CITY OF VICTORIA

Governance and Priorities Committee Report
For the January 22, 2015 Meeting

To:	Governance and Priorities Committee	**Date:**	January 15, 2015
From:	Dwayne Kalynchuk, Director, Engineering and Public Works		
Subject:	Point Ellice Bridge – Rehabilitation/Repairs Assessment and Updated Cost Estimates		

Executive Summary
To assist in developing options and recommendations for Council on determining capital priorities, Council directed a review of three of the City's largest capital priorities – Crystal Pool, Fire Hall #1, and the Point Ellice Bridge. In response, the City retained a consultant to conduct further analysis on bridge repairs initially identified in an earlier review, refine the design for possible pedestrian and cyclist improvements, and provide updated cost estimates for the Point Ellice Bridge.

A 2013 assessment had recommended complete replacement of the concrete portion of the bridge deck; however, field testing performed in September 2014 confirmed the concrete deck is in relatively good condition, and replacement is not required. As a result, the reduced scope of recommended maintenance work is now estimated at approximately $3,600,000 – currently, $4,000,000 is identified for consideration as part of the 2017 Capital budget.

Widening the Point Ellice Bridge for cyclist and pedestrian improvements would cost approximately $15,250,000. Priority projects for Bicycle Master Plan Implementation over the next five years (2015-2019) endorsed by Council in August 2014 did not include the Point Ellice Bridge.

Recommendation:
That Council direct staff to include maintenance repairs to the Point Ellice Bridge, as identified in the Report on Point Ellice Bridge Maintenance and Enhancement Proposals, dated December 1, 2014, as a project for Council consideration in the Financial Plan for 2017.

Respectfully submitted,

Brad Dellebuur
A/Assistant Director

Dwayne Kalynchuk, P.Eng.
Director,
Engineering and Public Works

Report accepted and recommended by the City Manager:

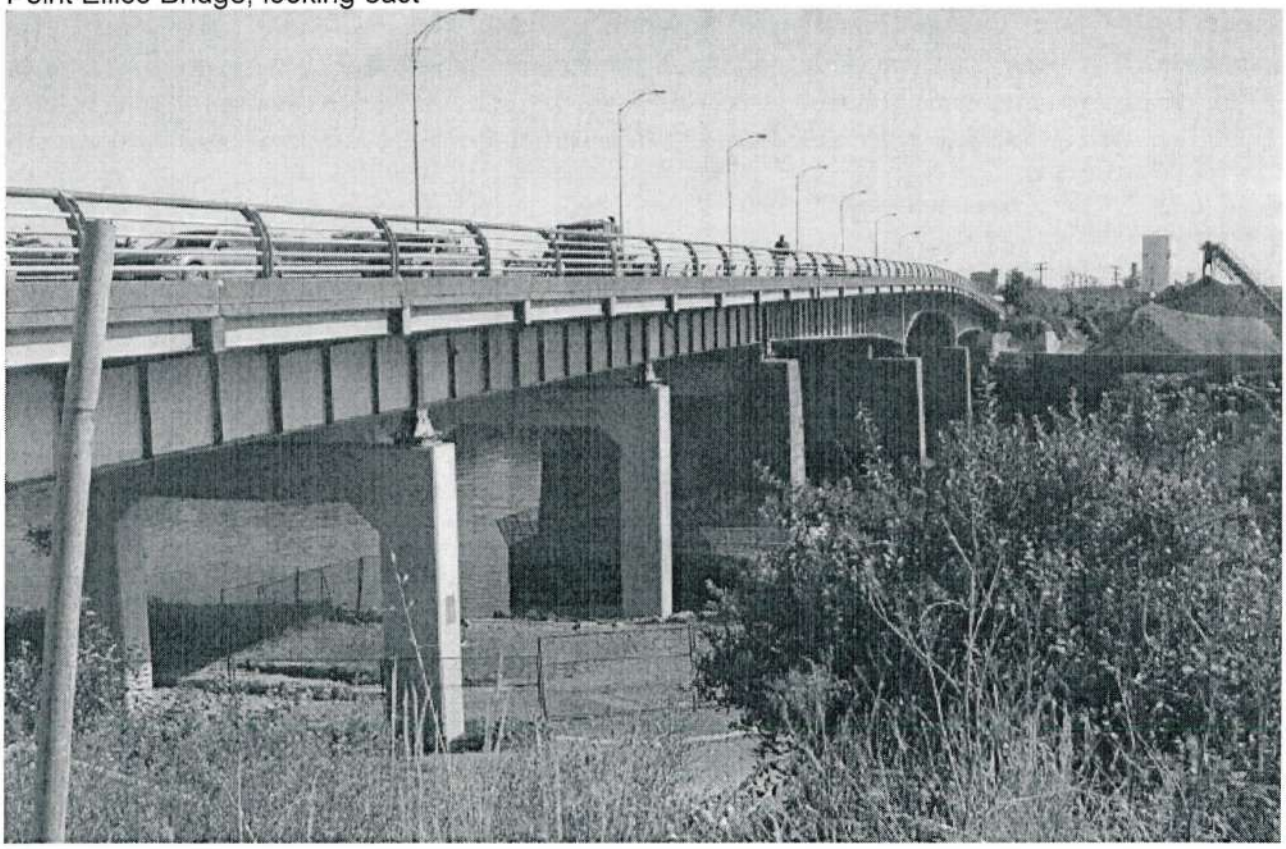
Date: January 16, 2015

Purpose:
The purpose of this report is to update Council on the latest condition assessment of the Point Ellice Bridge, including analysis of previously-identified repairs, refinements to proposed cyclist and pedestrian improvements, and updated cost estimates for the identified works.

Background:
The Point Ellice Bridge crosses Victoria's Upper Harbour, connecting downtown Victoria with the Victoria West neighbourhood. The existing steel and concrete bridge (opened in November 1957) is the sixth bridge to span the Harbour at this location, the first bridge being constructed in 1861.

The current bridge deck has one vehicle lane in each direction, with a sidewalk on the south side of the bridge. There are no marked bike lanes on the bridge. Long-range transportation planning for the Victoria West neighbourhood in 2005 identified the need to improve pedestrian and cyclist facilities on the Point Ellice Bridge, however, previous grant applications to secure funding to implement these improvements have been unsuccessful.

Point Ellice Bridge, looking east



While minor maintenance work continued to be done on the bridge over the past several years, larger-scale maintenance work, most notably steel structure repairs and repainting, was deferred while the City pursued third party funding. A condition assessment done for the City by Hindi Engineering Ltd. in April 2013 determined the existing bridge to be in poor to fair condition. The cost of identified repairs, including deck replacement and repainting of the existing structure, estimated at +/-$11,000,000. The estimate provided was an order-of-magnitude costing, and was based on preliminary design sketches.

At that time, the consultant noted that, with proper maintenance, the bridge would have a remaining life span of approximately 50 years.

To assist in developing options and recommendations for Council on determining capital priorities, Council directed a review of three of the City's largest capital priorities – Crystal Pool, Fire Hall #1, and the Point Ellice Bridge. The City retained Stantec Consulting Ltd. in 2014 to conduct further analysis on bridge repairs initially identified in the 2013 review, refine the design for pedestrian and cyclist improvements, and provide updated cost estimates for the Point Ellice Bridge.

The consultant completed investigation and analysis work in September, and provided the City a final report (dated December 1, 2014).

Issues & Analysis:
As part of their investigation/review, Stantec personnel identified field testing work needed to confirm the existing condition of the structure, to help refine the design for possible widening of the bridge, and provide greater certainty on work scope and cost.

1. **Condition Assessment/Maintenance-related repairs:**
   The 2013 assessment had recommended complete replacement of the concrete portion of the bridge deck – this represented a significant portion of the $11,000,000 estimate. Field testing was performed in September 2014 to verify this work was necessary - testing included removing a small portion of the asphalt surface on the bridge to physically examine the concrete deck below, and using ground-penetrating radar to confirm the condition of structural steel members located below the concrete deck. The results confirmed the concrete deck is in relatively good condition, and that replacement is not required.

   While the testing revealed the concrete deck is in good condition, the consultant expressed concerns that corrosion in the steel stringers and floor beams of the bridge deck (structural members immediately below the concrete deck) has reduced capacity by approximately 11%. To address this, the consultant is recommending that maintenance work include mitigation measures to reduce future steel corrosion.

   The present condition of the Point Ellice Bridge is considered safe for normal vehicle use. However, the consultant recommends implementing a 50,000kg Gross Vehicle Weight load restriction. The need to move this size of load across the Point Ellice Bridge rarely occurs, therefore the impact of this restriction is relatively minor. The load restriction would not necessarily prohibit vehicles from crossing the bridge, only the manner in which they travel over the bridge (speed restrictions, line of travel on the bridge deck, etc.).

   The load restriction would not impact traffic typically found on City streets (e.g. a fully loaded concrete truck - 43,100kg GVW, the heaviest Fire Department vehicle – 30,900kg GVW). Signs would be posted on the approaches to the bridge, and local businesses that could potentially be impacted would be advised of the restriction.

   The updated scope of maintenance work now includes:

   - replacing the main expansion joints;
   - repairing concrete at the abutments;
   - adding anodes to the bridge structure to reduce future steel corrosion;
   - removing the asphalt deck to add a waterproof membrane;
   - resurfacing the bridge deck (asphalt);
   - preparing and refinishing pedestrian handrails and light standards;
   - preparing and repainting the existing steel structure.

   Performing this maintenance work will impact traffic. While the consultant recommends doing the maintenance work within the next 3-5 years to avoid additional deterioration, they suggest

starting work after the completion of the Johnson Street Bridge project to minimize area traffic impacts. Although full closure of the bridge would allow for the most cost-effective construction method, the consultant recommends phasing work on the structure, and keeping pedestrian space and one vehicle lane open at all times. Details on potential traffic impacts will be defined once full design drawings are completed, and construction tenders are awarded for this work. At that time, this information will be shared with the general public, adjacent businesses, emergency service providers, transit, and other stakeholders.

Given the reduced scope of recommended maintenance work, the updated Class D estimate is approximately $3,600,000 – currently, $4,000,000 is identified for consideration as part of the 2017 Capital budget.

The testing work, and the subsequent refinements on the widening design, also confirmed the maintenance work can proceed independently, as there is minimal scope and cost overlap with the widening design.

2. **Refinement of Widening Design for Pedestrian/Cyclist Facilities:**
Plans to widen the Point Ellice Bridge to better accommodate cyclists were originally developed for the City in 2001. The most recent design concept includes widening the bridge deck, replacing the south side sidewalk, installing a new sidewalk on the north side of the bridge, and expanded improvements to road approaches.

To provide greater certainty on widening costs, the consultant evaluated the structural capacity of the deck steel work, and the increased deck weight associated with the widening. The consultant noted widening could be accomplished using standard bridge design and practice, with the limiting condition that the increase in deck weight would be limited to that allowed for in the original bridge design. Keeping within this limit would avoid the additional cost of strengthening the main steel girders, and avoid reducing the effectiveness of seismic upgrading work done to the bridge in 2001-2002.

A Class D cost estimate indicates widening would cost approximately $15,250,000.

The priority projects for Bicycle Master Plan Implementation over the next five years (2015-2019) endorsed by Council in August 2014 were Pandora Avenue, Johnson Street, Vancouver Street, and the off-Shelbourne Street, off-Bay Street, and Wharf/Belleville corridors. In addition, the construction of improved bicycle and pedestrian facilities on the Johnson Street Bridge will provide a more direct connection between the downtown core, the Victoria West neighbourhood, and regional cycling corridors. Improvements to the Johnson Street Bridge were not contemplated when the Point Ellice Bridge concept was developed in 2001.

Recommendation:
That Council direct staff to include maintenance repairs to the Point Ellice Bridge, as identified in the Report on Point Ellice Bridge Maintenance and Enhancement Proposals, dated December 1, 2014, as a project for Council consideration in the Financial Plan for 2017.

Executive Summary

This Report on Point Ellice Bridge Maintenance and Enhancement Proposals (Report) briefly states the major outstanding maintenance requirements of painting the structural steel work, replacing the main span expansion joints, and concrete repairs to deteriorating concrete at the abutments. Sealed joints in the asphalt roadway surface and clearing blocked deck drains require ongoing maintenance.

This Report examines in detail the proposal to widen the deck to provide a two lane bridge with bicycle lanes and sidewalks on both sides. This review also evaluated the capacity of the deck structure to carry the Canadian Highway Bridge Design Code (CHBDC) CL-625 design vehicle as well as overload type permit vehicles, based on criteria established by the British Columbia Ministry of Highways and Infrastructure (MOTI) for major routes. In this analysis an allowance was made for loss of structural beam capacity through corrosion. Non-destructive investigation has been undertaken to provide a more accurate figure of percentage loss of steel in the thickness of the beam top flanges and the analysis adjusted accordingly. The present condition is considered safe for normal use.

A study of the original deck drawings revealed that the concrete thickness protecting the reinforcing bars was only 25.4 mm (1") (modern practice is 70 mm or nearly 3"), plus the 50.8 mm (2") of asphalt. This depth of cover is intended to prevent ingress of chlorides and water that would, over time, corrode the steel bars. There is a concern that delamination of the concrete (separation of the top concrete from that below at the reinforcement layer) will have occurred. An investigation to determine the extent to which this may have occurred has been undertaken by Goal Engineering whose report is attached. Little evidence of delamination and corrosion of reinforcement was detected.

With respect to the proposed widening, this would be accomplished using standard bridge design practice and materials, with the limiting condition that the increase in deck weight would be limited by that allowed for in the original design. The proposed cross-section is shown in SK-1 in Appendix B. The sections meet the minimum requirements specified by the brief of 1.7 m sidewalks, 1.8 m bicycle lanes, and 3.05 m traffic lanes.

Phasing of the work is also examined in detail; with the proposal that the Bridge be closed to public two-way traffic, but retains controlled one-way operation for emergency vehicles (fire routes to Vic West and ambulance to Royal Jubilee Hospital use Bay Street), police, transit, and pedestrian use on one sidewalk. This would necessitate the work being done in two phases; with the initial phase being on the north side of the centreline. It is recommended that the work be scheduled after completion of the Johnson Street Bridge when the improved road alignment will mitigate the increase in traffic.