29: Southeast Bridge Rail Post Overhanging the East Fascia





MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 11

STRUCTURES INSPECTION FIELD REPORT INITIAL ROUTINE ARCH INSPECTION

B.I.N.

2-DIST 04

BR. DEPT. NO. R-11-007

04 8BM			INITIAL ROUTINE ARCH INSPECTION								R-11-007		
city/town ROWLEY			8ST	TRUCTURE NO. R11007-8B	M-MUN	I-BRI		-Kilo. P 000.	POINT .000	41-STATUS A:OPEN	90-ROUTIN		P. DATE 2016
07-FACILITY CARRIED				MEMORIAL NAM	E/LOCAL NA	AME		27-YR	BUILT	106-YR REBUILT	YR REHAE	3'D (NG	ON 106)
HWY GLEN ST EX	ζТ							18	850	1900	(0000)
06-FEATURES INTERSECTED	_			26-FUNCTIONAL			DIST. BRI	DGE I	NSPECTI	ON ENGINEER T	. G. Weil		
WATER MILL RIVE	R			Rural Loca	1								
43-STRUCTURE TYPE 811 : Masonry Arcl	h - De	eck		22-OWNER Town Agency	21-MAINTA Town Agency	AINER	TEAM LE	ADER	M. Sco		MGR Incorporated	l	
107-DECK TYPE N: Not applicable				WEATHER Sunny	TEMP. (air) 27°		TEAM MI J. MA			, A. GOUV	ΈIA		
ITEM 58			ITE	EM 59	[_	7		ITEM	60			
DECK	Ν	DEF	SUP	ERSTRUCTU		7	DEF	s	SUBST	RUCTURE	7		DEF
1. Wearing surface	7			ch/Arch Ring		7				tments	Dive Cur	7	DEF
2. Deck Condition	N	-		eystone Area		7	-	- 6	a. Pedesi	tals	N N	-	-
	Н			ringers		N	-		b. Bridge		N N		-
3. Spandrel Fill	N			orbeams		N			c. Backw d. Breast		N N N		-
4. Curbs									e. Wingw		N 7		-
5. Median	N	-		andrel Walls		7				Paving/Rip-Rap	N N		-
6. Sidewalks	N	-	6. Sp	ring Lines		7			g. Pointing h. Footings		N N N X		-
7. Parapets	N	-	7. Dia	aphragms/Cross	Frames	N	-		i. Piles		N N		-
8. Railing	6	-	8. Co	8. Conn Plt's, Gussets & Angles N -				<i>i</i>	_{i.} Scour		N H		
9. Anti Missile Fence	Ν	-	9. Piı	n & Hangers		Ν	-	4	<u>k.</u> Settlen	nent	N 7		-
10 Drainage System	Ν	-	10 Masonry Joints N -					т.		N N		-	
11 Lighting Standards	N	-	11 R	ivets & Bolts		N	-	2	2. Piers	s or Bents		Ν	
12 Utilities	N	-	12 W	/elds		N	-		a. Pedest	tals	N N		-
13 Deck Joints	N	_	13 D	eformation/Flatte	enina	N	-		b. Caps c. Colum	ns	N N		-
14	N					7	-			/Webs/Pierwalls	N N		-
		-		ember Alignmer	11	-	_		e. Pointin	•	N N		-
15	N	-	15 Pa	aint/Coating		N			f. Footing g. Piles	g	N N		-
16	N	-	16			Ν	-		h. Scour		N N		-
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									B. Pile	Bents		N	_
APPROACHES		DEF	NON	e (X) Minor ()	Moderate () 56	evere ()	é	a. Pile Ca	aps	N N		-
a. Appr. pavement condition	7	-	LOAI	D DEFLECTION:	Please exp	olain			b. Piles		N N		-
b. Appr. Roadway Settlement	8	-	Non	e (X) Minor ()	Moderate () Se	vere ()		•	nal Bracing ntal Bracing	N N N N		-
c. Appr. Sidewalk Settlement	N	-	LOAD	D VIBRATION:	Please exp	lain			e. Fasten	V	N N		-
d.	N	-	Non	e (X) Minor ()	Moderate (vere ()			INING (Y/N) If)	/ES please e	volain	N
(Attached to bridge)	(Y/N)	N DEF	Any i	Fracture Critical	Member:	(Y/N)	N		COLLISIC	ON DAMAGE:	•) Sev	vere ()
a. Condition of Welds	N	-	1 —					ŀ	l-60 (Dive l	Report): N	I-60 (This	Repor	t): 7
b. Condition of Bolts	N	-	1 —										
c. Condition of Signs	N	-	Any	Cracks: (Y/N)	N			9	93B-U/V	V (DIVE) Insp	00	/00/0	000
X=UNKNOWN		N=NC	DT AP	PLICABLE		H=HI	DDEN/I	NAC	CESS	IBLE	R=	REM	OVED

PAGE 2 OF 11

CITV/	TOWN	T			B.I.I	N	BR. DEPT. NO.	8 STDI	ICTU	PE NO		INSPECTIO		TE
			B.I.I 8B					ы	JUN 2					
									07-0E				,	
ITTR	EM 61				7	ľ	ITEM 36 TRAFFIC SA	4FETY 36	COND	DEF	ACCESSIE		(Y/N	,
	NNEI			I	<u> </u>	Α.	. Bridge Railing	0	6	•	Lift Bucket		Needed	Used N
СНА	NNEI	L PROTECTION	V			В.	. Transitions	0	0	S-P	Ladder		N	N
			Dive	Cur	DEF	<u>C.</u>	. Approach Guardrail	0	0	S-P	Boat		N	N
1.Ch	annel S	Scour	Ν	н	-	D.	. Approach Guardrail Ends	0	0	S-P	Waders		Y	Y
2.Em	bankn	nent Erosion	Ν	7	-	WF	EIGHT POSTING	Not Ap	oplical	ble X	Inspector 50)	Ν	Ν
3.Del	bris		N	Ν	-			H 3	352 5	Single	Rigging		Ν	Ν
4.Veç	getatio	n	N	7	-	Ac	ctual Posting	NN	Ν	Ν	Staging		N	N
5.Uti	lities		N	Ν	-	Re	ecommended Posting	NN	N	Ν	Traffic Cont	rol	N N	N
6.Rip	-Rap/S	Slope Protection	N	Ν	-	Wa	/aived Date: 00/00/0000	EJDMT Da	ate: 0	0/00/0000	RR Flagger Police		N N	N N
·	gradati	•	N	N	-		At brid			Advance	Other:			
	nder Sv		N	Ν	-		igns In Place E (=Yes,N=No,	W	E	w	Ouler.		N	N
				+		NR NR	R=NotRequired)							
				$\left \right $			egibility/ isibility				TOTAL H	OURS		6
							LEARANCE POSTING	N	4	S motor	PLANS	(Y/N	۱):	N
							Vot X ft	in O	ft	in meter		·		
		DW VELOCITY:		🖌) Nor	na ()		osted Clearance	0		0	(V.C.R.)	(Y/N):	Ν	
				,			igns In Place	dge S	A N	dvance	TAPE#:			
ITENIOI	(Dive Re	eport): N ITEM 61	(11)	; Repoi	rt): [/=Yes,N=No, R=Not Required)				List of field tes	sts performed:		
93b-L	J/W IN	SP. DATE: 00	/00/	/0000)	Le	egibility/ isibility							
RATI		rt (Y/N): N					be filled out by DBIE)		M		S please give pr			
-	· ·					Req	quest for Rating or Reratir	וg (Y/N):	Ν	HIG	H() MEDIUM	() LOW ()	
Date:		00/00/0000	: 4 :			RE4	ASON:							
		on data at time of e : - 160: - Dat												
• • •				0,00	/0000				-0111	D F				
							CONDITION R		GUI	DE (For	Items 58, 59, 60	and 61)		
	CODE N	CONDITION NOT APPLICABLE	+				DEFECTS	5						
G	N 9		F	vcellen	nt condition.									
G	8	VERY GOOD			lem noted.									
G	7	GOOD		· ·	inor probler	ns.								
F	6	SATISFACTORY	s	tructura	al elements	show s	some minor deterioration.							
F	5	FAIR	A	JI prime	ary structure	ıl elem	ments are sound but may have minor	section loss,	cracking,	spalling or scour.				
Р	4	POOR					eterioration, spalling or scour.							
Р	3	SERIOUS					ation, spalling or scour have seriously n concrete may be present.	affected prim	ary struc	tural components.	Local failures are p	ossible. Fatigue c	racks	
с	2	CRITICAL					f primary structural elements. Fatigue pport. Unless closely monitored it may						•	
с	1	"IMMINENT" FAILURE	м	/lajor de	eterioration	or secti	ction loss present in critical structural but corrective action may put it back	components of	or obviou	0			blility.	
	0	FAILED	0)ut of se	ervice - bey	ond co	corrective action.							
							DEFICIENCY RE	PORTI	NG G	UIDE				
DEFI	CIENC	Y: A defect in a stru	ucture	that re	quires corre	ective a	action.							
		ES OF DEFICIENC					a da ana tanàna amin'ny fisiana amin'ny fisiana amin'ny fisiana	1.44			la da base a ser de Par Mar d			
M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc. S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed - and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.														
		l Structural Deficie al Hazard Deficienc	e y - 1	A deficie Example	ing of the bridg	ge.	al element of a bridge that poses an extreme t or element of a bridge that poses an extrem tt limited to: Loose concrete hanging down ov							
URGI	ENCY	OF REPAIR:												
	mediate		itely coi	ntact Dis	strict Bridge In	spectior	on Engineer (DBIE) to report the Deficiency a	and to receive fu	rther instru	uction from him/her].				
$\mathbf{A} = \mathbf{A}$	SAP- rioritize-			-			e Engineer or the Responsible Party (if not a the Responsible Party (if not a state owned be							
1 - 11	IOI IUZe-								is made w	nen runus anu/or manp	ower is availablej.			

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
ROWLEY	8BM	R-11-007	R11007-8BM-MUN-BRI	JUN 20, 2016

he approaches are East and West. The elevations are North and South. The Mill River flows from South to Jorth.

JENERAL REMARKS

he structure is a dry laid masonry arch bridge. It is no longer used for public access to Route 1. The East upproach has guardrail blocking traffic from accessing the drive off of Route 1. The West approach is a lrive that extends off Glen Street and terminates at end of East approach.

TEM 58 - DECK

tem 58.8 - Railing

See Item 36a.

TEM 59 - SUPERSTRUCTURE

tem 59.1 - Arch/Arch Ring

he arch ring underside has random areas of efflorescence leaking through stone voids. Arch stones are jenerally in good condition. (See Photos #1).

3 oth the East and West arch ring have a few small filler stones that have slightly shifted. (See Photos #2-3)

TEM 60 - SUBSTRUCTURE

tem 60.1 - Abutments

tem 60.1.d - Breastwalls

he breastwall is composed of large, dry laid masonry blocks that support the arch ring. The stones in the reastwall are generally in good condition.

tem 60.1.e - Wingwalls

Vingwalls are dry laid masonry stone and are generally in good condition. (See photo #4)

RAFFIC SAFETY

tem 36a - Bridge Railing

here is evidence of one original bridge rail post in the Southwest roadway. Currently masonry brick posts have been set on a +/- 2" concrete spandrel wall cap. There are +/- 1" steel posts with steel chain link railing panning across the bridge. The railing does not meet current design standards and provides minimal protection for an errant vehicle. (See photos #5-6)

30th the North and South concrete leveling pads have areas with broken/deteriorated sections. (See photos ¹7-8)

The brick masonry posts base have areas with deterioration and broken/missing bricks.

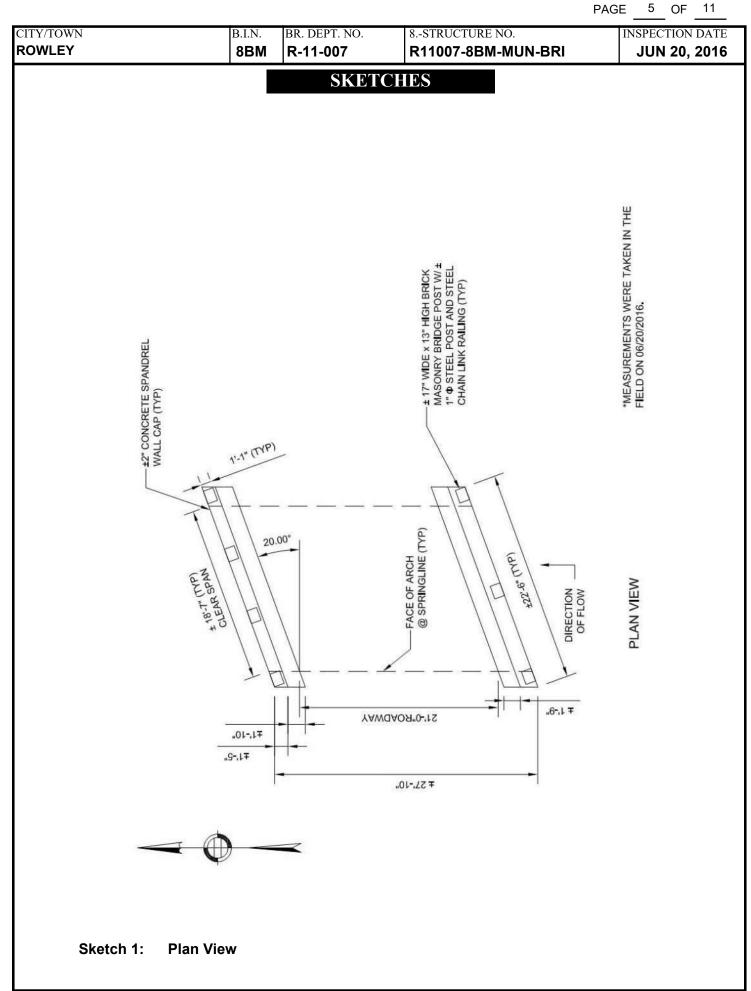
tem 36b - Transitions

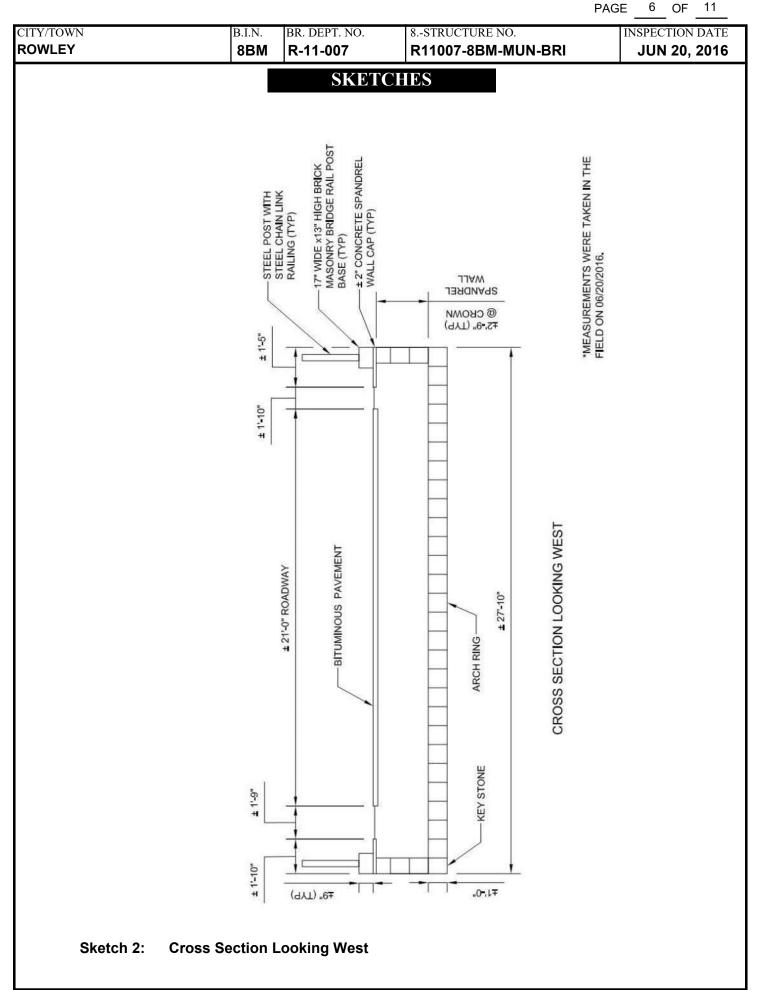
All approaches do not have any transition guardrail connecting to the bridge rail.

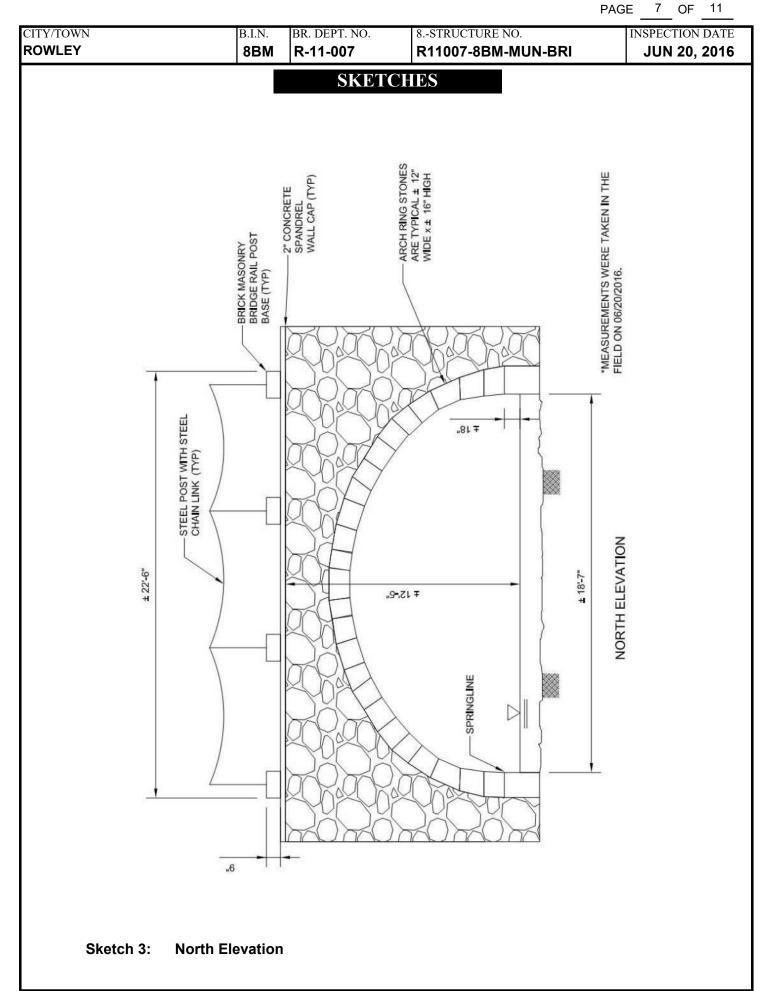
tem 36c - Approach Guardrail

CITY/TOWN	B.I.	N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
ROWLEY	8B	BM	R-11-007	R11007-8BM-MUN-BRI	JUN 20, 2016
			REMA	RKS	
Sketch 1 :	Plan View				
	Cross Section Looking	Wes	st		
Sketch 3 :					
hoto 1 :	Arch Crown Underside	Exp	osed Efflorescen	се	
hoto 2 :	Underside of Arch (Eas	terly	^r End)		
hoto 3 :	Underside of Arch (Wes	sterly	y Side)		
'hoto 4 :	Typical Wingwall Condi	tion			
hoto 5 :	South Bridge Rail				
hoto 6 :	North Bridge Rail				
'hoto 7 :	North Bridge Rail Concr	rete	Leveling Pad De	teriorated/Broken Section	
N 1 0					

 Photo 8 :
 South Bridge Rail Concrete Leveling Pad Deteriorated/Broken Section







CITY/TOWN ROWLEY	B.I.N. 8BM	BR. DEPT. NO. R-11-007	8STRUCTURE NO. R11007-8BM-MUN-BRI	INSPECTION DATE JUN 20, 2016
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Photo 1: Arch Crown Underside Exposed Efflorescence



Photo 2: Underside of Arch (Easterly End)

CITY/TOWN ROWLEY	B.I.N. 8BM	BR. DEPT. NO. R-11-007	8STRUCTURE NO. R11007-8BM-MUN-BRI	INSPECTION DATE JUN 20, 2016
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	and the second s			

Photo 3: Underside of Arch (Westerly Side)



Photo 4: Typical Wingwall Condition

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
ROWLEY	8BM	R-11-007	R11007-8BM-MUN-BRI	JUN 20, 2016
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	22			
Photo 5: S	South Bridge	Rail		
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			ALC: NORMAL S	
		/ 外心型		
		Star and	NA ST	



				PAGE 11 OF 1
CITY/TOWN ROWLEY	B.I.N. 8BM	BR. DEPT. NO. R-11-007	8STRUCTURE NO. R11007-8BM-MUN-BRI	INSPECTION DA JUN 20, 20
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		Contraction of the second		
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Photo 7: North Bridge Rail Concrete Leveling Pad Deteriorated/Broken Section



Photo 8: South Bridge Rail Concrete Leveling Pad Deteriorated/Broken Section

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 4

STRUCTURES INSPECTION FIELD REPORT ROUTINE INSPECTION

BR. DEPT. NO. R-11-008

04 B7Y				ROUTINE			-	- 11	-008						
CITY/TOWN ROWLEY			8S	TRUCTURE NO. R11008-B 7	7Y-MUN	I-NB			D. POINT 0.000	41-STATUS A:OPEN			NE INSP. DATE 13, 2017		
7-FACILITY CARRIED	ELD								r built 2009				. ,		
6-FEATURES INTERSECTED				26-FUNCTIONAL CLASS DIST. BRIDGE					E INSPECTI	ON ENGINEER	T. G.	Weil			
WATER MILL RIVE	R			Urban Local											
3-STRUCTURE TYPE				22-OWNER Town	21-MAINT	AINER	TEAM	LEADE	ER P. Burke	1					
107 : Concrete Frar	ne			Agency Agency											
07-DECK TYPE				WEATHER TEMP. (air) TEAM MEMB											
2 : Concrete Precas	st Pa	neis	_	Clear	27*	C	A. P								
ITEM 58	8		ITI	E M 59		8	٦		ITEM	60		8			
DECK	•	DEF	SUP	PERSTRUCTU	RE	•	ם ב	EF	SUBST	RUCTURE		•	DEF		
1.Wearing surface	7	-	1.Co	oncrete Rigid Fra	ame	8] [.	-	1. Abu	tments	Dive	Cur	8		
2.Deck Condition	8	-	2.Flo	oorbeams		Ν		-	a. Pile Ca	•	N	Н	-		
3.Stay in place forms	Ν	-	3.Flo	oor System Brac	ing	Ν		-	b. Bridge c. Backw		N	N N	-		
4.Curbs	8	-	4.Gi	rders or Beams		Ν		-	d. Breast		N	8	-		
5.Median	N	-	5.Tr	usses - General		Ν		-	e. Wingw		N	8 8	-		
5.Sidewalks	N	_	a.	Upper Chords	N			-	f. Slope g. Pointii	Paving/Rip-Rap ng	N N	8 N	-		
7.Parapets	N		b.	Lower Chords	N			-	h. Footings		Ν	N	-		
•	8		с.	Web Members	N			-	<u>i.</u> Piles i. Scour		N	Н 8	-		
3.Railing	0 N		d.	Lateral Bracing	N			-	k. Settler		N	8	-		
9.Anti Missile Fence			e.	Sway Bracings			-	Ι.		Ν	N	-			
10.Drainage System	8	-	f.	Portals	N	N -			<i>m.</i> 2. Piers	s or Bents	N	N	- N		
11.Lighting Standards	N	-	g.	End Posts	N			-	a. Pedestals		N	N	N _		
12.Utilities	N	-		n & Hangers		N		-	b. Caps	lais	N	N	-		
13.Deck Joints	N	-	7.Co	onn Plt's, Gusset	s & Angle			-	c. Colum	-	N	N	-		
14.	Ν	-	8.Co	over Plates		N	·	-	e. Pointir	/Webs/Pierwalls ng	N N	N N	-		
15.	N	-		aring Devices		N	·	-	f. Footin	-	Ν	Ν	-		
16.	Ν	-	10.0)iaphragms/Cros	s Frames	N	·	-	g. Piles h. Scour		N	N N	-		
]			Rivets & Bolts		N	·	-	i. Settler		N	N	-		
		s 175		Velds		N	·	-	j.		Ν	N	-		
(In millimeters)	•	170		lember Alignme	nt	8	·	-	<i>k.</i> 3. Pile	Bents	N	N	- N		
APPROACHES		DEF		aint/Coating		N	<u> </u>	-	a. Pile Ca		N	N			
a. Appr. pavement condition	7	_	15.			N		-	b. Piles	-r -	N	N	-		
b. Appr. Roadway Settlement	7	-	Yea	r Painted	Ν					nal Bracing	N	N	-		
c. Appr. Sidewalk Settlement	N	-		LISION DAMAGE:	Blazar	loi			d. Horizo e. Faster	ental Bracing	N	N N	-		
d.	N	-	Nor	DEFLECTION:	Please exp Moderate	() S	evere ()		INING (Y/N) If Y			xplain N		
OVERHEAD SIGNS (Nature) (Nature)	Y/N)	N DEF	Nor LOAI	ne (X) Minor () D VIBRATION:	Moderate Please exp	()So Iain	, , , , , , , , , , , , , , , , , , ,			DN DAMAGE:	Moderate () Severe ()				
a. Condition of Welds	Ν	-	Nor	ne (X) Minor ()	Moderate	() S	evere ()		Please explain Minor () N	odera	te () Severe ()		
b. Condition of Bolts	Ν	-	Any	Fracture Critical	Member:	(Y/N)	N						, (,		
c. Condition of Signs	Ν	-		Cracks: (Y/N)					I-60 (Div	e Report): N	<i>I</i> -6	0 (This	Report): 8		
]		U/ach3. (1/18)	Ν				93B-U/V	N (DIVE) Insp		00/	0/00/0000		

2-DIST

04 ||

B.I.N.

B7Y

													PAG	GE_2_0	DF	4
CITY/	TOW	J			B.I.	N.	BR. DEPT. NO.	89	STRU	CTUR	E NO.			INSPECTIO)N D	ATE
ROV					B7		R-11-008				Y-MUN-N	DI		SEP 1		
ROV					DI					0-D/					3, 20	,,,
ITE	CM 61			Г	8	ľ	TEM 36 TRAFFIC	SAFE	TY	0010	DEE	A(CCESSIB	ILITY	(Y/N	N/P)
CHA	NNE	L &		L	0		Bridge Railing		<u>36</u> 1	COND 8	DEF				Needed	
CHA	NNE	L PROTECTION	V				Fransitions		1	8			ft Bucket		Ν	N
			Dive	0	DEE				1	7		La	dder		Ν	N
			Dive		DEF		Approach Guardrail		1	7	-		oat		Ν	N
		Scour	Ν	8	-		Approach Guardrail Enc	IS	I	1	-		aders		Y	Y
2.Em	bankr	nent Erosion	Ν	8	-	WE:	IGHT POSTING		lot Ap				spector 50		N	N
3.Del	oris		Ν	7	-			H			ingle		gging		N	N
4.Veç	getatio	n	Ν	6	-	Act	ual Posting	N	N	N	N		Staging Traffic Control			N
5.Uti	ities		Ν	x	-	Red	commended Posting	Traffic Control			N	N N				
6.Rip	-Rap/	Slope Protection	Ν	8	-	Wai	ved Date: 00/00/000	0 EJD	MT Dat	te: 0	0/00/0000		R Flagger		N	
·	gradat	•	Ν	8	-			bridge			Advance				IN	
	-	ystem	N	N			ns In Place E	N		E	W	Οτ	her:		N	N
0.1 61		ystem	IN			(Y= NR=	Yes,N=No, =NotRequired)								1	
						Leg	ibility/					T(OTAL HC	OURS		8
							bility ARANCE POSTING				s					
								ft	in	ft	in meter	PI	LANS	(Y/N	1):	Υ
							al Field Measurement		0		0	(3.7				
		<u>OW VELOCITY:</u>	~			Pos	ted Clearance		0		0	(V	.C.R.)	(Y/N):	Ν	
Tidal () Higr	n() Moderate() Lo	ow (🌶	() None	()			bridge			vance	ТА	PE#:			
ITEM 61	(Dive R	eport): N ITEM 61	(This	Report)	: 8		ns In Place N Yes,N=No,	S	; [N	S	1:-	4 - f fin Ini 4a au			
			10.01	0000			=Not Required)	1—				LIS	t or neid test	s performed:		
93b-L	J/W IN	SP. DATE: 00	/00/	0000			bility									
RATI						(To b	e filled out by DBIE)				If YE	S ple	ase give pri	ority:		
Rating	l Repo	rt (Y/N): Y				Requ	lest for Rating or Rera	ting (Y	7N):	Ν	ню	GH () MEDIUM () LOW ()	
Date:		12/01/2014				DEA	SON:									
In	spection	on data at time of e	xistir	ng ratir	ng											
I 58: 8	1 59	: 8 I 60: 8 Dat	te :0	9/24/2	2013											
			-			1	CONDITION	RAT	ING	GUII	DE (For	Items	s 58, 59, 60 a	nd 61)		
	CODE	CONDITION					DEFEC	TS								
	N	NOT APPLICABLE														
G	9	EXCELLENT	E	xcellent o	condition.											
G	8	VERY GOOD	N	o probler	n noted.											
G	7	GOOD	S	ome min	or probler	ns.										
F	6	SATISFACTORY	St	tructural	elements	show so	ome minor deterioration.									
F	5	FAIR	AI	II primary	structura	al eleme	nts are sound but may have mir	nor section	n loss, cr	racking,	spalling or scour.					
Р	4	POOR					erioration, spalling or scour.	ioly offers	od =====		urol comment	1	foilures are a		rock-	
Р	3	SERIOUS					n, spalling or scour have seriou oncrete may be present.	isiy aifecti	eu prima	ry suuct	urai components.	Local	anures are po	solule. Faligue (acks	
С	2	CRITICAL					rimary structural elements. Fati ort. Unless closely monitored it								•	
с	1	"IMMINENT" FAILURE	м	ajor dete	rioration	or sectio	on loss present in critical structu	iral compo	onents or	r obvious	0				blility.	
–							t corrective action may put it ba	ick in light	service.							
	0	FAILED	0	ut of serv	/ice - bey	ond corr	rective action.									
 							DEFICIENCY R	EPO	RTIN	IG G	UIDE					
	CIENC				uires corre	ective ad	ction.									
		ES OF DEFICIENC					and income table advectional intermities of	4k - k - i d	و اواریمو او م						Minana	
							o not impact the structural integrity of gged drainage, etc.									
							nature and need more planning and ment, Considerable scouring or under									ed
C-S=	Critica	al Structural Deficie	ency -	A deficie	ency in a st	ructural el	ement of a bridge that poses an extre	eme unsafe	condition of	due to the	failure or imminent fa	ilure of	the element which	n will affect the stru	ctural	
		al Hazard Deficienc	w /	A deficience	y in a com	ponent or	element of a bridge that poses an ext nited to: Loose concrete hanging dow	reme hazar	d or unsaf	e conditio	n to the public, but do	es not i	mpair the structura	al integrity of the br	dge.	
			•	Examples bridge raili		are not ill	mea to. Loose concrete hanging dow	n over traff	io or peaes	əuidns, A	note in a sidewalk tha	с таў С	ause injuries to pe	uesularis, iviissing s	อสมแบก 01	
		OF REPAIR:														
I = Im A = AS	mediate SAP-		-		-		Engineer (DBIE) to report the Deficier ngineer or the Responsible Party (if no	-			-	n Repo	rt].			
	5AF- ioritize-			-			Responsible Party (if not a State own		-				-			

					PAGE <u>3</u> OF <u>4</u>
CITY/TOWN ROWLEY		B.I.N. B7Y	BR. DEPT. NO. R-11-008	8STRUCTURE NO. R11008-B7Y-MUN-NBI	INSPECTION DATE SEP 13, 2017
			REMA	ARKS	1
According to Approaches Elevations a This is a sin	o the design plans: s and abutments are are North and South nple span precast co ows from South to N	oncrete r		ame.	
<u>TEM 58 - D</u>	DECK				
	Wearing surface verse cracking at bo	oth east a	and west ends of	the deck.	
/linor longit	udinal cracking in th	ne eastbo	ound roadway.		
	HES				
	e <mark>s a - Appr. paveme</mark> nittent transverse an			roughout east approach.	
<u>TEM 61 - C</u>	CHANNEL AND CH	ANNEL	PROTECTION		
	Vegetation station growing at up	ostream e	end partially restr	icting flow.	
RAFFIC S	AFETY				
	Bridge Railing of structure have Ty	/pe "T10	1" Modified Bridg	je Rails.	
-	Transitions n of type "ss" guardr	rail.			
	Approach Guardrai ners have Type "ss"		y Guard Rail. Sor	ne spacer blocks are loose and	misaligned. (Photo
	Approach Guardrai and southeast have I		love ends with m	inor scrapes.	
Jorthwest e	endpost is rotated to	ward roa	adway. (Photo 2)		
⁻ he southw	est and northeast ha	ave burie	ed ends with mine	or scrapes and dents.	
<u>hoto Log</u> hoto 1 : hoto 2 :	Loose and misaligr Northwest guardra				

CITY/TOWN ROWLEY	B.I.N. B7Y	BR. DEPT. NO. R-11-008	8STRUCTURE NO. R11008-B7Y-MUN-NBI	INSPECTION DATE SEP 13, 2017
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				e de
	- 39 V	CAR THE	Carlon Fr	
	1-1-1-1			3.57
1				
		10		
		ALL Y		
		444		A COLOR
a 227				
			A WARNE	
		1		Store -

Photo 1: Loose and misaligned guardrail spacer block.



Photo 2: Northwest guardrail end post rotated towards roadway.

National Bridge Element Inspection

BDEPT#	R-11-008	Date	09/13/2017
B.I.N.	B7Y	District Bridge Inspection Eng'r	Thomas G. Weil
Item 8	R11008-B7Y-MUN-NBI	Inspecting Agency	Mass. Highway Dept.
Span Group	1	Team Leader	Patrick Burke
Town	Rowley	Team	Adam Power
District	4	Member(s)	

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4
12	Re Concrete Deck	sq feet	2	616.000	%	616.000			
Notes :		•			• •				·
> 510	Wearing Surfaces	sq feet	2	528.000	%	498.000	30.000		
Notes :	·	•			•				
> > 3220	Crack (Wearing Surface)	sq feet	2	50.000	%	20.000	30.000		
Notes :	·	•			•				
215	Re Conc Abutment	feet	2	56.000	%	56.000			
Notes :		•			• •				·
321	Re Conc Approach Slab	sq feet	2	720.000	%	720.000			
Notes :									
330	Metal Bridge Railing	feet	2	44.000	%	44.000			
Notes :									

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 7

STRUCTURES INSPECTION FIELD REPORT ROUTINE INSPECTION

BR. DEPT. NO. **R-11-009**

04 B80			5	ROUTINE	INSP	ECTI			F	R-1 1	1-009	9	
city/town ROWLEY			8S	tructure no. R11009-B	80-MU	N-NBI		Cilo. POINT	41-STATUS A:OPEN				P. DATE 2017
7-FACILITY CARRIED	IELD			MEMORIAL NAME/LOCAL NAME 27-Y					106-YR REBUILT 0000	YR F		3'D (NO 0000	ON 106))
6-FEATURES INTERSECTED				26-FUNCTIONAL	GE INSPECT	ION ENGINEER	T. G.	Weil					
WATER BACHELD	ER B	ROOK		Urban Loo	cal								
3-STRUCTURE TYPE				22-OWNER	21-MAINT	AINER	TEAM LEA	DER J. Dideo	,				
107 : Concrete Fra	me			Town Agency	Town Agency	/							
07-DECK TYPE		_		WEATHER	TEMP. (air	;)	TEAM MEN						
2 : Concrete Preca	st Pa	nels		clear	229	Ϋ́C	A. POV	VER					
ITEM 58	7		IT	EM 59		7	1	ITEM	60	Г	8		
DECK	1	DEF	SUI	PERSTRUCTU	RE	'	DEF	SUBST	RUCTURE		0		DEF
1.Wearing surface	7	-	1.St	ringers		N	-	1. Abu	Itments	Dive	Cur	8	DE!
2.Deck Condition	7	-		oorbeams		N	1 _	a. Pedes	stals	Ν	N		-
	N		3.FI	oor System Brad	cing	N	-	b. Bridg		N	N		-
3.Stay in place forms	7	-		oncrete Rigid Fra	-	7		c. Backw		N	N 8	-	-
I.Curbs		-		usses - General		/ N		e. Wing	,	N	8		-
5.Median	N	-		Upper Chords	N		-		Paving/Rip-Rap	N	8		-
6.Sidewalks	N	-		Lower Chords	N		-	g. Pointi h. Footii	-	N	N H		-
/.Parapets	N	-	с.	Web Members	N		-	i. Piles	.90	N	н		-
3.Railing	7	-		Lateral Bracing	N			j. Scou		N	8		-
9.Anti Missile Fence	Ν	-		Sway Bracings	N	_		k. Settle	ment	N	8 N	-	-
10.Drainage System	Ν	-	f. Portals N				-	<i>m.</i>		N	N		
11.Lighting Standards	Ν	-		End Posts	N		-	2. Pier	s or Bents	_		N	
12.Utilities	Ν	-	-	n & Hangers		N] _	a. Pedes	stals	N	N		-
13.Deck Joints	N	-		onn Plt's, Gusse	ts & Anale	es N		b. Caps	nns	N	N	-	-
14.	N	-		over Plates	J	N		d. Stems	s/Webs/Pierwalls	Ν	Ν		-
15.			9.Be	earing Devices		N		e. Pointi	-	N	N	-	-
15.	N	-		Diaphragms/Cros	ss Frames		╢─_	f. Footii g. Piles	ng	N	N N	-	-
16.	Ν	-		Rivets & Bolts		N		h. Scou	•	Ν	Ν		-
_1	N	S		Velds		N		<u>i.</u> Settle	ment	N	N		-
CURB REVEAL 15 (In millimeters)	50	150		/ember Alignme	ent	7		<u>j.</u> k.		N N	N N	-	-
· · · · · ·				Paint/Coating		N	-	3. Pile	Bents			N	
APPROACHES		DEF	15.	g		N		a. Pile C	aps	Ν	Ν	-	-
a. Appr. pavement condition	7	-					」	b. Piles	nal Bracing	N	N N		-
b. Appr. Roadway Settlement	8	-	Yea	r Painted	N				ontal Bracing	N	N		-
c. Appr. Sidewalk Settlement	Ν	-	COL	LISION DAMAGE:	Please ex	plain		e. Faste	ners	Ν	N	<u> [</u>	-
d.	Ν	-		ne (X) Minor () D DEFLECTION:	Moderate	. ,	evere ()	UNDERN	/INING (Y/N) If Y	ES ple	ease e	xplain	N
OVERHEAD SIGNS (Attached to bridge)	(Y/N)	N DEF	LOA	ne (X) Minor () D VIBRATION:) Moderate Please ex	plain		None (, , ,	lodera	te () Seve	ere (
a. Condition of Welds	Ν	-	No	ne (X) Minor ()) Moderate	() 56	evere ()		Please explain K) Minor () N	lodera	te () Seve	ere (
b. Condition of Bolts	N	-	Any	Fracture Critica	I Member:	(Y/N)	Ν						
c. Condition of Signs	N	-				. ,		I-60 (Div	ve Report): N	<i>I</i> -6	0 (This	Report	rt): 8
	1	L	Any	Cracks: (Y/N)	N			I	W (DIVE) Insp		0.0	/00/00	000

2-DIST

04

B.I.N.

B80

PAGE 2 OF 7

CITY/	TOW	V			B.L	N.	I. BR. DEPT. NO. 8STRUCTURE NO.						INSPECTION DATE					
ROV					B8		R-11-009					MUN-NI	31	SEP 1				
_						-	TEM 36 TRAFFIC						ACCESS		(Y/N			
	EM 61				7		IEM 36	SALE	36	COND		DEF	ACCESS	IDILIII	Needed	<i>,</i>		
	NNE. NNE	L & L PROTECTIOI	V			Α.	Bridge Railing		1	7	_	-	Lift Bucke	et	Needed	N		
CIIA			v			В.	Transitions		1	8	- -	-	Ladder	-	N	Ν		
			Dive	Cur	DEF		Approach Guardrail		1	8	- -	-	Boat		Ν	Ν		
1.Ch	annel	Scour	Ν	7	-	D.	. Approach Guardrail End	ls	0	8		-	Waders		Y	Y		
2.Em	bankr	nent Erosion	Ν	7	-	WF	EIGHT POSTING			oplical		X	Inspector	50	N	N		
3.Del	bris		Ν	8	-						Single	1	Rigging	N	N N			
4.Veç	getatio	n	Ν	7	-	Ac	ctual Posting	N	N	N	Ν			Staging N Traffic Control N				
5.Uti	lities		Ν	X	-	Re	ecommended Posting	Ν		RR Flagg		N	N					
6.Rip	-Rap/	Slope Protection	Ν	7	-	Wa	aived Date: 00/00/000	0 EJDI	MT Da	ite: 0	0/00	0/0000	Police		N	N		
7.Ag	gradat	ion	Ν	7	-			bridge		Other	r Adva		Other:					
8.Fer	nder S	ystem	Ν	Ν	-		gns In Place E =Yes,N=No,	W	/	E					Ν	Ν		
							R=NotRequired)		\exists		۶ŀ		TOTAL	HOURS				
						Vis	sibility						IUIAL	liours		8		
						CL	EARANCE POSTING	N			S		PLANS	(Y/I	N): [Y		
							ot X	ft	in O	ft	ir				· L			
		OW VELOCITY:					ctual Field Measurement		0				(V.C.R.)	(Y/N):	Ν			
Tidal () High	n() Moderate() L	.ow ()	K) Nor	ne()		u	bridge	•	A	dvand		TAPE#:					
ITEM 61	(Dive R	eport): N ITEM 61	l (This	Repo	rt): 7		gns In Place N =Yes,N=No,	S	<u> </u>	N		S						
						ŇF	R=Not Required)				╡			tests performed				
93b-L	J/W IN	SP. DATE: 00)/00/	0000)		egibility/ sibility						Hanus on	routine inspe	ction			
RATI						(To l	be filled out by DBIE)		Г		7	If YE	S please give	priority:				
Rating	g Repo	rt (Y/N): Y				Req	uest for Rating or Rera	ting (Y	/N):	Ν		HIG	GH () MEDIU	M() LOW ()			
Date:	(09/01/2013				REA	ASON:											
	•	on data at time of e																
I 58: 8	B 1 59	: 8 I 60: 8 Da	te :0	9/09	/2011													
							CONDITION	RATI	ING	GUI	DE	(For	Items 58, 59,	60 and 61)				
	CODE	CONDITION					DEFEC	CTS										
	N	NOT APPLICABLE																
G	9	EXCELLENT	E	xcellen	t condition.													
G	8	VERY GOOD	N	lo probl	em noted.													
G	7	GOOD	_		inor probler													
F	6	SATISFACTORY	_				some minor deterioration.	or addian		rooking	analli	22 07 000UF						
F	5	FAIR POOR	-				eterioration, spalling or scour.	tor section	11055, 0	cracking,	, spain	ng or scour.						
P	3	SERIOUS	L	oss of s	section, det	eriorati	tion, spalling or scour have seriou	usly affecte	ed prima	ary struc	ctural o	components.	Local failures ar	e possible. Fatigue	cracks			
	3	SERIOUS					concrete may be present. primary structural elements. Fatig	que cracks	s in ste	el or she	ear cra	cks in concre	te may be prese	nt or scour may hav	e			
С	2	CRITICAL	re	emoved	substructu	re sup	port. Unless closely monitored it	may be ne	ecessar	y to clos	se the	bridge until co	prrective action i	s taken.				
С	1	"IMMINENT" FAILURE					tion loss present in critical structu but corrective action may put it ba				us vert	ical or horizoi	ntal movement a	fecting structure sta	ablility.			
	0	FAILED	0	out of se	ervice - bey	ond co	prrective action.											
							DEFICIENCY R	EPO	RTIN	NG G	HUI	DE						
DEFI	CIENC	Y: A defect in a str	ucture	that re	quires corre	ective a												
CATE	GORI	ES OF DEFICIEN	CIES	:														
M= N	1inor I	Deficiency - Deficiencies holes, Minor	which a corrosi	are mino on of ste	r in nature, ge el, Minor sco	nerally uring, Cl	do not impact the structural integrity of clogged drainage, etc.	the bridge a	and could	easily be	repaire	d. Examples inc	lude but are not lim	ited to: Spalled concrete	e, Minor p	ot		
S= Se	vere/N	lajor Deficiency - ar	eficienci nd corro	ies which ded reba	n are more ex ars, Considera	tensive ble sett	in nature and need more planning and e tlement, Considerable scouring or under	effort to reparmining, Mod	air. Exam derate to	nples inclu extensive	ude but e corros	are not limited to	o: Moderate to majo steel with measurat	r deterioration in concre le loss of section, etc.	ete, Expos	ed		
				_ A defi	ciency in a st	ructural	element of a bridge that poses an extre											
		al Hazard Deficien	- v	A deficie	ency in a com	po. Donent d	or element of a bridge that poses an ext	treme hazaro	d or unsa	afe conditi	on to th	e public, but doe	es not impair the str	uctural integrity of the b	ridge.			
			•		es include but ailing, etc.	are not	limited to: Loose concrete hanging dow	n over traffic	ic or pede	esulans, A	1 noie ir	a sidewalk that	may cause injuries	to pedestrians, Missing	Section of			
		OF REPAIR:				_	-											
I = Im A = As	mediate SAP-		-		-		n Engineer (DBIE) to report the Deficien Engineer or the Responsible Party (if no					-	n Report].					
	ioritize-			-			ne Responsible Party (if not a State own			- · ·								

				PAGE <u>3</u> OF <u>7</u>			
CITY/TOWN ROWLEY	B.I.N. B80	BR. DEPT. NO. R-11-009	8STRUCTURE NO. R11009-B80-MUN-NBI	INSPECTION DATE SEP 11, 2017			
		REMA	ARKS				
This is a simple span precast co The approaches are West and E The elevations are South and Ne Bachelder Brook flows South to For the purpose of this report, right	East. orth. North.	-					
<u>TEM 58 - DECK</u>							
t em 58.4 - Curbs South curb has minor scrapes th	۱roughc	out. (Photo 1)					
TEM 59 - SUPERSTRUCTURE	-						
tem 59.4 - Concrete Rigid Fra The concrete structure is in good		tion.					
⁻ he west wall of the rigid frame	has loo	ose joint filler betw	veen Sections 2 and 3. (Photo	2)			
⁻ he east wall of the rigid frame I ind Sections 3 and 4. (Photo 3		se joint filler at the	e interface of Sections 1 and 2,	Sections 2 and 3,			
⁻ he frame roof has a number of	minor	spalls throughout.	. (Photo 4)				
⁻ he north face of rigid frame Se	ction 4	has minor hairline	e cracks at midspan. (Photo 5)	1			
tem 59.13 - Member Alignmer The interface between rigid fram		ions 2 and 3 shov	vs minor misalignment at the e	ast end. (Photo 6)			
RAFFIC SAFETY							
t em 36a - Bridge Railing Both sides of bridge have Type	T101, r	nodified bridge ra	illings. (Photo 7)				
t em 36b - Transitions Continuation of Type "ss" guard	rail with	ו wood posts spac	ced properly.				
t <mark>em 36c - Approach Guardrail</mark> All four corners have type"ss" guardrail.							
tem 36d - Approach Guardrail Ends Northeast and southwest ends are buried.							
Southeast and northwest have boxing glove ends.							
Yhoto Log Yhoto 1 : South curb has min	or scra	pes throughout					

- hoto 2 :
- West wall has loose joint filler between rigid frame sections 2 and 3. East wall has loose joint filler between rigid frame sections 1 and 2, 2 and 3, and 3 and 4. hoto 3 :

CITY/TOWN ROWLEY	B.I.N. B80	BR. DEPT. NO. R-11-009	8STRUCTURE NO. R11009-B80-MUN-NBI	INSPECTION DATE SEP 11, 2017
		РНО	TOS	
				122
			A states	
		-		alesse

Photo 1: South curb has minor scrapes throughout





CITY/TOWN	B.I.N.	BR. DEPT. NO.	8STRUCTURE NO.	INSPECTION DATE
ROWLEY	B80	R-11-009	R11009-B80-MUN-NBI	SEP 11, 2017
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100				
00	*			

Photo 3: East wall has loose joint filler between rigid frame sections 1 and 2, 2 and 3, and 3 and 4.





CITY/TOWN	DIN	DD DEPT NO		PAGE 6 OF 7
CITY/TOWN ROWLEY	B.I.N. B80	BR. DEPT. NO. R-11-009	8STRUCTURE NO. R11009-B80-MUN-NBI	INSPECTION DATE SEP 11, 2017
		РНО	TOS	
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and and	and the second			1.2
and the second se				
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En collection	and the second second	The second second		
Photo 5:	North face of midspan	rigid frame sec	tion 4 has minor hairline crack	s at
	inaopan			
a the second				
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a prime and	- inter the second	C. M. C. Martine Law	A Description of the second	Strengty .
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i e	the state	· · · · · · · · · · · · · · · · · · ·		a man
	And the state of the second	and the state	CST	
4				

Photo 6: Misalignment of approx. 1/2" at the interface of rigid frame sections 2 and 3 near east wall

CITY/TOWN ROWLEY	B.I.N. B80	BR. DEPT. NO. R-11-009	8STRUCTURE NO. R11009-B80-MUN-NBI	INSPECTION DATE SEP 11, 2017
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Sec.				
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		C.		
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00	Alter			
1994				

Photo 7: Type T101 modified bridge railing; Typical.

National Bridge Element Inspection

BDEPT#	R-11-009	Date	09/11/2017
B.I.N.	B80	District Bridge Inspection Eng'r	Thomas G. Weil
Item 8	R11009-B80-MUN-NBI	Inspecting Agency	Mass. Highway Dept.
Span Group	1	Team Leader	Joseph Dideo
Town	Rowley	Team	Adam Power
District	4	Member(s)	

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4
38	Re Concrete Slab	sq feet	2	616.000		606.000	10.000		
Notes :		•					•	•	
> 1080	Delamination/Spall/Patched Area	sq feet	2	10.000			100.00		
Notes :		1			1 1				
> 510	Wearing Surfaces	sq feet	2	528.000		528.000			
Notes :	1				1 1		1	1	
215	Re Conc Abutment	feet	2	60.500		60.500			
Notes :		•					•	•	
321	Re Conc Approach Slab	sq feet	2	720.000		720.000			
Notes :		•						•	•
330	Metal Bridge Railing	feet	2	40.000	%	40.000			
Notes :	I								
> 515	Steel Protective Coating	sq feet	2	80.000	%	80.000			
Notes : Galvanized steel railing									

Appendix B

Bridge Summary

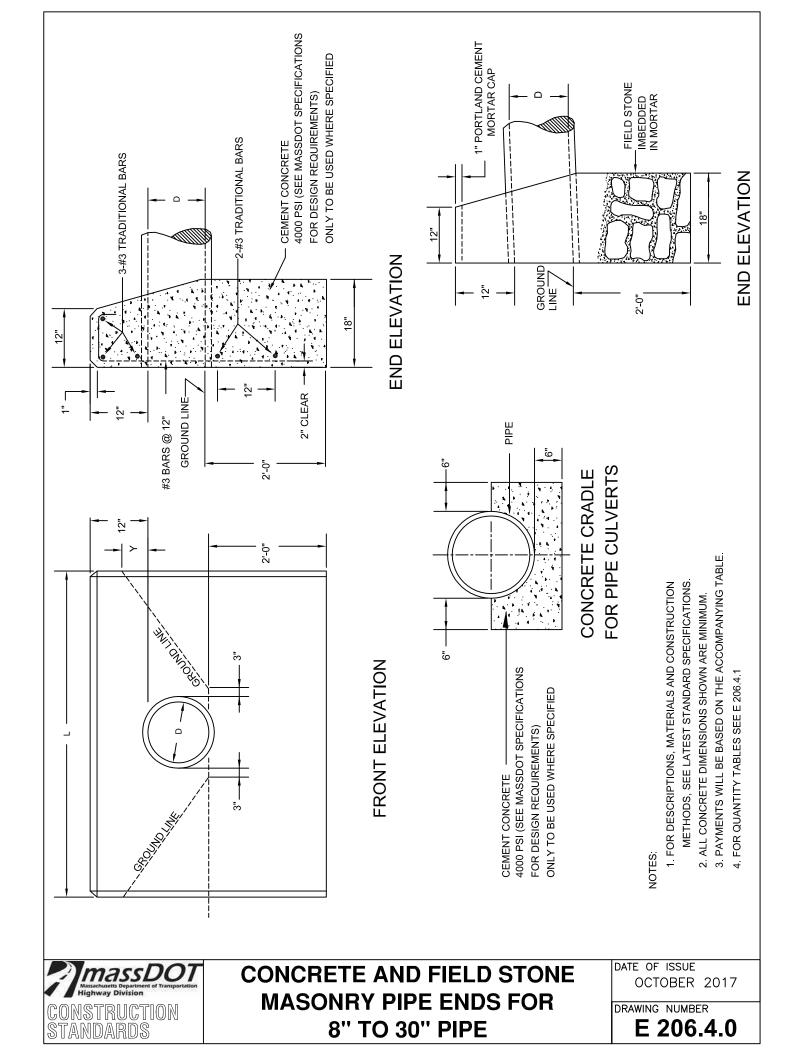
<u>Town</u> ID No.	<u>MassDOT</u> Bridge No.	Feature Carried	<u>Feature</u> Intersected	Structure Material	Structure Type	<u>Hydraulic</u> Opening	<u>Cover</u> Depth	<u>Wearing</u> Surface	<u>Railing</u>	<u>Year</u> Built	<u>Flooding</u> <u>Issue</u>	Scour Issues/ Undermining	L	Channel Condition Jpstream/Downstream	Overall Condition	Immediate Repairs Required	Notes
1		Bennett Hill Rd.	N/A	Stone	Single Culvert	24" dia.	3 ft	Asphalt	US - wood DS - none	N/A	NO	None	7		6	Remove vegetation from channel	Difficult access due to vegetation
2		Boxford Rd.	N/A	Pipe (Metal)	Single Culvert	30" dia.	3 ft	Asphalt	None	N/A	NO	None Visible	6	Upstream - very heavy vegetation and debris	6	Culvert is almost full with sediment, dry laid stone headwalls satisfactory	Clean culvert of sediment, and channel of debris and vegetation.
3		Boxford Rd.	N/A	Pipe (Metal)	Single Culvert	30" dia.	2.5 ft	Asphalt	None	N/A	YES	None Visible	6	Downstream, moderate debris, inlc. Large trees	6	Clean debris from channel, remove tree at DS headwall, rebuild both headwalls.	SDS headwall has 5" +/- tree growing on top. Both stone headwalls have loose or settled stones
4		Boxford Rd.	N/A	Pipe (Poly)	Single Culvert	24" dia	2 ft	Asphalt	None	2006	YES	Both ends of pipe are undermined	6	Moderate debris DS	6	Clear vegetation and debris, monitor undermining at pipe ends	Plastic pipe generally good condition, but damaged on upstream end. No headwalls, loose stone laid on down stream end.
5		Bradford St.	N/A	Pipe (Clay)	Single Culvert	24" dia.	4 ft	Asphalt	US - wood DS - none	N/A	NO	None	N/A	Downstream is a pond	6		ungrouted masonry headwall and channel outlet. Inlet headwall is failing (ungrouted stone) Pipe half filled with sediment. Pavement is in poor condition.
6		Central St.	N/A	Granite Slabs/30" CMP at outlet	Single Culvert	48" W x 30" H	< 1' at ends, 3' middle	Asphalt	US - guardrail DS - wood	N/A	YES	Minor @ pipe at inlet	5	Channel is constricted with rocks/debris	6		Rusting and section loss at inlet. Partial collapsing of outlet headwall (missing stones). Flooding issues due to heavy rain.
7		Central St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	2 ft	Asphalt	US - none DS - wood	N/A	YES	None	7	Pond upstream and downstream	5	Grout stones at outlet headwall. Remove debris	Headwall at outlet is leaning. Inlet at pond on private property
8		Central St.	N/A	Pipe (Metal)	Single Culvert	36" dia.	6 ft	Asphalt	None	N/A	NO	Some flow under pipe	6	Rock and debris in channel	6		Corrosion and section loss for first 5' of pipe. Headwalls are concrete
9		Christopher Rd.	N/A	Pipe (Metal)	Single Culvert	36" dia.	3 ft	Asphalt	None	N/A	NO	None	7		7		Vertical crack in downstream headwall. Inlet on private property
10		Cross St.	N/A	Concrete/Granite	Slab	63" W x 48" H	< 1 ft	Asphalt	US - wire DS - wood	N/A	NO	None	7		7		Masonry abutment with granite slab. Last 5' at downstream end is concrete abutments and slab.
11		Cross St.	N/A	Pipe (Metal)	Single Culvert	24" dia.	3 ft	Asphalt	None	N/A	NO	minor at outlet	7		6		Some crushing of pipe at outlet (could have been at construction). Grouted masonry at inlet, dry stacked masonry at outlet
12		Daniels Rd.	N/A	Pipe (Metal)	Single Culvert	24" dia.	3 ft	Asphalt	None	N/A	YES	minor at US wingwall	6		5	Rebuild downstream headwall and wingwall	Bank erosion downstream. Appears downstream headwall and wingwall have collapsed
13		Dodge Rd.	N/A	Pipe (Clay)	Single Culvert	28" W x 15" H	3 ft	Asphalt	None	N/A	NO	None	6		3	Replace	Appears headwall, wingwalls, and pipe have collapsed at outlet. Depression in road above pipe.
14		Dodge Rd.	N/A	Pipe (Metal)	Single Culvert	24" dia.	5 ft	Asphalt	None	N/A	NO	None	N/A	Wetlands	7		Riprap slope at inlet, perched outlet. Minor erosion of outlet bank.
15		Dodge Rd.	N/A	Pipe (Metal)	Double Culvert	2 - 12" dia.	4 ft	Asphalt	None	N/A	NO	None	6	Heavy debris in downstream channel	5		Gaps in stones at inlet and outlet. Perched outlet, bottom of pipe with 100% section loss for approx. 3' (water does not flow out end of pipe)
16	R11005	Dodge Rd.	Mill River	Concrete	Arch-Deck			Asphalt		2009					7		See MassDOT Inspection Report for further information
17	R11002	Glen St.	Mill River	Concrete	Arch-Deck			Asphalt		1850					4		See MassDOT Inspection Report for further information
18		Haverhill St.	N/A	Pipe (Metal)	Single Culvert	24" dia	7ft	Asphalt	DS - metal gr US - metal gr	N/A	YES	None			5	Rebuild upstream headwall	Downstream end of pipe si rusted with minor section loss, wingwalls are spalled ans cracked. Upstream pipe not visible. Headwall condtion is poor with spalling and sink hole behind.

<u>Town</u> ID No.	<u>MassDOT</u> Bridge No.	Feature Carried	<u>Feature</u> Intersected	Structure Material	Structure Type	<u>Hydraulic</u> Opening	<u>Cover</u> Depth	<u>Wearing</u> <u>Surface</u>	<u>Railing</u>	<u>Year</u> Built	<u>Flooding</u> <u>Issue</u>	Scour Issues/ Undermining	<u>l</u>	Channel Condition Jpstream/Downstream	Overall Condition	Immediate Repairs Required	Notes
19		Haverhill St.	N/A	Pipe (HDPE)	Single Culvert	18" dia	6ft	Asphalt	DS - metal gr US - none	N/A	YES	None	6	Heavy Veg. & Debris	6	Clean Debris at Portals	Pipe in good condition, downstream stone headwall in good condition, concrete upstream headwall has some spalling.
20		Haverhill St.	N/A	DS Pipe (Metal) US pipe (Plastic)	Single Culvert	24" dia	7ft	Asphalt	DS - metal gr US - none	N/A	YES	Yes upstream wingwall			5	Repair upstream headwall	Upstream headwall in fair condition with some spalling. Roadway drains directly over headwall. Downstream headwall has minor spalling.
21		Haverhill St.	N/A	Concrete	Single Culvert	24" dia	7 ft	Asphalt	US - metal gr	N/A	NO	Yes sloped paving at upstream portal.	5	Channel meander US	4	Rebuild downstream headwall	Upstream headwall in good condition. Downstream headwall has failed.
22		Haverhill St.	N/A		Single Culvert			Asphalt	none	N/A	NO					Clear vegetation up stream for better access. Scope upstream portal.	
23		Haverhill St.	Batchelder Brook				4 ft	Asphalt	Metal gr	N/A	YES	None Visible	6	Vegetation and debris		Re-inspect during lower flow period	Culvert completely submerged.
24		Haverhill St.	N/A	Concrete	Single Culvert	30" dia.	2.5 ft	Asphalt	Metal gr	N/A	YES	None Visible	6	Vegetation and debris	5	Repair US headwall	Upstream pipe submerged in water, not visible. Mortared stone headwall in good condition. Dowstream pipe was 90% full. Stone headwall has failed.
25		Haverhill St.	Mill River	TBD	TBD	TBD		Asphalt	DS - metal gr US - metal gr	N/A	YES	None Visible	6	Minor debris US		Revisit culvert during period of low flow to better identify.	Due to high water and heavy debris, culvert was not visible at either end.
26		Hillside St.	N/A	Pipe (Metal)	Single Culvert	36" dia.	< 1 ft	Asphalt	None	N/A	YES	None	7		7		Concrete headwall and wingwalls at inlet. Masonry at outlet. Floods frequently
27		Hillside St.	N/A	Pipe	Single Culvert	Could not measure	3 ft	Asphalt	None	N/A	NO	unknown	6		4	Rebuild headwalls	Inlet and outlet headwalls have completely collapsed
28		Independent St.	Ox Pasture Brook		Opened Bottom Arch	44" W x 24" H	2 ft	Asphalt	Guardrail	N/A	YES	None	6	Heavy vegetation	4	Reconstruct headwall and wingwall, remove debris	Erosion behind headwall and wing at inlet and outlet. Partial collapse of upstream wingwalls. Ungrouted masonry. Fills up during heavy rain but no overtopping.
29		Newbury Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	2 ft	Asphalt	None	N/A	NO	None	N/A		7		Inlet is steel grate and drop inlet. Outlet to riprap apron and field. Asphalt on top is rutted and patched.
30		Newbury Rd.	N/A	Pipe (Metal)	Single Culvert	12" dia.	2 ft	Asphalt	None	N/A	YES	None	7	Riprap upstream	7		Ungrouted masonry headwall and wingwalls at inlet and outlet. (dry during field visit)
31		Newbury Rd.	N/A	Pipe (Metal)	Single Culvert	unknown	3 ft	Asphalt	None	N/A	NO	None	7		5	Uncover inlet and outlet	Inlet headwall is missing, outlet headwall is not visible. Riprap slopes around outlet
32		Pleasant St.	N/A	not visible	Single Culvert	Could not measure	2 ft	Asphalt	US - wood DS - none	N/A	NO	None	7		5	Repair headwall, remove sediment	Headwall at outlet has collapsed. Inlet is partially blocked with sediment.
33		Prospect St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	2 ft	Asphalt	Low stone parapet	N/A	NO	None	7		8		Grouted masonry headwall and wings
34		School St.	N/A	Masonry/ Concrete	Single Culvert	50" W x 50" H	4 ft	Asphalt	Wood	N/A	NO	Minor at DS wingwall	7	Minor bank erosion	6	Repair sidewalk, downstream side	Headwall at inlet is leaning outwards. Some need of repointing. Cracks in asphalt.
35		Summer St.	N/A	Pipe (Concrete/ Clay)	Single Culvert	24" dia. Clay @ inlet, 36" dia. Conc. @ outlet	3 ft	Asphalt	US - none DS - wood	N/A	NO	None	6	Some large rocks in channel	7		Minor erosion behind inlet wingwall. Additional 15" dia. Conc. Pipe at outlet from nearby drop inlet.
36		Turcotte Mem. Dr.	N/A	Pipe (Concrete)	Double Culvert	2 - 46" dia.	12 ft	Asphalt	Wood guardrail	N/A	NO	None	7		8		North pipe blocked with debris.

<u>Town</u> ID No.	<u>MassDOT</u> Bridge No.	Feature Carried	<u>Feature</u> Intersected	Structure Material	Structure Type	<u>Hydraulic</u> Opening	<u>Cover</u> Depth	<u>Wearing</u> Surface	<u>Railing</u>	<u>Year</u> Built	<u>Flooding</u> <u>Issue</u>	Scour Issues/ Undermining	<u> </u>	Channel Condition Jpstream/Downstream	<u>Overall</u> Condition	Immediate Repairs Required	<u>Notes</u>
37		West Ox Pasture Ln.	N/A	Pipe (Poly)	Single Culvert	12" dia.	1 ft	Compacted stone	None	2009	NO	None	N/A	Wetlands	8		Recently installed structure. Riprap slopes
38		Wethersfield St.	N/A	Pipe (Concrete)	Single Culvert	24" dia.	4 ft	Asphalt	Wood guardrail	N/A	NO	Minor at outlet	6		5	Remove trees behind headwall, rebuild inlet headwall	No pointing at outlet. Dislodged stones at inlet headwall, no pointing.
39	R11008	Wethersfield St.	Mill River	Concrete	Frame	24" dia.		Asphalt		2009					8		See MassDOT Inspection Report for further information
40	R11009	Wethersfield St.	Batchelder Brook	Concrete	Frame			Asphalt		2009					7		See MassDOT Inspection Report for further information
41		Wethersfield St.	N/A														Culvert is being replaced in 2018
42		Wilkes Rd.	N/A	Pipe (Concrete)	Double Culvert	2-15" dia.	12 ft	Asphalt	Conc. Parapet with metal rail	N/A	NO	None	N/A	Wetlands	8		Pipes at base of back-to-back retaining walls supporting road
43		Spencer Knowles Rd.	N/A	Pipe (Concrete)	Single Culvert	24" dia.		Asphalt	Conc. Parapet with wood rail	N/A	NO	None	7	Minor debris in channel	8		Minor cracks in parapet
44		Wethersfield St.	N/A	Pipe (Poly)	Single Culvert	14" dia.	2 ft	Asphalt	None	N/A	NO	None	7		6		Drains wetlands area. Dip in road over pipe. Ungrouted stones for headwall.
45		Haverhill St.	N/A		Single Culvert	12" est.	4 ft	Asphalt	DS - metal gr US none	N/A	NO	Not visible	6	Minor debris DS channel	6	Clean DS channel	Downstream (N) portal submerged in water, headwall fair, upstream portal appears to be CB.
46		Haverhill St.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	4 ft	Asphalt	DS - metal gr US - metal gr	N/A	NO	Not visible	6	Heavy veg US channel	6	Clean debris from pipe and DS channel	Upstream (N) portal submerged in water, headwall fair, downstream pipe is about 1/2 full of heavy debris.
47		Boxford Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	3.5 ft	Asphalt	None	N/A	NO	None	6	Heavy Vegetation and debris upstream	5	Remove tree at DS headwall and re-set stones. Clean channel of debris	DS Stone headwall has large tree and roots growing over it
48		Boxford Rd.	N/A	Pipe (Poly)	Single Culvert	24" dia	1.5 ft	Asphalt	None	N/A	NO	Not Visible	6	Heavy Vegetation upstream and downstream	6	Clear vegetation and debris	Pipe is in good condition, no headwall down stream., upstream headwall satisfactory
49		Wilkes Rd.	N/A	Pipe (Concrete)	Single Culvert	12" dia.	4 ft	Asphalt	US - none DS - wood	N/A	NO	None	N/A	Wetlands	6	Remove debris from inlet	Debris at inlet and no headwall. Stone headwall at outlet. (Dry during field visit)
50		Cindy Ln.	N/A	Pipe (Concrete)	Triple Culvert	3 - 30" dia.	4 ft	Asphalt	Wood guardrail	N/A	NO	None	N/A	Wetlands	7	Remove vegetation growing between pipes	Vegetation growing between pipes and on slopes.
51	R11007	Glen St. Ext.	Mill River	Masonry	Arch-Deck			Asphalt		2009					7		See MassDOT Inspection Report for further information
52	R11006	Mill Rd.	Mill River	Steel	Girder			Asphalt		1900					4		See MassDOT Inspection Report for further information

Appendix C

MassDOT Standard Construction Details (Headwalls)



PIPE DIAM. 11/2:1SLOPE DIAM. D D L OR STEEL DIAM. CONC. B 4'-2" DIAM. CONC. B 4'-2" CU.YDS. STEEL CU.YDS. STEEL CU.YDS. STEEL CU.YDS. STEEL PEPTH PEPTH CU.YDS. STEEL LBS. STEEL LD. O.77 20. 23.91 6'-6" 1.08 21 26.25 7'-6" 1.34 24 29.75 8'-6" 1.61 21" 8'-6" 18" 7'-6" 7'-6" 33.25 21" 8'-6" 21" 8'-6" 21" 30'-33.35 21" 30'-33.35 210" 30'-33.35 210" 30'-33.35 30" 10					ENGLISH UNITS	UNITS			
L CONC. L ORF.S.M. CU. YDS. 4'-2" 0.77 4'-10" 0.92 5'-6" 1.08 6'-6" 1.08 6'-6" 1.95 8'-6" 1.95 9'-3" 2.16 10'-6" 2.63	PIPE		1 1/2 : 1 9	SLOPE			2:1 SLOPE	OPE	
4'-2" 0.77 4'-10" 0.92 5'-6" 1.08 5'-6" 1.34 6'-6" 1.34 8'-6" 1.61 8'-6" 1.95 9'-3" 2.16 10'-6" 2.63	D		CONC. OR F.S.M. CU. YDS.	STEEL LBS.	TRENCH EXCAV. 1-0" DEPTH CU. FT.		CONC. OR F.S.M. CU. YDS.	STEEL LBS.	TRENCH EXCAV. 1'-0" DEPTH CU FT.
4'-10" 0.92 5'-6" 1.08 5'-6" 1.34 6'-6" 1.34 8'-6" 1.61 8'-6" 1.95 9'-3" 2.16 10'-6" 2.63	"8		0.77	15	21.60	5'-10"	1.08	21	27.40
5'-6" 1.08 5'-6" 1.34 6'-6" 1.34 7'-6" 1.61 8'-6" 1.65 9'-3" 2.16 10'-6" 2.63	10"	4'-10"	0.92	20	23.91	6'-8"	1.28	23	30.35
6'-6" 1.34 7'-6" 1.61 8'-6" 1.95 9'-3" 2.16 10'-6" 2.63	12"		1.08	21	26.25	7'-6"	1.49	29	33.25
7'-6" 1.61 8'-6" 1.95 8'-6" 2.16 9'-3" 2.16 10'-6" 2.63	15"		1.34	24	29.75	8'-9"	1.82	32	37.63
8'-6" 1.95 9'-3" 2.16 10'-6" 2.63	18"		1.61	30	33.25	10'-0"	2.18	39	42.00
9'-3" 2.16 10'-6" 2.63	21"	8'-6"	1.95	34	37.35	11'-6"	2.62	43	47.25
10'-6" 2.63	24"	9'-3"	2.16	35	39.38	12'-6"	2.97	50	50.75
4" FOR 1 1/2 1 SI (30"	10'-6"	2.63	44	43.75	15'-0"	3.86	62	59.50
		>		4" FOF	3 1 1/2 1	I SLOPE			
6" FOR 2 : 1 SLOPE		-		6" FOF		OPE			

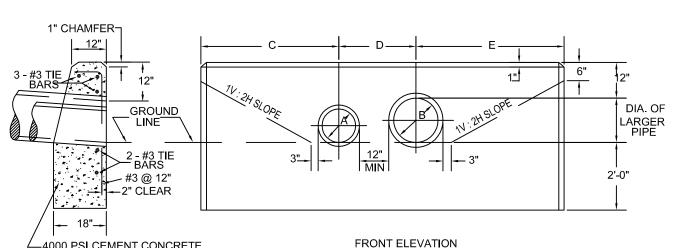


QUANTITY TABLES FOR CONCRETE AND FIELD STONE MASONRY PIPE ENDS

DATE OF ISSUE

OCTOBER 2017 DRAWING NUMBER

E 206.4.1



-4000 PSI CEMENT CONCRETE (SEE MASSDOT SPECIFICATIONS FOR DESIGN REQUIREMENTS)

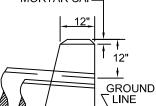
END ELEVATION

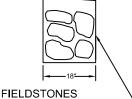
TRENCH LENGTHS DIAMETER EXCAV. MASONRY STEEL (IN.) DESIGN 1'-0" (LBS) (CY) DEPTH (CF) NO. в С D А F 3'-9" 2'-2" 12 3'-9" 1.89 37 40.85 1 12 45.50 2 12 15 2.27 42 4'-3" 2'-4" 4'-5" 3 12 18 2.66 48 49.88 4'-9" 2'-6" 5'-0" 21 5'-4" 5'-8" 54.85 4 12 2'-8" 3.12 54 5 12 24 2'-10" 3.54 59 58.91 6'-3" 5'-9" 6'-9" 3'-0" 7'-6" 67.38 6 12 30 4.48 71 7 15 4'-5" 2'-6" 4'-5" 2.32 41 46.66 15 8 51.03 15 18 4'-11" 2'-8" 5'-0" 2.72 48 9 15 21 5'-5" 2'-10" 5'-8" 3.16 54 55.72 60.10 10 15 5'-11' 3'-0" 6'-3" 3.60 60 24 6'-11" 3'-2" 7'-6" 4.54 68.53 11 15 30 72 12 5'-0" 2'-8" 5'-0" 2.72 51.35 18 18 48 21 5'-7" 2'-10" 5'-8" 56.28 13 18 3.17 52 60.38 14 18 24 6'-0" 3'-0" 6'-3" 3.58 60 30 15 18 7'-0" 7'-6" 4.53 72 68.85 3'-2" 57.19 16 21 21 3.20 53 5'-8" 3'-0" 5'-8" 17 6'-2" 3'-4" 62.13 21 24 6'-3" 3.69 61 7'-2" 30 7'-6" 3'-6" 18 4.65 73 70.60 21 24 6'-3" 19 24 3'-4" 6'-3" 3.67 61 62.40 7'-3" 3'-8" 7'-6" 30 64.47 20 4.69 74 24 7'-6" 4'-0" 7'-6" 73.50 21 30 30 4.76 75

FIELD STONE

MASONRY ENDS

1" PORT. CEMENT MORTAR CAP-





IMBEDDED — IN MORTAR

END ELEVATION

NOTE:

1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.

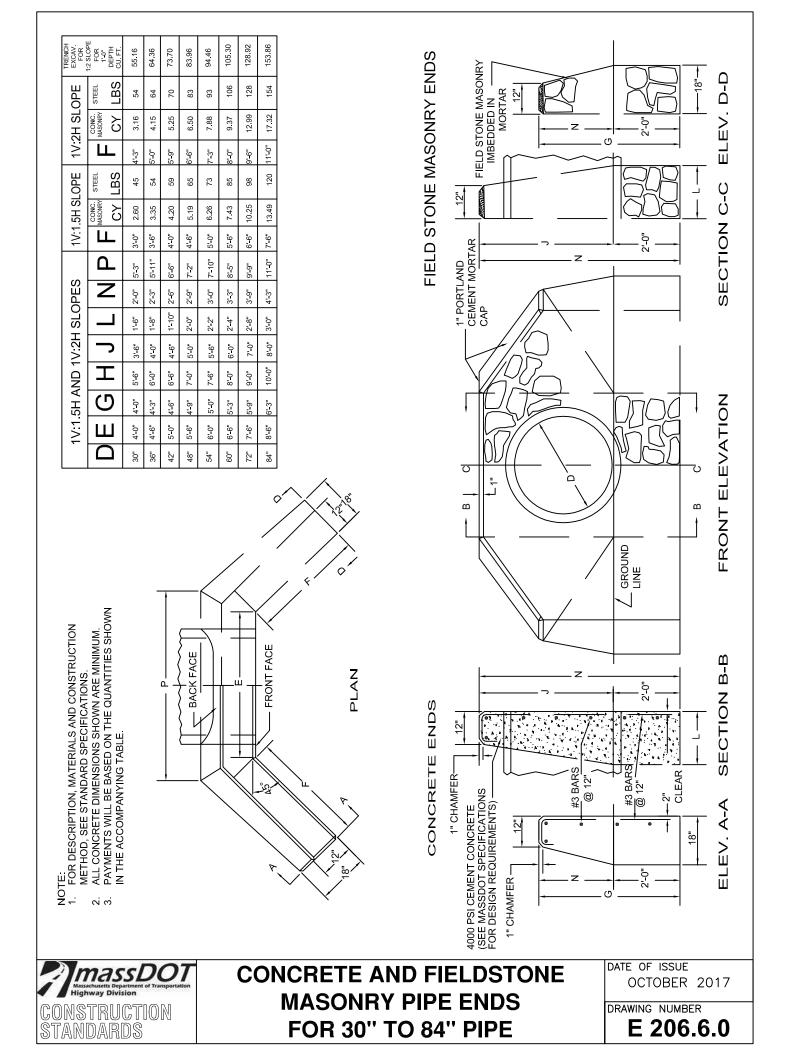
3. PAYMENTS WILL BE BASED ON THE QUANTITIES SHOWN IN ACCOMPANYING TABLE.

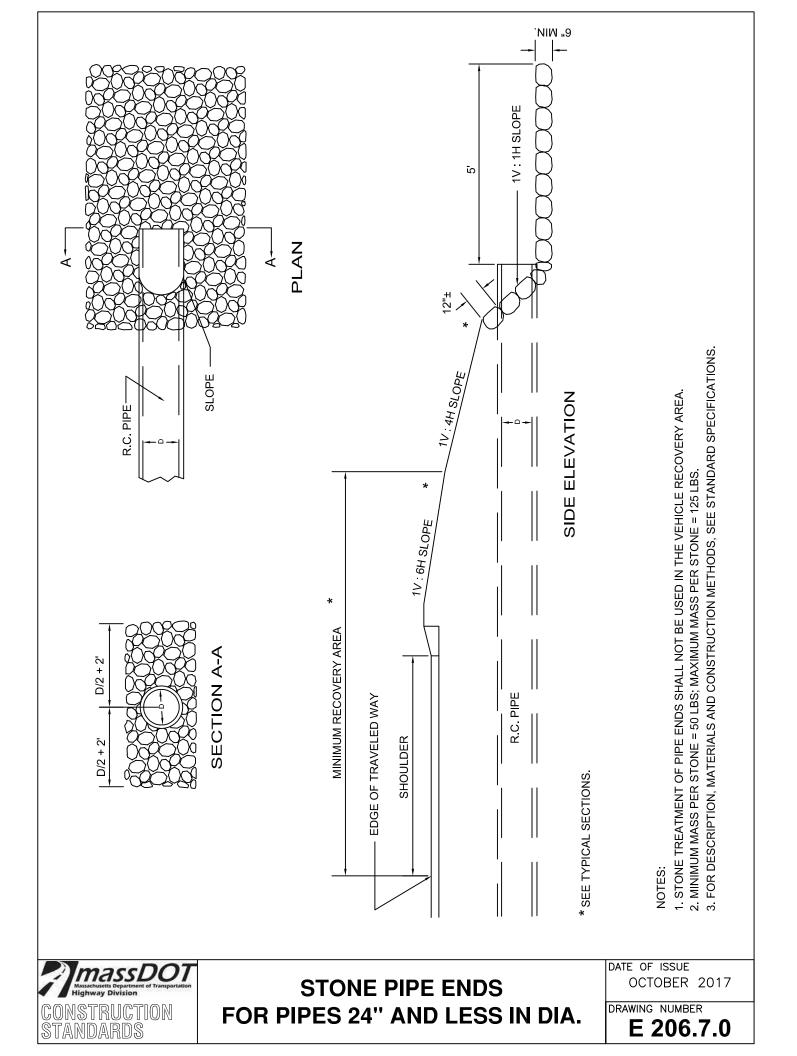


CONCRETE AND FIELDSTONE MASONRY PIPE ENDS FOR COMBINATION PIPES UP TO 30"

DATE OF ISSUE OCTOBER 2017

DRAWING NUMBER E 206.5.0







DATE OF ISSUE OCTOBER 2017

3. THE JOINTS ARE TO BE COMPATIBLE WITH THE MAIN RUN OF PIPE.

SEE STANDARD SPECIFICATIONS FOR THE TYPE OF PIPE AND PLACING OF STEEL REINFORCEMENT.

1. SEE STANDARD SPECIFICATIONS FOR	THE TYPE OF PIPE TO BE USED (BELL & SPIGOT OR TONGUE & GROOVE)
1. SEE STANDARD OF EGH IOATIONS FOR		

REINFORCED CONCRETE PIPE

FLARED ENDS

1.	SEE STANDARD	SPECIFICA	TIONS F	FOR TH	HE TYPE	OF PIPE	TO BE	USED (BELL & SF	IGOT OF	۲ONGUE د	Ξ&
2			TIONO					ACINIC				T.

1.	SEE STANDARD	SPECIFICATION	IS FOR THE	E TYPE OF PIPE	TO BE USED (BE	ELL & SPIGOT OR	TONGUE & GROOVE

1.	SEE STANDARD	SPECIFICATION	S FOR TH	HE TYPE (OF PIPE '	TO BE USED) (BELL & S
2	OFF OTANDADD	SPECIFICATIONS					

 SEE STANI 	DARD SPECIFICATION	S FOR THE TYPE OF PIPE 1	TO BE USED (BELL & SF	PIGOT OR TONGUE & G

1. SEE STANDARD SPECIFICATIONS FOR	THE TYPE OF PIPE TO BE USED	(BELL & SPIGOT OR TONGUE &
	THE TYPE OF DIDE AND DUACING	

1.	SEE STANDARD	D SPECIFICATI	ONS FOR	R THE TYPE	OF PIPE	TO BE USED	(BELL & SP	IGOT OR T	ONGUE
2									

2 1/2"									
	9"	2'-3"	6'-0"	3'-0"	29"	19"	15 1/2"	12"	1V : 3H
2 3/4"	9"	2'-11"	6'-0"	3'-6"	31 5/8"	22"	16 1/8"	13"	1V : 3H
3"	9 1/2"	3'-7 1/2"	6'-0"	4'-0"	33 3/16"	25"	16 13/16"	14"	1V : 3H
3 1/4"	10 1/2"	4'-0"	6'-0"	4'-6"	36"	28"	18 9/16"	14 1/2"	1V : 3H
3 1/2"	12"	4'-6"	6'-0"	5'-0"	37"	31"	18 1/2"	15"	1V : 3H
4"	15"	5'-3"	8'-0"	6'-0"	47 13/16"	37"	24 5/16"	20"	1V : 3H
4 1/2"	21"	5'-3"	8'-0"	6'-6"	53 7/8"	43"	27 1/2"	22"	1V : 3H
5"	24"	6'-0"	8'-0"	7'-0"	56 1/2"	49"	28 1/2"	22"	1V : 3H
3 3 3 4 4	3" 3 1/4" 3 1/2" 1" 1 1/2"	3" 9 1/2" 3 1/4" 10 1/2" 3 1/2" 12" 4 1/2" 15"	3" 9 1/2" 3'-7 1/2" 3 1/4" 10 1/2" 4'-0" 3 1/2" 12" 4'-6" 11/2" 15" 5'-3" 4 1/2" 21" 5'-3"	3" 9 1/2" 3'-7 1/2" 6'-0" 3 1/4" 10 1/2" 4'-0" 6'-0" 3 1/2" 12" 4'-6" 6'-0" 1'" 15" 5'-3" 8'-0" 4 1/2" 21" 5'-3" 8'-0"	3" 9 1/2" 3'-7 1/2" 6'-0" 4'-0" 3 1/4" 10 1/2" 4'-0" 6'-0" 4'-6" 3 1/2" 12" 4'-6" 6'-0" 5'-0" 1'" 15" 5'-3" 8'-0" 6'-0" 4 1/2" 21" 5'-3" 8'-0" 6'-6"	3" 9 1/2" 3'-7 1/2" 6'-0" 4'-0" 33 3/16" 3 1/4" 10 1/2" 4'-0" 6'-0" 4'-6" 36" 3 1/2" 10 1/2" 4'-6" 6'-0" 4'-6" 36" 3 1/2" 12" 4'-6" 6'-0" 5'-0" 37" 1" 15" 5'-3" 8'-0" 6'-0" 47 13/16" 1 1/2" 21" 5'-3" 8'-0" 6'-6" 53 7/8"	Image: state stat	Image: state stat	Image: state Image: state <th< td=""></th<>

Е

2'-0"

[ALL DIMENSIONS ARE inches OR feet]

4"

А

W

massD01

Massachusetts Departme Highway Division

CONSTRUCTION STANDARDS

2"

W

1 DIA.

W

TABLE

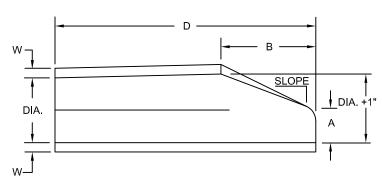
DIAMETER Inch

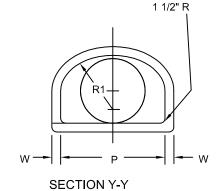
12"

SECTION

В

2'-0"





R2

9"

SLOPE

1V : 3H

DIA. +1"

13"

R1

10 1/8"

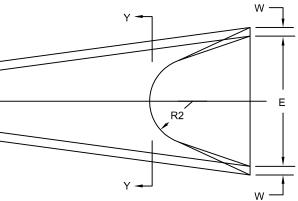
Ρ

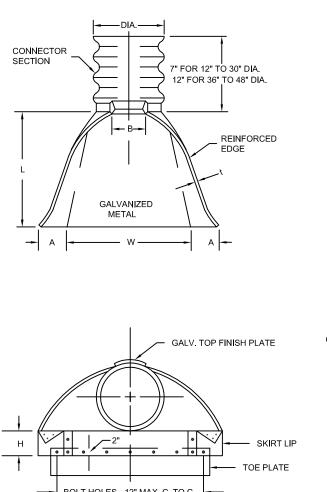
19 15/16"

PLAN

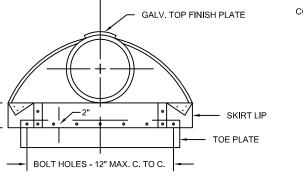
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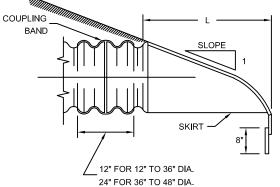
6'-0"



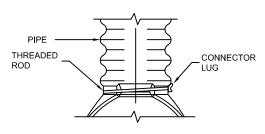


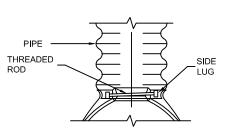
PIPE			APPROX.				
DIA. (IN)	GA.	A (± 1")	B (MAX.)	H (± 1")	L (±1 1/2")	W (± 2")	SLOPE
12	16	6	6	6	21	24	1V : 2.5H
15	16	7	8	6	26	30	1V : 2.5H
18	16	8	10	6	31	36	1V : 2.5H
21	16	9	12	6	36	42	1V : 2.5H
24	16	10	13	6	41	48	1V : 2.5H
30	14	12	16	8	51	60	1V : 2.5H
36	14	14	19	9	60	72	1V : 2.5H
42	12	16	22	11	39	84	1V : 2.5H
48	12	18	27	12	78	90	1V : 2.25H





ALTERNATE CONNECTIONS





FOR 12" TO 24" ONLY

FOR 30" AND 36" ONLY

NOTES:

- TOE PLATE TO BE PUNCHED TO MATCH HOLES IN SKIRT LIP. 3/8" Ø GALVANIZED BOLTS TO BE FURNISHED. 1. LENGTH OF TOE PLATE TO BE W+10" FOR 12" TO 30" DIA. PIPE AND W+22" FOR 36" TO 48" DIA.
- SKIRT SECTION FOR 12" TO 24" DIA. PIPE TO BE MADE IN ONE PIECE. SKIRT SECTION FOR 12" TO 30" 2. DIA. PIPE MAY BE MADE FROM TWO SHEETS JOINED BY RIVETING OR BOLTING ON CENTER LINE WITH 3/8" DIA. FASTENERS.
- CONNECTOR SECTION, TOE PLATE AND SKIRT TO BE OF SAME THICKNESS METAL; EACH TO BE GALVANIZED 3 AND COATED WITH A TAR BASE PAINT.

STANDARD METAL END

4. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE LATEST STANDARD SPECIFICATIONS.



DATE OF ISSUE OCTOBER 2017

DRAWING NUMBER E 206.9.0

Appendix D

Conceptual Cost Estimates

Glen Street over Mill River (R-11-002)

Conceptual Cost Estimate

Scope of Work:

vhb

Construction Costs

Items/ Description	Unit		Unit Cost	Quantity	,	Item Cost
Demolition (remove existing superstructure)	LS	\$	50,000	1	\$	50,000.00
Bridge Excavation	CY	\$	40	180	\$	7,200.00
Gravel Borrow for Backfilling Structures	CY	\$	60	400	\$	24,000.00
Prefabricated Bridge	LS	\$	325,000	1	\$	325,000.00
Highway Guardrail	LF	\$	70	200	\$	14,000.00
Asphalt overlay	TON	\$	300	22	\$	6,480.00
Erosion Control	FT	\$	20	240	\$	4,800.00
Signing and Pavement Markings	LS	\$	10,000	1	\$	10,000.00
Temporary Shoring/Control of Water	LS	\$	75,000	1	\$	75,000.00
Mobilization	LS	\$	20,000	1	\$	20,000.00
			Subtotal:		\$	536,480.00
			Contigency:	25%	\$	134,120.00
Design Services						
	I	Bridge	e/Highway Design:		\$	80,000.00
			Survey:		\$	6,000.00
			Permitting:		\$	12,000.00
			Geotechnical:		\$	8,000.00
			Hydraulic Report:		\$	9,000.00
			Subtotal:		\$	115,000.00
Miscellaneous						
	Traffic M	lanag	ement and Detour		\$	10,000.00
			Subtotal:		\$	10,000.00
			Project Total:		\$	795,600.00
			Total Conceptual	Estimate	: \$	796,000.00

Replace structure

Additional Details on above items:

Design fee estimated based on percentage of construction cost.

Assumes all work can be performed within the right-of-way.

A contingency of 25% for unknowns has been provided.

Further design is needed and this estimate has been prepared for planning purposes.

Prepared by: ATB Reviewed by: KGK

Mill Road over Mill River (R-11-006)

Conceptual Cost Estimate

Scope of Work:

vhb

Superstructure Replacement

Construction Costs

Items/ Description	Unit		Unit Cost	Quantity		Item Cost
Demolition (remove existing superstructure)	LS	\$	17,000	1	\$	17,000.00
Bridge Excavation	CY	\$	60	180	\$	10,800.00
Gravel Borrow for Backfilling Structures	CY	\$	50	180	\$	9,000.00
New Superstructure	LS	\$	120,000	1	\$	120,000.00
Highway Guardrail	LF	\$	70	200	\$	14,000.00
Asphalt overlay	TON	\$	300	13	\$	3,825.00
Erosion Control	FT	\$	20	240	\$	4,800.00
Substructure Repairs	LS	\$	75,000	1	\$	75,000.00
Signing and Pavement Markings	LS	\$	5,000	1	\$	5,000.00
Temporary Shoring/Control of Water	LS	\$	25,000	1	\$	25,000.00
Mobilization	LS	\$	20,000	1	\$	20,000.00
			Subtotal:		\$	304,425.00
			Contigency:	25%	\$	76,106.25
Design Services						
		Bridge	e/Highway Design:		\$	76,000.00
			Survey:		\$	7,000.00
			Permitting:		\$	10,000.00
			Geotechnical:		\$	5,000.00
			Hydraulic Report:		\$	4,000.00
			Subtotal:		\$	102,000.00
Miscellaneous						
	Traffic	Mana	agement (signage)		\$	5,000.00
			Subtotal:		\$	5,000.00
			Project Total:		\$	487,531.25
			Total Conceptual	Estimate	:\$	488,000.00

Additional Details on above items:

Design fee estimated based on percentage of construction cost.

Assumes all work can be performed within the right-of-way.

A contingency of 25% for unknowns has been provided.

Further design is needed and this estimate has been prepared for planning purposes.

Prepared by: ATB Reviewed by: KGK

Independent Street over Ox Pasture Brook

Conceptual Cost Estimate

Scope of Work:

Culvert Replacement

Construction Costs

Items/ Description	Unit		Unit Cost	Quantity	,	Item Cost
Demolition (remove existing structure)	LS	\$	6,400	1	\$	6,400.00
Bridge Excavation	CY	\$	60	80	\$	4,800.00
Gravel Borrow for Backfilling Structures	CY	\$	50	80	\$	4,000.00
New Culvert and Wingwalls	LS	\$	160,000	1	\$	160,000.00
Highway Guardrail	LF	\$	70	200	\$	14,000.00
Asphalt overlay	TON	\$	300	8	\$	2,250.00
Erosion Control	FT	\$	20	240	\$	4,800.00
Signing and Pavement Markings	LS	\$	5,000	1	\$	5,000.00
Temporary Shoring/Control of Water	LS	\$	25,000	1	\$	25,000.00
Mobilization	LS	\$	20,000	1	\$	20,000.00
			Subtotal:		\$	246,250.00
			Contigency:	25%	\$	61,562.50
Design Services						
	l	Bridge	e/Highway Design:		\$	45,000.00
			Survey:		\$	6,000.00
			Permitting:		\$	10,000.00
			Geotechnical:		\$	14,000.00
			Hydraulic Report:		\$	12,000.00
			Subtotal:		\$	87,000.00
Miscellaneous						
	Traffic	Mana	agement (signage)		\$	5,000.00
			Subtotal:		\$	5,000.00
			Project Total:		\$	399,812.50
			Total Conceptual	Estimate	:\$	400,000.00

Additional Details on above items:

Design fee estimated based on percentage of construction cost.

Assumes all work can be performed within the right-of-way.

A contingency of 25% for unknowns has been provided.

Further design is needed and this estimate has been prepared for planning purposes.

Prepared by: ATB Reviewed by: KGK



Conceptual Cost Estimates

Structure 21

ltem	Pipe Diameter	Unit	Unit Price		Cost
Rebuild Headwall	24"	1	\$ 6,316.30	\$	6,316.30
	Со	ntigency =	15%	\$	947.44
			Total Cost =	\$	7,263.74
			Say	\$	7,300.00
				*	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

Structure 27

Item	Pipe Diameter	Unit	Unit Price	Cost
Rebuild Headwalls	30"	2	\$ 8,160.74	\$ 16,321.48

Contigency = 15% \$ 2,448.22

Total Cost =	\$ 18,769.70
Say	\$ 18,800.00

Structure 7

Item	Pipe Diameter	Unit	Unit Price	Cost	
Remove debris	N/A	1	\$ 2,500.00	\$	2,500.00
	Со	ntigency =	15%	\$	375.00
			Total Cost =	\$	2,875.00
			Say	\$	2,900.00

Structure 12

Item	Pipe Diameter	Unit	Unit Price	Cost	
Rebuild Headwall	24"	1	\$ 6,316.30	\$ 6,316.30	
Rebuild Wingwall	24"	1	\$ 6,000.00	\$ 6,000.00	

Contigency = 15% \$ 1,847.44

Total Cost =	\$ 14,163.74
Say	\$ 14,200.00

ltem	Pipe Diameter	Unit	Unit Price	Cost	
Rebuild Heawall	24"	1	\$ 6,316.30	\$	6,316.30
	Со	ntigency =	15%	\$	947.44
			Total Cost =	\$	7,263.74
			Say	\$	7,300.00

Structure 20

Item	Pipe Diameter	Unit	Unit Price	Cost	
Rebuild Headwall	24"	1	\$ 6,316.30	\$ 6,316.3	30

Contigency = 15% \$ 947.44

Total Cost =	\$ 7,263.74
Say	\$ 7,300.00

Structure 24

Item	Pipe Diameter	Unit	Unit Price	Cost
Rebuild Headwall	30"	1	\$ 8,160.74	\$ 8,160.74
	Со	ntigency =	15%	\$ 1,224.11
			Total Cost =	\$ 9,384.85
			Say	\$ 9,400.00

ltem	Pipe Diameter	Unit	Unit Price	Cost
Uncover inlet and oulet	N/A	1	\$ 1,000.00	\$ 1,000.00
	Со	ntigency =	15%	\$ 150.00
			Total Cost =	\$ 1,150.00
			Say	\$ 1,200.00

ltem	Pipe Diameter	Unit	Unit Price	Cost
Rebuild Headwall	30"	1	\$ 8,160.74	\$ 8,160.74
Remove sediment	N/A	1	\$ 2,500.00	\$ 2,500.00
	Со	ntigency =	15%	\$ 1,599.11
			Total Cost =	\$ 12,259.85
			Say	\$ 12,300.00

Structure 38

Item	Pipe Diameter	Unit	Unit Price		Cost	
Rebuild Headwall	24"	1	\$	6,316.30	\$	6,316.30
Remove trees	24"	1	\$	1,500.00	\$	1,500.00

Contigency = 15% \$ 1,172.44

Total Cost =	\$ 8,988.74
Say	\$ 9,000.00

Structure 47

ltem	Pipe Diameter	Unit	Unit Price	Cost
Remove trees	N/A	1	\$ 1,500.00	\$ 1,500.00
Reset stones	N/A	1	\$ 5,000.00	\$ 5,000.00
Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00

Contigency = 15% \$ 1,350.00

Total Cost =	\$ 10,350.00
Say	\$ 10,400.00

Item	Pipe Diameter	Unit	U	nit Price	Cost
Remove vegetation	N/A	1	\$	1,500.00	\$ 1,500.00
Contigency = 15%					\$ 225.00

Total Cost =	\$ 1,725.00
Say	\$ 1,700.00

ltem	Pipe Diameter	Unit	Unit Price	Cost
Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00
Remove vegetation	N/A	1	\$ 1,500.00	\$ 1,500.00
	Со	ntigency =	15%	\$ 375.00
			Total Cost =	\$ 4,375.00
			Say	\$ 4,400.00

Structure 3

Item	Pipe Diameter	Unit	Unit Price	Cost
Rebuild Heawalls	30"	2	\$ 8,160.74	\$ 16,321.48
Clean debris from channel		1	\$ 2,500.00	\$ 2,500.00
Remove tree at downstream		1	\$ 1,000.00	\$ 1,000.00

Contigency = 15% \$ 2,973.22

Total Cost =	\$ 22,794.70
Say	\$ 22,800.00

Structure 4

	ltem	Pipe Diameter	Unit	Unit Price	Cost
	Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00
Remove vegetation N/A 1 \$ 1,500.00 \$ 1,500.00	Remove vegetation	N/A	1	\$ 1,500.00	\$ 1,500.00

Contigency = 15% \$ 375.00

Total Cost =	\$ 4,375.00
Say	\$ 4,400.00

Item	Pipe Diameter	Unit	U	nit Price	Cost
Clean channel of debris	N/A	1	\$	2,500.00	\$ 2,500.00
Contigency = 15%					\$ 375.00

Total Cost =	\$ 2,875.00
Say	\$ 2,900.00

Item	Pipe Diameter	· Unit		Cost		
Repair Sidewalk, downstream side	N/A 1		\$ 5,000.00	\$ 5,000.0		
	Со	ntigency =	15%	\$	750.00	
			Total Cost =	\$	5,750.00	
			Say	\$	5,800.00	

Structure 45

ltem	Pipe Diameter	· Unit		Cost		
Clean channel of debris	N/A	1	\$ 2,500.00	\$	2,500.00	

Contigency = 15% \$ 375.00

Total Cost =	\$ 2,875.00
Say	\$ 2,900.00

Structure 46

Item	Pipe Diameter	Unit	Unit Price	Cost	
Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00	

Contigency = 15% \$ 375.00

Total Cost =	\$ 2,875.00
Say	\$ 2,900.00

Item	Pipe Diameter	Unit	Unit Price	Cost
Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00
Remove vegetation	N/A 1		\$ 1,500.00	\$ 1,500.00
	Со	ntigency =	15%	\$ 375.00
			Total Cost =	\$ 4,375.00
			Say	\$ 4,400.00

Item	Pipe Diameter	Unit	Unit Price	Cost
Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00
	Со	15%	\$ 375.00	
			Total Cost =	\$ 2,875.00
			Say	\$ 2,900.00
			Say	\$ 2,900.00

Structure 50

Item	Pipe Diameter	Unit	Unit Price	Cost
Clean channel of debris	N/A	1	\$ 2,500.00	\$ 2,500.00
	Со	ntigency =	15%	\$ 375.00
			Total Cost =	\$ 2,875.00
			Say	\$ 2,900.00

Structure 13

ltem	Pipe Diameter	Unit	Unit Price	Cost	
Construct Headwalls	24"	2	\$ 8,160.74	\$ 16,321.48	
HDPE Pipe	24"	1	\$ 600.00	\$ 600.00	20 ft length
Excavation and pavement		1	\$ 15,000.00	\$ 15,000.00	

Contigency = 15% \$ 2,448.22

Total Cost =	\$ 34,369.70
Say	\$ 34,400.00

Culvert Headwalls

Conceptual Cost Estimate

Scope of Work:

Headwall Replacement

Construction Costs

							Subtotal			Total
Pipe Size	Excava	ation Cost	Ba	ackfill Cost	(Concrete Cost	(per Headwall)	Contigency	(pe	er Headwall)
8"	\$	101.48	\$	101.48	\$	2,160.00	\$ 2,362.96	15%	\$	2,700.00
10"	\$	112.59	\$	112.59	\$	2,560.00	\$ 2,785.19	15%	\$	3,200.00
12"	\$	123.33	\$	123.33	\$	2,980.00	\$ 3,226.67	15%	\$	3,700.00
15"	\$	139.26	\$	139.26	\$	3,640.00	\$ 3,918.52	15%	\$	4,500.00
18"	\$	155.56	\$	155.56	\$	4,360.00	\$ 4,671.11	15%	\$	5,400.00
21"	\$	175.19	\$	175.19	\$	5,240.00	\$ 5,590.37	15%	\$	6,400.00
24"	\$	188.15	\$	188.15	\$	5,940.00	\$ 6,316.30	15%	\$	7,300.00
30"	\$	220.37	\$	220.37	\$	7,720.00	\$ 8,160.74	15%	\$	9,400.00

Calculation of quantities taken from MassDOT Construction Standards E206.4.1 Unit costs taken from historic MassDOT bid data.



Project: Location: Rowley, MA Calculated by: ATB Checked by: Title: Preliminary Estimate Project #: 14361.00 Sheet: 2 of 4 Date: 2-25-19 Date:



140.

BRIDGE EXCAVATION

CY

Note: Assume 1' outside wingwalls

Excavation for Required to repair headwalls (2:1 slope)

Pipe Dia.	CF	CY	Cost
8 in	27.4	1.0	\$ 101.48
10 in	30.4	1.1	\$ 112.59
12 in	33.3	1.2	\$ 123.33
15 in	37.6	1.4	\$ 139.26
18 in	42	1.6	\$ 155.56
21 in	47.3	1.8	\$ 175.19
24 in	50.8	1.9	\$ 188.15
30 in	59.5	2.2	\$ 220.37

From MassDOT Weighted Bid Prices for Item No. 140., use \$40.00/CY Use \$100 since excavation is such a small quantity Unit Cost = \$ 100.00 /CY Project: Location: Rowley, MA Calculated by: ATB Checked by: Title: Preliminary Estimate Project #: 14361.00 Sheet: 3 of 4 Date: 2-25-19 Date:



XXXX

GRAVEL BORROW

CY

Note: Assume 1' outside wingwalls

Excavation for Required to repair headwalls (2:1 slope)

Pipe Dia.	CF	СҮ	Cost
8 in	27.4	1.0	\$ 101.48
10 in	30.4	1.1	\$ 112.59
12 in	33.3	1.2	\$ 123.33
15 in	37.6	1.4	\$ 139.26
18 in	42	1.6	\$ 155.56
21 in	47.3	1.8	\$ 175.19
24 in	50.8	1.9	\$ 188.15
30 in	59.5	2.2	\$ 220.37

From MassDOT Weighted Bid Prices for Item No. 140., use \$40.00/CY Use \$100 since excavation is such a small quantity Unit Cost = \$ 100.00 /CY

\\vhb\gbl\proj\Wat-TE\14361.00\tech\Cost Estimates\Conceptual Cost Estimates

Project: Location: Rowley, MA Calculated by: ATB Checked by: Title: Preliminary Estimate



901.

4000 PSI, 1.5" 565 CONCRETE

CY

Concrete Required to replace each headwall (2:1 slope)

Pipe Dia.	CY	Cost
8 in	1.1	\$ 2,160.00
10 in	1.3	\$ 2,560.00
12 in	1.5	\$ 2,980.00
15 in	1.8	\$ 3,640.00
18 in	2.2	\$ 4,360.00
21 in	2.6	\$ 5,240.00
24 in	3.0	\$ 5,940.00
30 in	3.9	\$ 7,720.00

From MassDOT Weighted Bid Prices for Item No. 901., use \$2000.00/CY

(due to small quantity)

Unit Cost = \$ 2,000.00 /CY