July 3, 2024

Mr. Jimmy Sullivan
Superintendent
Blackstone Department of Public Works
15 Saint Paul Street
Blackstone, MA 01504

RE: Evaluation of Repairs for Bridge No. B-13-009
Blackstone, Massachusetts
Pare Project No. 24061.01

Dear Mr. Sullivan:

At the request of the Town of Blackstone (Town), Pare Corporation has evaluated Bridge No. B-13-009 carrying St. Paul Street over the Blackstone Canal. The bridge, constructed in 1880 and rebuilt in 1925, is a 38-foot long two span structure with granite masonry arches and a reinforced concrete sidewalk addition supported on granite block abutments and a concrete pier. It carries two lanes of traffic, one sidewalk, and a chain link fence with concrete barriers as well as a W-beam guardrail. The Town is the owner and is responsible for maintaining the bridge. To identify needed repairs and help with planning for required maintenance, the Town has requested that existing conditions be reviewed to determine the scope and extent of recommended repairs to the various bridge components. An Opinion of Probable Construction Cost (OPCC) for identified repairs was also requested.

The latest inspection and load-rating reports were obtained from The Massachusetts Department of Transportation, Highway Division (MassDOT). The structure was evaluated by Pare during a field visit on June 5, 2024. Access was obtained to the arch and pier on foot and using a ladder. Access to the top of the bridge was attained on foot. Conditions reported in the latest inspection report were verified, and sketches and photographs were taken to document the conditions. Based on this information, Pare developed repair recommendations and an OPCC. This letter report summarizes existing conditions and field observations, recommends maintenance and repair activities, and provides an OPCC for each of the recommended repairs.

Existing Structure Condition

The latest available routine inspection report is dated January 4, 2024, which details the existing structure condition. The bridge is a two-span structure spanning from east to west. The spans are labeled west and east with a central arch abutment and concrete pier wall. The Canal flows north to south. A summary of conditions is provided below. The latest inspection report is attached for a more complete description of existing conditions.

- The deck wearing surface is a bituminous concrete pavement with minor cracking. Typical wearing surface conditions are shown in Photo 1.

Photo 1: Wearing Surface Over Bridge (Facing West)

- The sidewalk underside has many surface spalls with heavily corroded exposed reinforcement. There are several deep spalls that show exposed rebar and a steel plate. See Photo 2.

Photo 2: Underside of Sidewalk

- The masonry arch was in overall good condition, with isolated areas of leakage, light efflorescence, and minor cracking. See Photo 3.

Photo 3: Masonry Arch

- The northwest wingwall consists of cast in place concrete and contains spalls along the edge of the channel wall and wingwall. See Photo 4.

Photo 4: Northwest Wingwall

- The northeast wingwall is made of masonry with a cast in place concrete cap. The wingwall has a cracked stone and a large, scaled area under the sidewalk slab, as well as a large void underneath the approach pavement. See Photo 5.

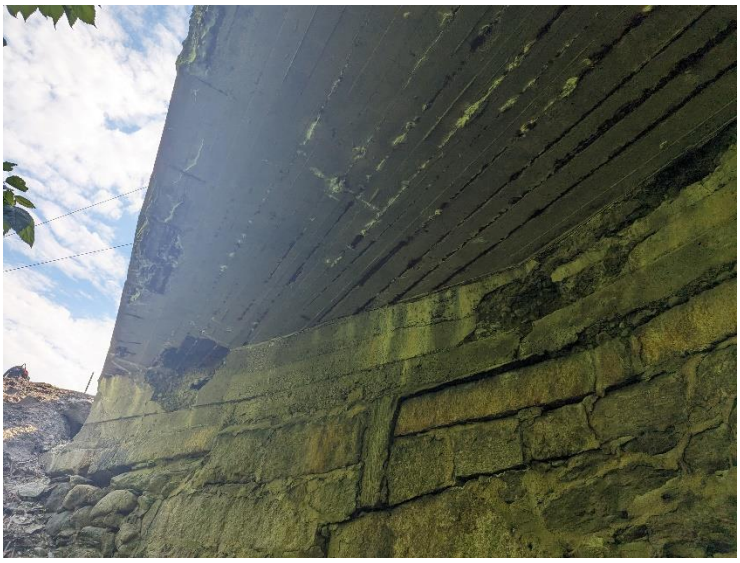

Photo 5: Northeast Wingwall

- The northeast, northwest and southeast embankments have sloughed into the channel constricting flow with heavy vegetation growth. For typical embankment conditions see Photo 6.

Photo 6: Northeast Embankment

- The south bridge rail is concrete Jersey barrier in front of a four-foot-high chain-link fence. The north bridge rail is a single panel W-beam steel guardrail in front of a seven-foot-high chain-link fence. Neither railing meets current MassDOT or AASHTO bridge standards. See Photo 1.

Recommended Maintenance and Repairs

The primary concerns on this bridge are the condition of the concrete sidewalk, embankment conditions, railing type, and deterioration of stone masonry. The repairs recommended in this letter are intended to preserve the vehicle load carrying capacity of the structure, restore the sidewalk portion of the structure, provide compliant bridge railings, and extend the bridge's service life. The following repairs are recommended:

Concrete Sidewalk Replacement

The deteriorated concrete visible on the underside of the sidewalk is the most critical condition observed on the structure. Further deterioration could result in a reduced load capacity or even sidewalk closure until replacement is completed. The extent of deterioration observed makes preservation of the existing concrete superstructure impractical. Typical sidewalk replacement would include demolition of the existing sidewalk, casting a new sidewalk structure in-place or installing a precast sidewalk structure, substructure repairs and modifications, relevant traffic control for the work, and a new bridge railing. It is anticipated that the pier at the midpoint of the sidewalk would be acceptable for re-use with repairs and modifications. As part of this repair, Pare recommends removing and replacing the deteriorated concrete at the wingwalls and spandrel wall above the arches.

Replacement of South Bridge Railing

Due to the non-compliant railing on the south side of St. Paul Street, Pare recommends replacing this bridge railing on a new concrete moment slab. A standard compliant MassDOT bridge railing is the S3-TL4 steel bridge railing which could be installed on a moment slab over the existing arch on the south side. An alternate railing type is the concrete MassDOT CT-MTL2 Texas Rail, though further investigation is needed to determine if this rail type is acceptable on St. Paul Street. A typical installation of a moment slab with attached railings would include the removal of the existing railings and a portion of the bituminous wearing surface, and possibly the top of the granite spandrel wall. An example detail of a transverse section with S3-TL4 railings and moments slab is visible below in Figure 1.

Photo 7: Example of S3-TL4 Barrier

Photo 8: Example of CT-MTL2 Texas Rail

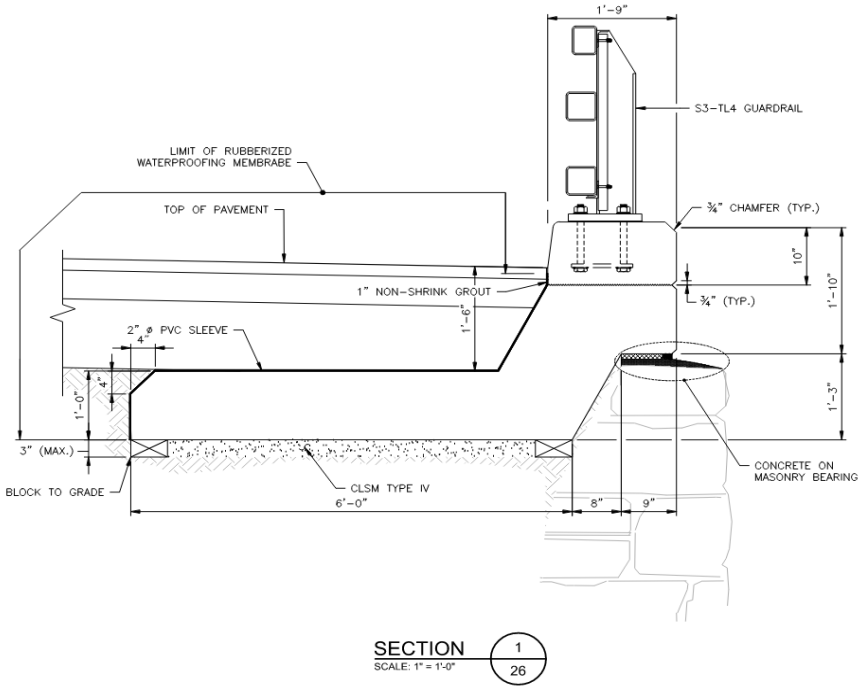

Figure 1: Example of a Moment slab with S3-TL4 Railing – Transverse Section

Embankment Protection

It is Pare's understanding that the Town has expressed interest in installing concrete wingwalls at the corners of the bridge. However, significant costs are associated with the installation of wingwalls. Typical cast-in-place wingwalls at this bridge would require either pile or spread footings, control of water, and cast-in-place reinforced concrete. As a lower-cost alternative Pare recommends providing riprap as slope

protection at the embankments to restore the slopes and prevent future embankment erosion to maintain channel conditions. An example of a riprap slope detail is shown in Figure 2.

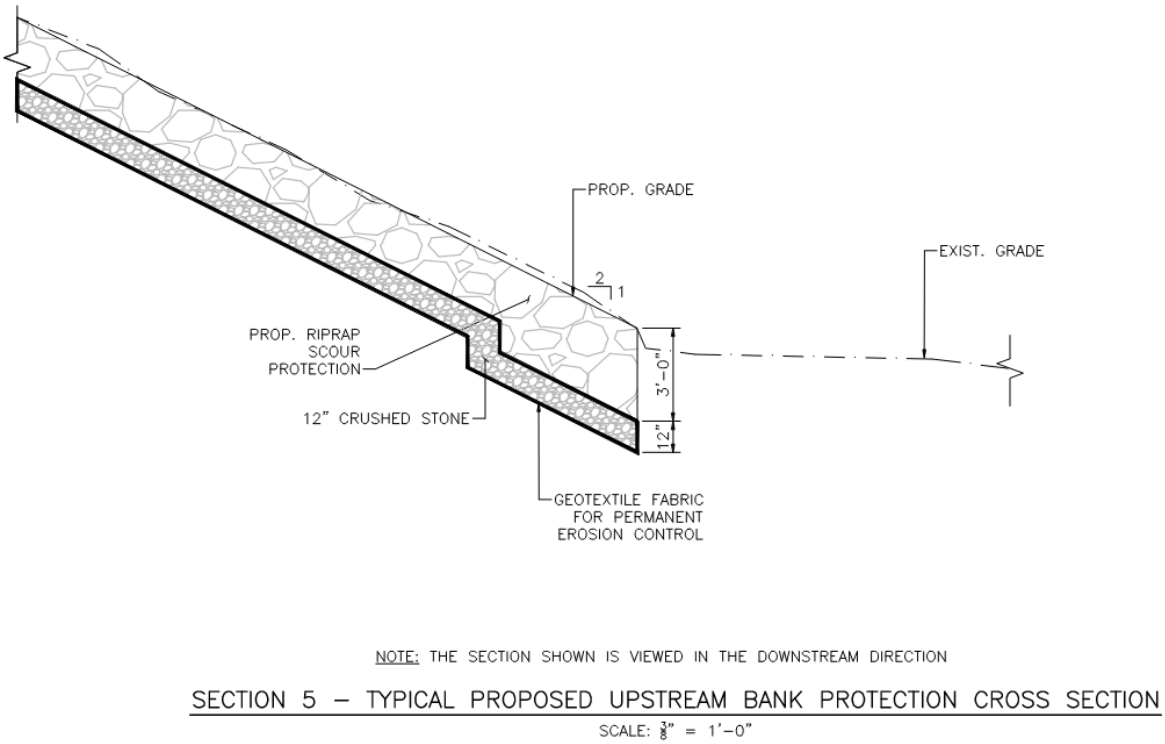

Figure 2: Example Riprap Slope Protection Section

Arch Repairs

The arch is in acceptable condition, with some deterioration noted. Pare recommends pointing and grouting the masonry to maintain its current condition and prevent potential future deterioration. This repair is considered non-critical at this time.

Opinion of Probable Construction Cost

Pare has developed preliminary estimated quantities and preliminary OPCCs for the recommended repairs described in this report. The quantities and costs are based on Pare's cursory site review and the latest Routine Inspection Report. Costs are based on average and recent bids for similar MassDOT projects.

The costs in the table below do not include items such as design and contract development, traffic control, police details, mobilization, administrative costs, and other conditions. In addition, the costs may be impacted by work being combined under a single contract and work that is self-performed and/or self-administered by the Town.

Type of Repair	Estimated Quantity	Estimated Cost	Notes
Concrete Sidewalk Replacement	LUMP SUM	$434,000	Replacement of existing sidewalk with repairs to concrete on wingwalls.
Breakdown:			
Sidewalk Excavation	30 CY	$150,000	
Wingwall Excavation	3 CY	$15,000	
Wingwall/Sidewalk Concrete	35 CY	$84,000	
Reinforcing	7700 LB	$31,000	
S3-TL4 Railing & Transition	50 FT	$81,000	
20% Miscellaneous	20%	$73,000	
South Side Moment Slab	LUMP SUM	$444,000	Moment slab over entire bridge integral with railings. Includes sidewalk.
Breakdown:			
Excavation	48 CY	$115,000	
Concrete for Slab	48 CY	$116,000	
Reinforcing	16,060 LB	$43,000	
S3-TL4 Railing & Transition	50 FT	$81,000	
3-Course Bridge Pavement	30 TON	$15,000	
20% Miscellaneous	20%	$74,000	
New Concrete Wingwalls	LUMP SUM	$1,109,000	Installation of 4 new wingwalls.
Breakdown:			
Concrete for Wall/Footing	81 CY	$266,000	
Reinforcing	17,820 LB	$98,000	
Excavation	300 CY	$90,000	
Control of Water	LUMP SUM	$150,000	
Piles	24 EA	$320,000	
20% Miscellaneous	20%	$185,000	
Embankment Protection	LUMP SUM	$108,000	Riprap slope protection on top of crushed stone.
Breakdown:			
Riprap	300 TON	$30,000	
Crushed Stone	120 TON	$7,000	
Earth Excavation	50 CY	$3,000	
Control of Water	LUMP SUM	$50,000	
20% Miscellaneous	20%	$18,000	
Arch Repairs	LUMP SUM	$123,000	Pointing and grouting of arch.
Breakdown:			
Pointing/Grouting Masonry	FT	$102,000	
20% Miscellaneous	20%	$21,000	

We are available to discuss the results of our evaluation at your convenience. If you have any questions or need additional information, please feel free to contact me.

Sincerely,

David J. Elwell, P.E.
Managing Engineer

DJE/JCH/kls

Enclosure
Inspection Report dated January 4, 2024

STRUCTURES INSPECTION FIELD REPORT

ROUTINE ARCH INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
03	1EB	B-13-009

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
BLACKSTONE	B13009-1EB-MUN-NBI	000.515	A:OPEN	JAN 4, 2024

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
HWY ST PAUL ST		1880	1925	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
WATER CANAL	Urban Minor Arterial	M. Azizi

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER
811 : Masonry Arch - Deck	Town Agency	Town Agency	T. T. Gumula

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
N : Not applicable	Overcast	3°C	N. GAINES

ITEM 58 — DECK: N

		DEF
1. Wearing Surface	7	M-P
2. Deck Condition	N	-
3. Spandrel Fill	7	-
4. Curbs	5	S-P
5. Median	N	-
6. Sidewalks	4	S-A
7. Parapet / Coping	4	S-A
8. Railing	6	M-P
9. Anti Missile Fence	N	-
10 Drainage System	N	-
11. Lighting Standards	N	-
12 Utilities	N	-
13 Deck Joints	N	-
14	N	-
15	N	-
16	N	-

CURB REVEAL (In millimeters): N = 130, S = N

APPROACHES

		DEF
a. Appr. Pavement Condition	7	M-P
b. Appr. Roadway Settlement	8	-
c. Appr. Sidewalk Settlement	8	-
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N): N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 — SUPERSTRUCTURE: 7

		DEF
1. Arch/Arch Ring	7	-
2. Keystone Area	7	-
3. Stringers	N	-
4. Floorbeams	N	-
5. Spandrel Walls	5	S-A
6. Spring Lines	7	-
7. Diaphragms/Cross Frames	N	-
8. Conn Plt's, Gussets & Angles	N	-
9. Pin & Hangers	N	-
10 Masonry Joints	N	-
11. Rivets & Bolts	N	-
12 Welds	N	-
13 Deformation/Flattening	7	-
14 Member Alignment	7	-
15 Paint/Coating	N	-
16	N	-

Year Painted: N

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member: **(Y/N): N**

Any Cracks: **(Y/N): N**

ITEM 60 — SUBSTRUCTURE: 6

	Dive	Cur		DEF
1. Abutments			6	
a. Pedestals	N	N		-
b. Bridge Seats	N	N		-
c. Backwalls	N	N		-
d. Breastwalls	N	6		M-P
e. Wingwalls	N	4		S-A
f. Slope Paving/Rip-Rap	N	N		-
g. Pointing	N	N		-
h. Footings	N	X		-
i. Piles	N	N		-
j. Scour	N	7		-
k. Settlement	N	7		-
l. Embankment Erosion	N	5		S-A
m.	N	N		-
2. Piers or Bents			6	
a. Pedestals	N	N		-
b. Caps	N	N		-
c. Columns	N	N		-
d. Pierwall	N	6		M-P
e. Pointing	N	N		-
f. Footing	N	X		-
g. Piles	N	N		-
h. Scour	N	6		M-P
i. Settlement	N	7		-
j.	N	N		-
k.	N	N		-
3. Pile Bents			N	
a. Pile Caps	N	N		-
b. Piles	N	N		-
c. Diagonal Bracing	N	N		-
d. Horizontal Bracing	N	N		-
e. Fasteners	N	N		-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

I-60 (Dive Report): N ***I-60 (This Report):*** 6

93B-U/W (DIVE) Insp 00.00.0000

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

ITEM 61 — CHANNEL & CHANNEL PROTECTION — 4

	Dive	Cur	DEF
1.Channel Scour	N	6	M-P
2.Embankment Erosion	N	4	S-P
3.Debris	N	7	-
4.Vegetation	N	4	S-P
5.Utilities	N	N	-
6.Rip-Rap/Slope Protection	N	N	-
7.Aggradation	N	4	S-A
8.Fender System	N	N	-

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate ( ) Low (**X**) None ( )

ITEM 61 (Dive Report): **N** ***ITEM 61 (This Report):*** **4**

93b-U/W INSP. DATE: 00.00.0000

ITEM 36 — *TRAFFIC SAFETY*

	36	COND	DEF
A. Bridge Railing	0	4	S-A
B. Transitions	N	N	-
C. Approach Guardrail	0	5	S-P
D. Approach Guardrail Ends	0	6	M-P

WEIGHT POSTING — *Not Applicable* X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 00.00.0000 **EJDMT Date:** 00.00.0000

Signs In Place (Y=Yes,N=No, NR=NotRequired)	At bridge E	At bridge W	Other Advance E	Other Advance W
Legibility/ Visibility				

CLEARANCE POSTING — *Not* X

	N ft	N in	S ft	S in	meter
Actual Field Measurement		0		0	
Posted Clearance		0		0	

Signs In Place (Y=Yes,N=No, NR=Not Required)	At bridge N	At bridge S	Advance N	Advance S
Legibility/ Visibility				

ACCESSIBILITY (Y/N/P)

	Needed	Used
Lift Bucket	N	N
Ladder	P	Y
Boat	N	N
Waders	Y	Y
Inspector 50	N	N
Rigging	N	N
Staging	N	N
Traffic Control	N	N
RR Flagger	N	N
Police	N	N
Other:		
	N	N

TOTAL HOURS 8

PLANS (Y/N): **N**

(V.C.R.) (Y/N): **N**

TAPE#: _____

List of field tests performed:
Visual and Hands On Inspection

RATING

Rating Report (Y/N): **Y**

Date: 09.01.2009

Inspection data at time of existing rating
I 58: **-** I 59: **6** I 60: **6** Date : 01.07.2008

Recommend for Rating or Rerating (Y/N): **N**

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON: _____

CONDITION RATING GUIDE (For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advanced section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stablility. Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

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.

C-S= Critical Structural Deficiency A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].

A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

REMARKS

BRIDGE ORIENTATION

This two span structure carries St. Paul Street over the Canal in the Town of Blackstone. **See Sketch 1.** According to the map and rating report, the approaches are east and west and the elevations are north and south. This is a two span masonry arch with the arches labeled west and east. The canal flows north to south.

ITEM 58 - DECK

Item 58.1 - Wearing Surface

At the west end there is an almost full width light to moderate transverse crack.
Westbound lane at the west end there is a 12' long x 3' wide area of light to moderate map cracking extending into the west approach. **See Photo 1.**

Item 58.4 - Curbs

See Item 58.6 - Sidewalks for comments.

Item 58.6 - Sidewalks

North Sidewalk Top:

- 6 full depth spalls, up to full width (5') x up to 1'-10" long x 3" deep filled with soil. **See Photo 2.**

North Sidewalk Underside:

- There are many surface spalls exposing slab reinforcement which is heavily corroded. Many of the spalls have efflorescence staining.
- West half (span #1) along the outside edge of the slab has a 20' long x 3' wide x 3" deep spall exposing two broken longitudinal rebars.
- Span #1 at the spandrel wall interface near the pier has a 6' long x 10" wide x 5" deep spall with a 3' long x 9" wide hole exposing heavily rusted slab reinforcement and a steel plate covering the hole from the top. (The steel plate(s) are buried under the new pavement). **See Photo 3.**
- Span #2 along the interface with the spandrel wall at the pier has a 2' long x 10" wide x 5" deep spall exposing heavily rusted reinforcement. Within this spall there is a 1.25' x 8" hole with a steel plate over it same as in span 1. **See Photo 4.**
- The east end of the slab which rests on top of the masonry wingwall at 4' from the end has a 4' long x up to 1'-6" wide x full depth spall exposing heavily rusted reinforcement and underside of the concrete sidewalk. **See Photo 5.**

Item 58.7 - Parapet / Coping

South Parapet/Coping:

South parapet has severe concrete deterioration in many areas throughout with a 21' long x full height x full width area at the east end that has been previously dislodged by collision damage (reported on 5/17/05). **See Photo 6.** There is a row of Jersey barrier and chain link fencing in front of the parapet/coping.

North Parapet/Coping:

There are cracks with efflorescence, spalls up to 3' long x 1' wide, and delaminations throughout.
The East 6' of the parapet/coping has heavy delamination cracks and spalling exposing heavily rusted reinforcement. **See Photo 7.** There is a row of guardrail and chain link fencing in front of the parapet/coping anchored into the sidewalk slab.

Item 58.8 - Railing

The South bridge railing and approach traffic safety features consist of a row of jersey barrier with chain link fencing behind it. The barrier sections are not interconnected. Many have map cracks and minor

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BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

REMARKS

delaminations at the bottom. The top of the chain link fence at the west end has moderate collision damage. **See Photo 8.**
See Item 36.D - Approach Guardrail Ends for additional comments.

APPROACHES

Approaches a - Appr. Pavement Condition
See Item 58.8 - Wearing Surface for comments.

ITEM 59 - SUPERSTRUCTURE

Item 59.1 - Arch/Arch Ring
Both arches consist of large dry laid granite blocks. There are isolated areas of leakage and light efflorescence through both arches. **See Photo 9.** In the east arch, the south end of the 2nd and 4th courses from the pierwall each have one stone with a full height minor crack. **See Photo 10.**

Item 59.5 - Spandrel Walls
South Spandrel Wall:
There are many stones throughout the top 2' that are up to 8" out of horizontal alignment, measuring from the arch ring out, over the west arch (span #1). **See Photo 11.**
Stones over the east arch are up to 2.5" out. **See Photo 12.**

North Spandrel Wall:
There are intermittent areas of heavy scaling to the concrete cap below the sidewalk slab, up to 5' long x 1' high x 7" deep. **See Photos 13 and 14.**
The top course of masonry has two stones that each have one full height minor crack.

ITEM 60 - SUBSTRUCTURE

Item 60.1 - Abutments
Item 60.1.d - Breastwalls
Both breastwalls and the pierwall have a few missing chinking stones.
The east breastwall, 3rd stone from the north end, has one full height minor crack.

Item 60.1.e - Wingwalls
The northwest wingwall consists of cast in place concrete.
The northeast wingwall is made up of masonry with a CIP concrete cap in line with the spandrel wall cap.
Both south wingwalls are made up of masonry entirely.

The northwest concrete wingwall has heavy scaling and concrete deterioration throughout. **See Photo 15.** There are spalls along the edge of the wall at the interface with the channel wall and wingwall up to 7' high x 4' wide x 1' deep.

The northeast wingwall, 4' from east end near the top of the slope has one cracked stone. **See Photo 16.** At the top of the wingwall in the concrete portion there is a 4'-6" wide x up to 2' high x full depth scaled area under the sidewalk slab. **See Photo 5.** This has exposed a large void underneath the approach pavement.
See Item 60.1.l - Embankment Erosion for additional comments.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

REMARKS

Item 60.1.l - Embankment Erosion
At the east end of the northeast wingwall at the top of the embankment there is a 5' long area of embankment erosion which extends under the northeast approach sidewalk slab and behind the northeast wingwall. **See Photos 17 and 18.** The void under the approach sidewalk is 3' wide x 1'-6" high x 4' deep.

Item 60.2 - Pier
Item 60.2.d - Pierwall
The concrete pierwall supporting the sidewalk has moderate scaling throughout. **See Photo 19.**

Item 60.2.h - Scour
There is scour at the upstream nose of the pier up to 4'-7" wide x 1'-6" deep.
See Chart #1 for the streambed profile.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour
See Item 60.2.h - Scour for comments.

Item 61.2 - Embankment Erosion
The northeast, northwest and southeast embankments have sloughed into the channel constricting flow to the center of the channel. There is heavy vegetation growth at these locations. **See Photos 20 through 22.**

Item 61.4 - Vegetation
There is heavy vegetation growth at the upstream end of the west arch. **See Photo 22.**

Item 61.7 - Aggradation
Embankment encroachment into the channel at all corners of the bridge has constricted the flow to the center of the channel around the pier. There are large vegetated islands at both the upstream and downstream ends of span #1. **See Photos 21 and 22.**

TRAFFIC SAFETY

Item 36a - Bridge Railing
The south bridge rail is concrete Jersey barrier placed in front of a 4' high chain-link fence continuing into the approaches.
The north bridge rail is single panel W-beam steel guardrail with boxing glove end (west end is missing) in front of a 7' high chain-link fence.
See Items 58.7 - Parapets and 58.8 - Railing for additional comments.

Item 36c - Approach Guardrail
The southeast, southwest, and northwest approach traffic safety features do not have end treatments (blunt ends). **See Photo 23.**

Item 36d - Approach Guardrail Ends
The southwest and southeast barrier ends and the northwest boxing glove end are not turned from traffic. Previously noted northwest end panel has been removed since the previous inspection.

Sketch / Chart / Photo Log
Sketch 1 : Location Map
Chart 1 : Streambed Elevation Chart
Photo 1 : West end of the wearing surface.

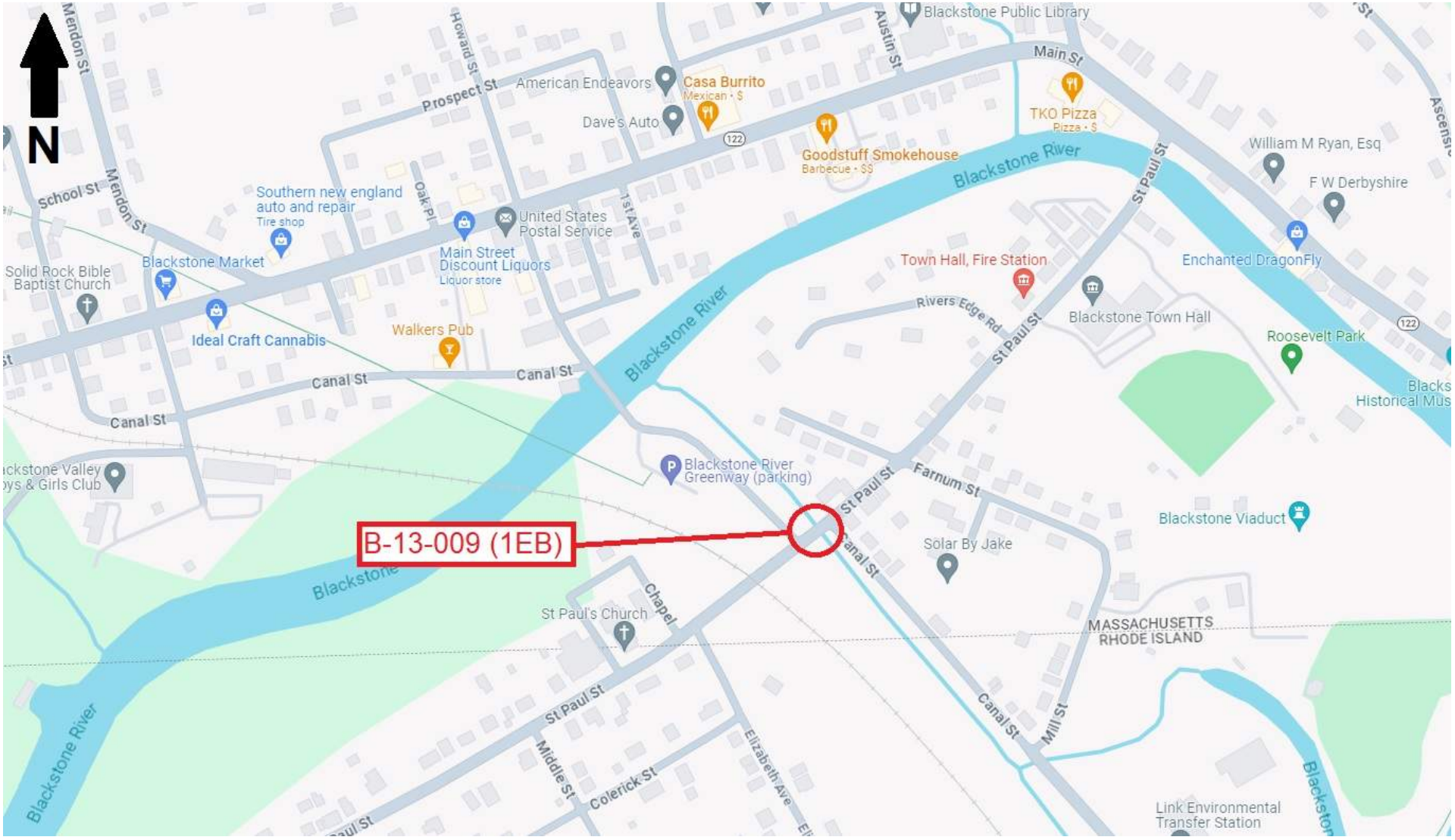
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

REMARKS

Photo 2 : Spalls to the top of the north sidewalk.
Photo 3 : Span #1 underside of the north sidewalk near the pier.
Photo 4 : Span #2 underside of the north sidewalk near the pier.
Photo 5 : Underside of the north sidewalk at the east end. Note spall to the northeast wingwall and hole.
Photo 6 : Heavily deteriorated south parapet/coping.
Photo 7 : East end of the north coping.
Photo 8 : South railing at the west end.
Photo 9 : Typical arch condition. Span #2 shown
Photo 10 : Cracks to the arch in span #2 at the pier wall.
Photo 11 : South spandrel wall over span #1.
Photo 12 : South spandrel wall over span #2.
Photo 13 : North spandrel wall over span #1.
Photo 14 : North spandrel wall over span #2.
Photo 15 : Northwest wingwall.
Photo 16 : Northeast wingwall.
Photo 17 : Erosion behind the northeast wingwall.
Photo 18 : Close up of the erosion at the northeast wingwall.
Photo 19 : Pierwall condition. East face shown.
Photo 20 : Southeast embankment.
Photo 21 : Southwest channel.
Photo 22 : Northwest channel.
Photo 23 : Northwest approach guardrail.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	1EB	B-13-009	B13009-1EB-MUN-NBI	JAN 4, 2024

SKETCHES



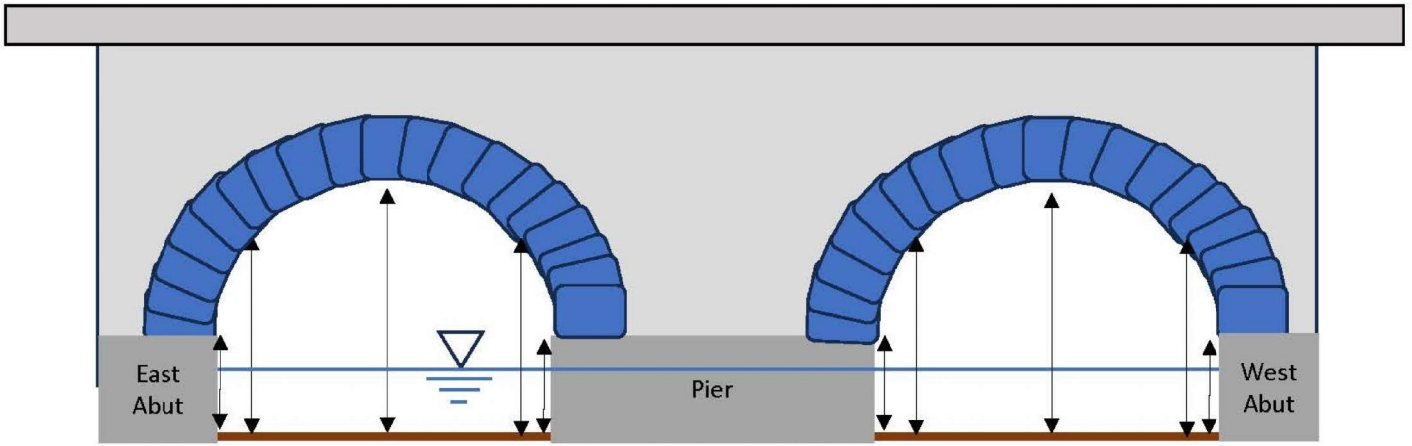
Sketch 1: Location Map

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	1EB	B-13-009	B13009-1EB-MUN-NBI	JAN 4, 2024

CHARTS

Typical Elevation B-13-009 (1EB)

Blackstone - St. Paul St over Canal



- Measurements were taken using a surveyor's rod and laser distance device. Intervals were at both faces of breastwall/pier to the spring line. The remaining locations throughout were the 5th, keystone (10th), and 15th blocks measured at the midpoint of the block.

Fascia Monitoring (ft)

		1/4/2024									
		South	North	South	North	South	North	South	North	South	North
Span #1	West Abut	1.42	0.33								
	Block 5	6.25	6.25								
	Keystone	6.00	7.83								
	Block 15	6.25	5.83								
	W Face Pier	1.08	1.58								
Span #2	E Face Pier	3.00	1.50								
	Block 5	6.83	6.16								
	Keystone	7.92	8.50								
	Block 15	4.33	5.08								
	East Abut	Buried	0.66								

Chart 1: Streambed Elevation Chart

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 1: West end of the wearing surface.

Photo 2: Spalls to the top of the north sidewalk.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 3: Span #1 underside of the north sidewalk near the pier.

Photo 4: Span #2 underside of the north sidewalk near the pier.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 5: **Underside of the north sidewalk at the east end. Note spall to the northeast wingwall and hole.**

Photo 6: **Heavily deteriorated south parapet/coping.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 7: East end of the north coping.

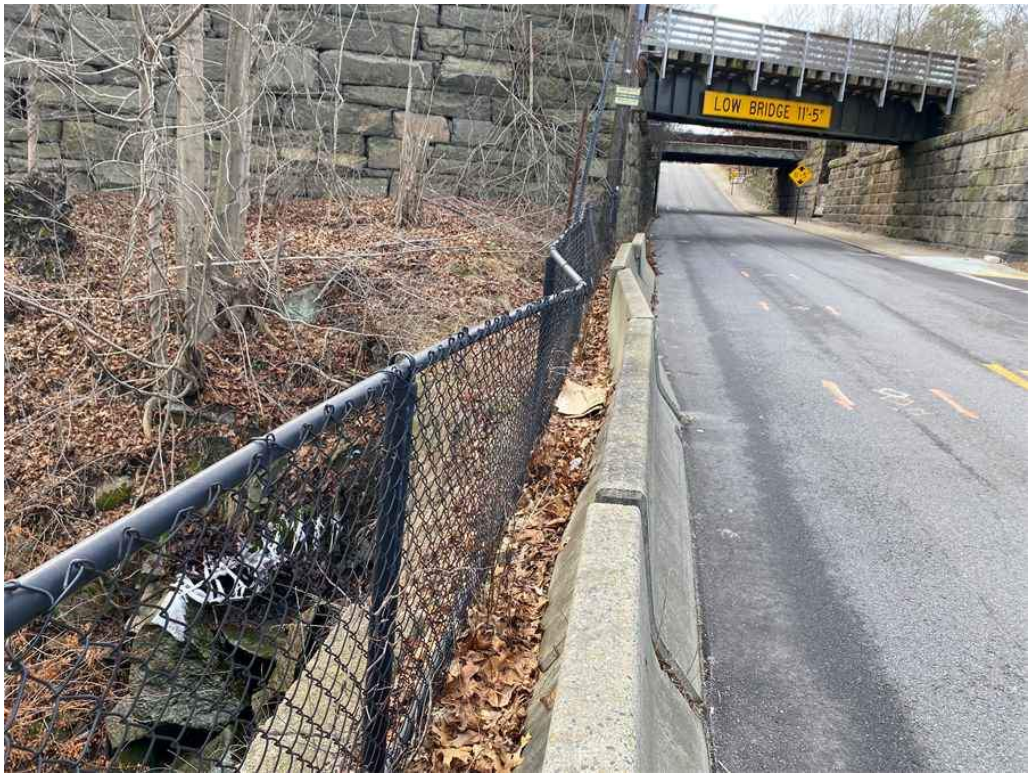

Photo 8: South railing at the west end.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

PHOTOS

Photo 9: Typical arch condition. Span #2 shown

Photo 10: Cracks to the arch in span #2 at the pier wall.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

PHOTOS

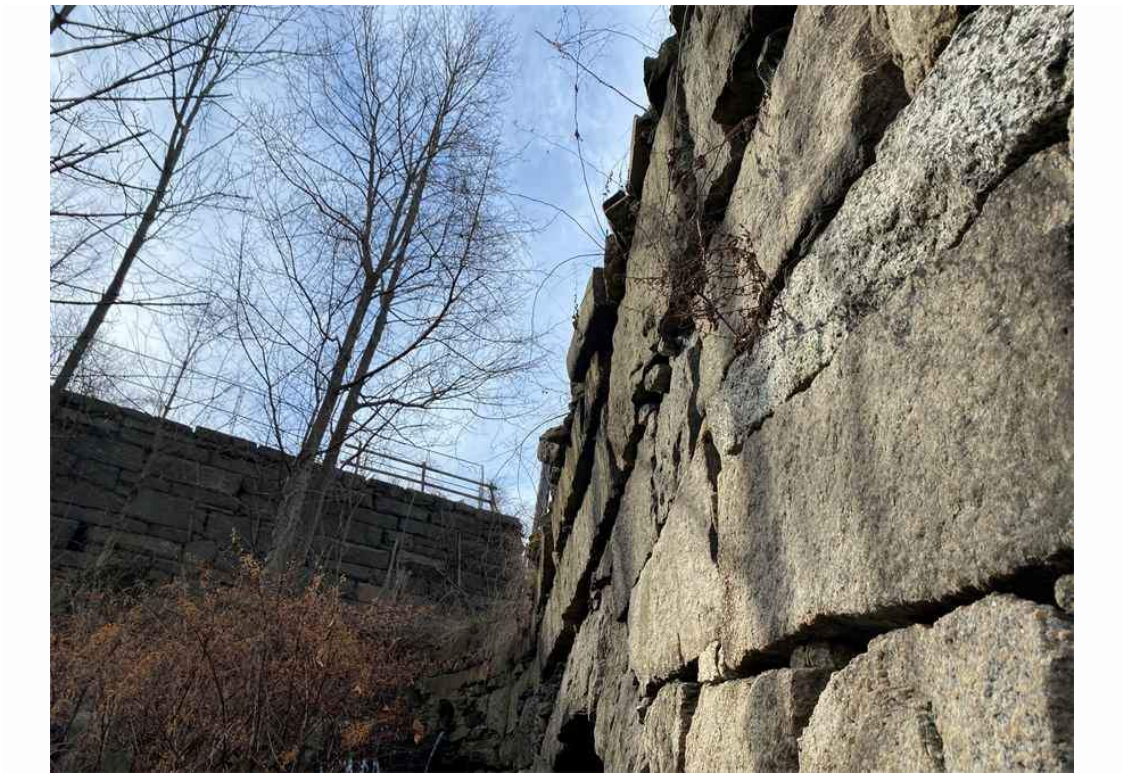

Photo 11: South spandrel wall over span #1.

Photo 12: South spandrel wall over span #2.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 13: North spandrel wall over span #1.

Photo 14: North spandrel wall over span #2.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

PHOTOS

Photo 15: Northwest wingwall.

Photo 16: Northeast wingwall.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 17: Erosion behind the northeast wingwall.

Photo 18: Close up of the erosion at the northeast wingwall.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 19: Pierwall condition. East face shown.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
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PHOTOS

Photo 20: Southeast embankment.

Photo 21: Southwest channel.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
BLACKSTONE	**1EB**	**B-13-009**	**B13009-1EB-MUN-NBI**	**JAN 4, 2024**

PHOTOS

Photo 22: Northwest channel.

Photo 23: Northwest approach guardrail.

Report Date: March 18, 2024

State Information

BDEPT#= B13009 Agency Br.No.

Town= Blackstone L.O.

B.I.N= 1EB AASHTO= 076.4

RANK= 3220 H.I.= 84.1 % FHWA Select List= Y (6.21.2017)

Identification

(8) Structure Number	B130091EBMUNNBI
(5) Inventory Route	151000000
(2) State Highway Department District	03
(3) County Code 027 (4) Place code	06015
(6) Features Intersected	**WATER CANAL**
(7) Facility Carried	**HWY ST PAUL ST**
(9) Location	.2 MI W OF ST-122
(11) Kilometerpoint	0000.515
(12) Base Highway Network	N
(13) LRS Inventory Route & Subroute	000000000000
(16) Latitude	42 DEG 00 MIN 56.62 SEC
(17) Longitude	71 DEG 32 MIN 11.06 SEC
(98) Border Bridge State Code	Share %
(99) Border Bridge Structure No. #	

Structure Type and Material

(43) Structure Type Main: Masonry	Code 811
Arch - Deck	Jointless bridge type: Not applicable
(44) Structure Type Appr: Other	Code 000
(45) Number of spans in main unit	002
(46) Number of approach spans	0000
(107) Deck Structure Type - Not applicable	Code N
(108) Wearing Surface / Protective System:	
A) Type of wearing surface - Not applicable=no deck	Code N
B) Type of membrane - Not applicable=no deck	Code N
C) Type of deck protection - Not applicable=no deck	Code N

Age and Service

(27) Year Built	1880
(106) Year Reconstructed	1925
(42) Type of Service: On - Highway-Ped	
Under - Waterway	Code 55
(28) Lanes: On Structure 02	Under structure 00
(29) Average Daily Traffic	008453
(30) Year of ADT 2018 (109) Truck ADT	04 %
(19) Bypass, detour length	003 KM

Geometric Data

(48) Length of maximum span	0005.8 M
(49) Structure Length	00012.8 M
(50) Curb or sidewalk: Left 01.7 M	Right 00.1 M
(51) Bridge Roadway Width Curb to Curb	006.1 M
(52) Deck Width Out to Out	009.4 M
(32) Approach Roadway Width (w/shoulders)	007.0 M
(33) Bridge Median - No median	Code 0
(34) Skew 00 DEG (35) Structure Flared	N
(10) Inventory Route MIN Vert Clear	99.99 M
(47) Inventory Route Total Horiz Clear	08.8 M
(53) Min Vert Clear Over Bridge Rdwy	99.99 M
(54) Min Vert Underclear ref N	00.00 M
(55) Min Lat Underclear RT ref N	00.0 M
(56) Min Lat Underclear LT	00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway	Code 0
(111) Pier Protection	Code
(39) Navigation Vertical Clearance	000.0 M
(116) Vert-lift Bridge Nav Min Vert Clear	M
(40) Navigation Horizontal Clearance	0000.0 M

Classification

	Code
(112) NBIS Bridge Length	Y
(104) Highway System	N
(26) Functional Class - Urban Minor Arterial	16
(100) Defense Highway	0
(101) Parallel Structure	N
(102) Direction of Traffic - 2-way traffic	2
(103) Temporary Structure	N
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll - On free road	3
(21) Maintain - Town Agency	03
(22) Owner - Town Agency	03
(37) Historical Significance undetermined	

Condition

	Code
(58) Deck	N
(59) Superstructure	7
(60) Substructure	6
(61) Channel & Channel Protection	4
(62) Culverts	N

Load Rating and Posting

	Code
(31) Design Load - Unknown	0
(63) Operating Rating Method - Load Factor (LF)	1
(64) Operating Rating	99.9
(65) Inventory Rating Method - Load Factor (LF)	1
(66) Inventory Rating	99.9
(70) Bridge Posting	5
(41) Structure - Open	A

Appraisal

	Code
(67) Structural Evaluation	6
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	5
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 N 0 0
(113) Scour Critical Bridges	7

Inspections

(90) Inspection Date 01.04.24 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00.00.00
(B) Underwater Inspection	N	00	MO B)	10.01.88
(C) Other Special Inspection	N	00	MO C)	00.00.00
(*) Other Inspection (Flood)	N	00	MO *)	04.03.10
(*) Closed Bridge	N	00	MO *)	00.00.00
(*) UW Special Inspection	N	00	MO *)	00.00.00
(*) Damage Inspection			MO *)	05.17.05

Rating Loads

Report Date 09.01.09	H20	Type 3	Type 3S2	Type HS
Operating	45.0	82.0	99.0	81.0
Inventory	74.0	99.0	99.0	99.0

Field Posting

Status LEGAL Posting Date 09.28.09

	2 Axle	3 Axle	5 Axle	Single
Actual				
Recommended				

Missing Signs N

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Freeze/Thaw N : Not Applicable

Stairs On/Adjacent 0 Stair Owner(s)

Accessibility (Needed/Used)

N / N	Liftbucket	N / N	Rigging	N / N	Other
P / Y	Ladder	N / N	Staging		
N / N	Boat	N / N	Traffic Control		
Y / Y	Wader	N / N	RR Flagperson		
N / N	Inspector 50	N / N	Police		

Inspection Hours: 008