
Subject: Transportation Infrastructure Means Protection Update

Report to: Public Works Committee

Report date: Tuesday, April 16, 2019

Recommendations

1. That the recommendations contained in the *Transportation Infrastructure Means Protection* report, attached as Appendix 2 to Report PW 24-2019, **BE ENDORSED**;
2. That staff **BE DIRECTED** to proceed with the detailed design and tendering of the Transportation Infrastructure Means Protection project; and
3. That financing in the amount of \$4,000,000 gross and net **BE INITIATED** from the approved 2019 capital budget for the Transportation Infrastructure Means Protection project and that the project **BE FUNDED** as follows:
 - Reserves – Capital Levy - \$4,000,000

Key Facts

- The purpose of this report is to update Council on the status of the preliminary design report completed by Parsons Inc. (March 2019) and to seek direction on proceeding with the detailed design and tender package creation.
- In January 2019 Niagara Region's Medical Officer of Health and Commissioner (Acting), M. Mustafa Hirji, brought forward a report to Public Health and Social Services Committee entitled *PHD 03-2019 Preventing Deaths by Suicide on Public Infrastructure (PHD 03-2019)*. *PHD 03-2019* is attached as Appendix 1.
- In consideration of *PHD 03-2019*, Committee approved a means prevention barrier at location StC-1, and directed staff to proceed with planning and to report back in the spring with a final recommendation and a detailed cost estimate.
- During 2019 Capital Budget deliberations, staff was directed to include \$4,000,000 in the 2019 Capital Budget for the Transportation Infrastructure Means Protection project subject to Committee and Council approval of project initiation.
- Due to the extreme sensitivity of this project, and timeliness of erecting the means protection barriers being of significant importance (to address risk of additional deaths), staff are recommending that Parsons Inc. be directly retained to proceed

with the detailed design and tender package creation in accordance with Niagara Region's Purchasing Bylaw.

- In January 2019, Region staff directly retained Parsons Inc. to complete a preliminary design report for Means Protection at StC-1, the direct award was attributed to the following:
 - The sensitive nature of the subject at hand
 - The need to expedite the composition of such report
 - Parsons familiarity with the structural design of the structure having been the original designer
- In late March 2019, staff received the final report completed by Parsons Inc. entitled *Transportation Infrastructure Means Protection (TIMP)* (Appendix 2).
- The TIMP report reviewed several areas of interest including the following:
 - Current state of the structure
 - A number of other structures throughout North America along with means protection design utilized on each structure
 - Options for outer wall barriers
 - Options for inner wall barriers
 - Construction materials
 - Capital cost associated with construction
- The estimated cost of construction for the means protection barrier would be in the order of \$2,977,350 excluding taxes.

Financial Considerations

The full cost of implementing means protection barriers at StC-1 is estimated to be in the order of \$3,508,023 (including 1.76% non-refundable HST). These costs include the following items:

- Detailed design of the barrier system
- Tendering
- Labor and material associated with the installation of the barrier system
- Contract administration and inspection of the barrier system
- Approval and coordination with MTO
- Miscellaneous contract costs

Should any deviation from these costs arise that cannot be accommodated within the \$4,000,000 budget, staff will come back to Council in accordance with the budget control by-law.

Financial evaluation of the preferred barrier system should closely consider the lifecycle cost of the barrier system as it relates to suggested material types. Life cycle cost shall include the cost of expected future maintenance of various materials along with the initial capital cost of each material.

During 2019 Capital Budget deliberations, on the direction of Council through PHD 03-2019, staff submitted and Council approved an uninitiated business case entitled Transportation Infrastructure Means Protection - 20001038. Staff recommends initiating these approved funds in order to move forward with the detailed design, tender and construction of the means protection barriers.

In the six month period since October 2018, there have been six deaths by suicide at the location in question, as well as at least 1 additional serious attempt. With future deaths being a known probability as per updated assessment and recommendation by Dr. Hirji (Appendix 3), there is considerable risk with not installing the means protection barriers at this time.

Due to the extreme sensitivity of this project, and timeliness of erecting the means protection barriers being of significant importance (to address risk of additional deaths), staff are recommending that Parsons Inc. be directly retained to proceed with the detailed design and tender package creation in accordance with Niagara Region's Purchasing Bylaw. Parsons Inc. has extensive background and knowledge of StC-1, which will allow Niagara Region to proceed with the installation of means protection barriers in an expeditious manner. Staff have solicited a proposal from Parsons Inc. to complete this phase of the project and have received a proposed cost of \$141,626 (including 1.76% non-refundable HST). It is more than likely that Staff will retain Parsons Inc. to undertake contract administration and inspection services during the next phase of this work. Council should be aware that the award of contract administration and inspection services for the construction of StC-1 itself was also awarded to Parsons Inc. as a sole source procurement due to the criticality of the designer overseeing their design. The value of this previous work required and received Council approval.

Analysis

In January 2019 Niagara Region's Medical Officer of Health and Commissioner (Acting), M. Mustafa Hirji, brought forward a report to Public Health and Social Services Committee entitled *PHD 03-2019 Preventing Deaths by Suicide on Public Infrastructure* (PHD 03-2019D).

Council endorsement of recommendations in the above report directed staff to proceed with planning for means protection at StC-1.

In January 2019, staff retained Parsons Inc. to carry out a preliminary design report that would consider the feasibility of installing means protection on StC-1. The report would review similar structures that have means protection structures, and the various types of means protection that are feasible for the required application, the physical ability to retrofit means protection to the existing infrastructure, potential design parameters, materials options, along with their expected service life.

In late March 2019, staff received a completed TIMP report (Appendix 2). The highlights of the report are as follows:

- There are a number of examples throughout North America where various types of means protection have been installed and are performing as expected. A few locations are Burrard Street Bridge (Vancouver), Ironworkers Memorial Bridge (Surrey), Golden Gate Bridge (San Francisco), Prince Edward Viaduct (Toronto), High Level Bridge (Edmonton)
- Advantages and disadvantages of examples were provided
- Design options recommended for exterior barriers: 1. *Inclined barrier with cantilever pipes*, 2. *Inclined barriers with supported pickets*
- Design options recommended for interior barriers: 1. *Horizontal mesh at top of parapet*, 2. *Horizontal mesh at bottom of parapet*
- Materials options for means protection barrier construction
- Life cycle cost analysis of different construction materials

The TIMP report clearly concluded that retrofitting means protection to StC-1 was a feasible option.

In mid-March, staff attended a steel fabrication plant to view a full scale model of the two exterior barrier options considered viable in the TIMP report. Staff reviewed the scale models along with our consultant Parsons Inc. Upon conclusion of this site visit, it was evident that of the two options considered, one option (inclined barrier with cantilever pipes) was far more robust and appeared to better serve the intended purpose.

The major benefit of the inclined barrier with cantilever pipes was the robust cross section. The stability of this robust cross section required less bracing and a reduced need for bracing resulting in a design that is less scalable by persons. The scalability of the design is an important consideration as a less scalable design is more likely to deter persons from attempting to climb the means protection.

The interior barrier considerations are very similar in nature; however, the *horizontal mesh at top of parapet* has benefits related to installation and maintenance. The top mounted option is also more visible and will act to further deter potential scaling of the interior parapet wall.

Materials evaluated for construction of the means protection barriers were galvanized steel and aluminum.

Galvanized steel and aluminum are estimated to have a very similar initial capital cost. However, the longevity of galvanized steel is dependant on the quality and durability of its galvanizing and its ability to resist corrosion. Galvanized steel would require a more frequent maintenance program to ensure the full life expectancy of the asset is realized. Aluminum is resistant to corrosion. Aluminum oxidizes naturally and is extremely durable in our climate. It is expected that an aluminum barrier would have significantly less ongoing maintenance to reach its expected asset life. Galvanized steel is a much heavier material making dampening of the steel to control vibration more predictable. Galvanized steel has been widely used for similar applications thus making its performance highly predictable. Although there have been no identified cantilevered pipe means protection barriers constructed of aluminum, staff are recommending further analysis be conducted during detailed design to determine the feasibility of this option.

Life cycle cost analysis is a method for evaluating the initial capital cost of an asset along with the maintenance required to assist the asset in reaching its expected asset life before requiring replacement. Some materials will require a lower initial capital investment and have a higher long term maintenance cost while others will have a higher initial capital investment and a lower long term maintenance cost. When making a determination of the most financially responsible materials to use it is important to consider the long term cost of an asset including any maintenance required over the life of the asset.

When reviewing all of the variables and the life cycle cost analysis is clear that galvanized steel has a higher life cycle cost than aluminum (see TIMP report Appendix 2). Staff along with our consultant feel that it would be prudent to take advantage of the lower life cycle cost of utilizing aluminum. However, further detailed design is required to ensure that dampening the barrier to prevent vibration is possible in this application. During the detailed design stage the cost associated with dampening the aluminum barrier will be reviewed and if found that dampening the aluminum would not be cost adverse, staff will proceed with the design utilizing aluminum. If found that in this application, dampening the aluminum barrier is not possible or cost prohibitive staff will proceed with a galvanized steel barrier. Staff will report back to Council via Council Memo once a final material has been established, in order for Council to be aware of the expected final product.

Alternatives Reviewed

Means protection is part of a holistic approach to suicide prevention as detailed in the Prevention Report, and as is being proposed in PHD 08-2019.

Staff have reviewed alternatives for several types of means protection including but not limited to the following:

- Vertical Steel Rod Fence (Burrard Street Bridge)
- Vertical Galvanized Cantilever Pipes (Ironworkers Memorial Bridge) **Preferred**
- Netting Systems (Golden Gate Bridge)
- Vertical Barrier with Rods (Price Edward Viaduct)
- Horizontal Steel Cable Barrier (High Level Bridge)

The advantages and disadvantages of each type of means protection in the locations listed is detailed in the TIMP report attached as (Appendix “2”).

Relationship to Council Strategic Priorities

This report does not relate specifically to any of Council’s strategic priorities. Nonetheless, it addresses a matter of current public interest, and is pursuant to an approval and direction by Council through PHD 03-2019.

Other Pertinent Reports

PHD 03-2019 Preventing Deaths by Suicide on Public Infrastructure

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This report was prepared in consultation with M. Mustafa Hirji, Medical Officer of Health & Commissioner (Acting) (Public Health and Emergency Services), Sardar Nabi, Program Director Bridges (Parsons), Catherine Habermehl, Acting Commissioner (Public Works), Ron Tripp, Acting CAO, Dan Ane, Manager Program Financial Support

Appendices

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| Appendix 1 | PHD 03-2019 Preventing Deaths by Suicide on Public Infrastructure | |
| Appendix 2 | Transportation Infrastructure Means Protection | 43 pages |
| Appendix 3 | Update on Need for Means Protection on Infrastructure in St. Catharines (Memo to Pubic Works Committee by Dr. M. Mustafa Hirji, Medical Officer of Health & Commissioner (Acting)) | |