

## Sound Wall Lifecycle Replacements for Critical Locations

### **RECOMMENDATION(S):**

That the Standing Policy Committee on Transportation and Transit recommend that Council:

Allocate \$4.0 million in one-time funding from the Lifecycle Maintenance and Upgrade Reserve to the Sound Wall Lifecycle Program to meet program deficiencies and address remaining high priority locations with immediate needs.

### **HIGHLIGHTS**

- This report provides background to recent Council direction from the 2020 Mid-Cycle Budget Adjustments to refer a decision on investments to repair sections of sound attenuation walls (sounds walls) in Calgary by providing an overview of the current asset condition and capital program budget requirements.
- *What does this mean to Calgarians?* Sound walls provide noise attenuation and visual screening for high volume roadways. A small portion of the network requires immediate repairs and removals are planned as an interim measure to ensure public safety. Receiving additional one-time capital funds will address safety issues, minimize public impact and allow work to proceed sooner.
- *Why does this matter?* Maintaining the existing network in safe condition improves quality of life for residents and communities. Removal of existing sound walls will result in increased complaints to The City along with decreased liveability for adjacent residents.
- Through recent structural inspections, The City has identified several locations that require immediate removal for safety reasons. Critical sections are located on Crowchild Tr SW (32 Ave to 24 Ave, Tecumseh Rd to 23a St and 24 St & Richmond Rd), 14 St SW (Southland Dr SW, 75 Av SW) and Memorial Dr NE (Bridgeland). These sound walls have degraded and require removal to mitigate public safety issues.
- The City operates and maintains approximately 95 kilometers (km) of sound walls with a total estimated asset value of \$143 Million.
- With a design life of approximately 25 years, 42 km of sound attenuation walls in service prior to 1992 have reached their end of life. Approximately 1.7 km are rated in very poor/critical condition.
- The One Calgary Budget Cycle 2019-2022 was the first time dedicated capital funding was allocated for sound wall lifecycle replacement. The total budget approved was \$1.98 million over 4 years. These capital funds were almost entirely exhausted in 2019/2020 to focus on addressing critical locations.
- Prior to One Calgary 2019-2022, there was no dedicated capital lifecycle program for sound walls.
- Strategic Alignment to Council's Citizen Priorities: A city that moves

## **Sound Wall Lifecycle Replacements for Critical Locations**

### **DISCUSSION**

#### **Design & Construction**

Sound attenuation walls are engineered structures consisting of several pre-approved designs and materials. They play a significant role to ensure a reduced decibel level of road noise migrating into neighboring communities and create a level of privacy as a barrier between traffic and residential areas.

The City of Calgary typically inherits most sound wall assets through subdivision developments, road upgrades such as interchanges or through new locations that qualify through the Sound Attenuation Retrofit Program which is currently unfunded.

Sound walls within the road right of way are constructed mainly out of concrete and vary in height and length based on the requirements needed to mitigate road noise. Most of the City's concrete sound walls in service prior to 1992 were constructed using a porous concrete mixture (basket weave design), consisting of precast concrete planks stacked on each other spanning horizontally between precast concrete posts. Depending on how far the sound wall is situated away from the road, this type of wall design typically has an estimated service life of 20 to 25 years.

#### **Rate of Deterioration**

Due to the porous characteristics of the concrete mixture, small voids allow water and air to pass through resulting in deterioration. The placement of a sound wall in relation to a roadway plays a significant role in the severity and rate of deterioration. The closer the sound wall is to the road, the greater the exposure to road spray containing salt/chlorides.

#### **Asset Condition & Assessment**

The goal of inspections is to maintain a high level of safety. There are several key elements pertaining to the evaluation of these assets (i.e. panels, posts, base, visual appearance, stability and safety) and assigning a severity rating (1 to 5) to each element. A Severity 1 (Very Good) indicates little to no cracking or spalling, and no collision damage or exposed rebar while a Severity 5 (Critical) is assigned where there is exposed rebar, post separation from the concrete panels, severe cracking & deterioration and or evidence of a breach/ rupture.

According to best management practices, each sound wall within City road right of way has a basic assessment completed annually and a detailed assessment every 5 years. Basic assessments consist of a visual check along the wall and documenting any defects that require urgent repair or replacement. A detailed assessment consists of assessing the condition of each of the sound wall's structural elements (i.e. post, panel, base, appearance & stability).

Based on visual inspections, there are situations where one sound wall element experiences more significant deterioration than others. For example, the basket weave design sound walls commissioned prior to 1992 had the bottom concrete panels either buried underground or resting at grade. Over time the ground settles and the panels begin to sink or buckle. Prolonged exposure to moisture and freeze/ thaw cycles contribute to further deterioration that is evident today. Once a fracture occurs either on the post or panels, the rate of deterioration increases exponentially rendering the sound wall structurally compromised.

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Since 2017, comprehensive visual condition surveys identified several locations past their useful design life where visible deterioration has occurred. The City has accepted a level of risk due to the shortage of capital funds and some walls have deteriorated faster than expected.

Of the 95 km of sound attenuation walls in the network:

- 53 km are in good condition
- 42 km are in fair condition (but have exceeded design/service life)
- 1.7 km are in poor/critical condition.

### **Lifecycle Replacement Strategy**

Most sound wall lifecycle repair projects utilize the original location requiring little to no deviation in the original alignment. Coordination with planning groups to determine future noise forecasts is considered to design the wall at the appropriate height. In terms of the maintenance strategy, the service life of sound walls is used as a planning tool and a higher level of risk is accepted once the typical service life has passed. In some instances, critical condition is reached as a result of premature failure due to environmental factors or external damage.

The One Calgary Budget Cycle 2019-2022 allocated funding for performing lifecycle replacement of sound walls of which 3 km were rated in poor/critical condition prior to 2019. The total budget approved was \$1.98 million. These capital funds were almost entirely expended in 2019/2020 by replacing approximately 1.3 km of sound wall with a new design service life over 50 years. 1.7 km of sound walls in the network remain in very poor/critical condition.

## **STAKEHOLDER ENGAGEMENT AND COMMUNICATION (EXTERNAL)**

- Public Engagement was undertaken
- Public Communication or Engagement was not required
- Public/Stakeholders were informed
- Stakeholder or customer dialogue/relations were undertaken

Through 3-1-1 service requests from citizens and community associations, concerns have been expressed regarding the condition and state of the sound walls in various communities city-wide. The City has been communicating regularly with adjacent community associations and ward offices relating to the timing of planned removals.

## **IMPLICATIONS**

### **Social**

Sound walls provide value for a variety of stakeholders such as adjacent residents, the general public, City Business Units, Calgary Police Service, Utility Providers and Developers. Although the primary function of a sound wall is to mitigate noise caused by adjacent traffic, it also provides a secondary benefit of separation and blocking visible traffic.

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### **Environmental**

The City of Calgary has been actively participating in exploring innovative ideas with regards to sound attenuation wall design and construction along with more environmentally friendly materials (i.e. solar panel integrated sound walls, composite and alternative materials).

### **Economic**

Work is underway to integrate sound wall data into the City's new Bridge Management System as an engineered structure to assist with future lifecycle maintenance and budget forecasting. The intent is to find efficiencies and to maximize effectiveness that would ultimately equate to increased longevity and performance of the asset.

### **Service and Financial Implications**

New capital funding request

\$4.0M

The recommended \$4.0 million in one-time funding from the Lifecycle Maintenance and Upgrade Reserve (LMUR) will be used to repair approximately 1.7 km of sound walls. Unit rates for these projects are typically dependent on the total scope of the repair program. A larger work program will likely result in more competitive market pricing allowing The City to complete more repairs.

### **RISK**

The City adopts a risk-informed and evidence-based approach of managing infrastructure risks. Sound wall risks are identified and assessed regularly. Risk treatments are applied to minimize the infrastructure risks based on available resources.

**Public Safety:** Sound wall panels that have deteriorated significantly pose a potential safety risk and can impact adjacent road users, pedestrians and cyclists.

**Budget Impact:** These capital investments will address the remaining sound walls in poor condition. As an interim measure, expenditures to conduct sound wall repairs will need to be re-allocated from other operating programs and services. Due to other competing infrastructure needs, funding within existing maintenance programs is limited. Funding from other sources and stimulus programs has been submitted but did not receive approval.

**Reputational:** Lack of action to adequately address documented safety issues may expose the City of Calgary to potential liability or reputational risk and this is mitigated through a detailed inspection program.

### **ATTACHMENT(S)**

1. TP003 Surface Transportation Noise Policy
2. Sound Wall Condition Report

#### Department Circulation

General Manager	Department	Approve/Consult/Inform
Doug Morgan	Transportation	Approve