

To: Chief Administrative Officer **Date:** September 3, 2024
From: Rob Racine, Manager of Capital Projects
Subject: **Wren Street Bridge Rehabilitation Options**

Recommendation(s)

1. That Council support Option 4 – Replacement with a Twin Cell Box Girder Bridge;
2. That \$1,350,000 be added to the 2026 Capital Plan for contract award, construction services and environmental monitoring; and
3. That the 2024 – 2028 Financial Plan be amended.

Purpose

The purpose of this report is to present the findings of the Wren Street Bridge Investigation Report for Council's consideration and to initiate the rehabilitation project by updating the Capital Plan as recommended.

Background

The Wren Street Bridge has been in service since 1982 (42 years old) and consists of a single 7m span sawn timber stringer superstructure supported on treated piles through cast-in-place concrete pile caps. Along with being a key link in the city's transportation network, the bridge also accommodates a 250mm diameter watermain, and three sanitary sewer forcemains.

City staff observed increased subsidence in the northbound approach on the south abutment. Asphalt was added to the approach and upon further investigation, deficiencies were observed in the structure. On July 27, 2023, staff retained GeoMetrix Group Engineering to conduct a preliminary inspection. As detailed in the report, key observations noted include:

- Scour holes and voids behind south abutment.
- Split piles.
- Rotten piles and timber blocks between stringers.
- Broken lateral post tension bar.
- Abandoned SW timber retaining wall.

Upon receipt of the report, staff imposed a load restriction on the bridge of not more than 5,500kg which removed commercial vehicles from using the structure. To provide some relief to the south abutment issue, steel road plates were installed to bridge the area of subsidence. These measures are intended to mitigate degradation to the bridge until it could be studied, options for rehabilitation could be presented to Council and adopted.

Discussion and Analysis

Staff retained Morrison Hershfield (now Stantec) and on November 8, 2023, a kick off meeting was held to conduct a multidisciplinary investigation including inputs from hydrotechnical, survey, geotechnical, utilities, environmental and climate change disciplines to thoroughly analyze the bridge and rehabilitation options to provide Council with the best possible information.

The four options investigated included:

1. Existing Bridge Rehabilitation – Conduct a condition assessment and repair the existing structure.
2. Temporary Bridge Structure – Consider a modular or Bailey Bridge structure.
3. Culverted Crossing – Remove the existing bridge and abutments and construct a culvert(s).
4. Full Bridge Replacement – Consider modular or cast in place options.

<p>Option 1: Existing Bridge Rehabilitation</p>	<p>Scope: Immediate intervention to extend the bridge's service life by 10 to 15 years through short-term and medium-term rehabilitation measures.</p> <p>Cost / Net Present Value: \$0.30M / \$2.71M (least expensive option).</p> <p>Advantages: Minimal environmental impact, no need for extensive in-stream work.</p> <p>Disadvantages: Shortest lifespan, does not meet modern roadway safety standards, and requires future replacement.</p>
<p>Option 2: Replacement with Bailey Bridge (Temporary Structure)</p>	<p>Scope: Medium-term solution involving the installation of a temporary Bailey bridge lasting 20 to 30 years.</p> <p>Cost / Net Present Value: \$2.30M / \$3.77M.</p> <p>Advantages: Moderate environmental impact, relatively quick installation.</p> <p>Disadvantages: Still a temporary solution requiring future replacement, moderate construction complexity and risk.</p> <p>Sidewalk is only 1.5 m wide compared to the desired 4 m multi-use path.</p>
<p>Option 3: Replacement with Arch Culvert</p>	<p>Scope: Long-term solution replacing the bridge with a steel arch culvert, expected to last 75 years.</p> <p>Cost / Net Present Value: \$2.99M / \$3.28M.</p> <p>Advantages: Meets modern standards for roadway safety and hydraulic capacity, significant longevity.</p>

	Disadvantages: High environmental impact due to increased footprint and in-stream work, complex construction process.
Option 4: Replacement with Twin Cell Box Girder Bridge	<p>Scope: Long-term solution involving the construction of a twin-cell concrete box girder bridge, also expected to last 75 years.</p> <p>Cost / Net Present Value: \$3.00M / \$3.46M (most expensive option, but similar to Option 3).</p> <p>Advantages: Best performance in terms of hydraulic capacity and overall project complexity, meets modern safety standards.</p> <p>Disadvantages: High environmental impact, significant construction complexity.</p>

Cost Estimates

Each option was estimated as detailed in the table below using July 2024 costing information.

	Tender Price	Associated City Cost*	Total
Option 1: Existing Bridge Rehabilitation	\$202,923	\$97,403	\$300,326
Option 2: Replacement with Bailey Bridge (Temporary Structure)	\$1,520,931	\$780,047	\$2,300,978
Option 3: Replacement with Arch Culvert	\$2,021,216	\$970,184	\$2,991,400
Option 4: Replacement with Twin Cell Box Girder Bridge	\$2,029,055	\$973,946	\$3,003,001

* Associated City Cost includes 30% Contingency, 10% Engineering (Design), 8% Construction Supervision, and a \$50,000 Utility Relocation Allowance (for Option 2 only).

Option Analysis

Each option was evaluated based on certain weighting criteria. A ranking of “1” and a lower score indicates the most favourable option:

	Option 1	Option 2	Option 3	Option 4

Criteria Description	Criteria Weighting (%)	Existing Bridge Rehabilitation	Replacement with Bailey Bridge (Temporary Structure)	Replacement with Arch Culvert	Replacement with Twin Cell Box Girder Bridge
Cost of Construction	21%	0.4	2.6	3.98	4.00
Roadway Functionality and Safety	14%	4	4	1	1
Environmental Permitting & Impacts	7%	1	4	3	2
Hydraulic Capacity	18%	4	3	2	1
Overall Project Complexity / Risk	14%	3	4	2	1
Traffic Impact / Construction Schedule	4%	1	2	4	4
Net Present Value / Life Cycle Cost	21%	2.88	4.00	3.48	3.67
Weighted Score		2.52	3.55	2.74	2.39
Overall Rank		2	4	3	1

(Scoring: 1 = most favourable, 4 = least favourable)

Option 4 – Replacement with Twin Cell Box Girder Bridge is the recommended option based on the following:

- Best satisfaction on roadway functionality and safety performance.
- Meets hydraulic capacity and adequate soffit clearance.
- The least overall project complexity and risks involved throughout the project design life.

This option, despite its higher upfront cost, offers the best long-term value, superior hydraulic capacity, and meets modern roadway safety standards. The conceptual design includes a multi-use pathway which can facilitate active transportation in the area. The anticipated lifespan of 75 years justifies the investment, providing a sustainable solution with minimized future maintenance and replacement needs.

Environmental Permitting, Traffic Impact and Construction Schedule

The environmental permitting associated with rehabilitating the bridge will require significant lead times. To mitigate and make best use of this time, staff are proposing to initiate the design and application process as recommended. Option 4 will require a Water Sustainability Act Change Approval and a DFO review which could take up to 18 months.

Construction of Option 4 will impact traffic. Staff investigated if the existing bridge could remain in service while the new bridge is being constructed but due to the property lines, Silverdale Creek stream configuration and the roadway alignments of Wren and Tyler Streets, the existing bridge would have to be demolished to facilitate construction. The construction duration time for Option 4 is estimated at 24 weeks. Depending on the design and the contractor's methodology,

a detour would be in place for most, if not all this time. The detour would be significant and similar to the past bridge construction projects such as the Keystone Bridge, staff would determine a detour plan and communicate it to the community.

Financial Implications

The current funds available under Bridge Rehabilitation / Replacement Program from 2024 through 2027 are \$1,671,097.

Current Capital Plan	
2024	\$371,097 (Available)
2025	\$150,000
2026	\$350,000
2027	\$800,000

Staff are recommending that \$1,350,000 be added to the 2026 Capital Plan for contract award, construction services and environmental monitoring.

Since construction is a minimum of 18 months after permit applications are submitted, the cost estimates contained in this report may become insufficient. Staff may report back to Council at the time of the construction contract award should more budget be required to complete the works.

Communication

There are no communication implications associated with this report.

Summary and Conclusion

This report is to present the findings of the Wren Street Bridge Investigation Report for Council's consideration. Option 4 – Replacement with Twin Cell Box Girder Bridge is recommended based on the multi factored evaluation and best overall value.

Staff are also recommending that the Capital Plan be updated as recommended to retain an engineering team to initiate the design and to submit permit applications.

Report Prepared by: Rob Racine, Manager of Capital Projects

Reviewed by: Tracy Kyle, Director of Engineering and Public Works

Approved for Inclusion: Mike Younie, Chief Administrative Officer