| Director | Municipal Manager/Deputy Municipal Manager |
|---|---|

| COUNCIL AGENDA | |
|---|---|
| Date: July 7, 2025 | Item: 7. |

7.

DISTRICT OF WEST VANCOUVER
750 17TH STREET, WEST VANCOUVER BC V7V 3T3

# COUNCIL REPORT

| | |
|---|---|
| Date: | June 23, 2025 |
| From: | Sean O'Sullivan, Senior Manager, Roads & Transportation<br>Dave Choo, Transportation Technologist |
| Subject: | Nelson Canyon Bridge Update |
| File: | 1700.09 |

## RECOMMENDATION

THAT the Council report titled "Nelson Canyon Bridge Update" dated June 23, 2025, from the Senior Manager, Roads & Transportation and the Transportation Technologist, be received for information.

THAT staff be directed to proceed with the Nelson Canyon Bridge Project by moving forward with the following next steps:

1. pursue the renewal of Nelson Canyon Bridge, which includes a full-deck replacement, and seismic upgrades described in Option 1 of this report; and
2. staff report back to Council with refined cost funding options, a proposed project timeline, and detailed Class A cost estimate.

## 1.0 Purpose

The purpose of this report is to provide an update to Council based on previous direction regarding the Nelson Canyon Bridge. The report seeks Council direction to inform an approach for the future of the asset.

## 2.0 Legislation/Bylaw/Policy

The District applies the bridge engineering and construction specifications, standards and guidelines outlined by the Ministry of Transportation and Transit.

The District's Capital Asset Management Procedures No. 04-30-372, 2017, outlines the process to achieve effective ongoing management and planning for the District's capital assets.

## 3.0 Council Strategic Objective(s)/Official Community Plan

### *Council Strategic Plan*

Council's Strategic Plan (2024-2025) includes the following relevant Strategic Goals and Objectives:

- 4.0 Enhance the mobility within the community.
- 5.0 Deliver Municipal services efficiently.

### *Official Community Plan*

The Official Community Plan ("OCP"), Section 2.4, outlines a need to use existing road networks more efficiently and provide a range of safe and accessible transportation options within our community and across the region. The OCP seeks to enhance road network safety for all users.

## 4.0 Background

Constructed in 1956 by the Ministry of Transportation and Transit, the Nelson Canyon Bridge was built as part of the original Trans Canada Highway 1 alignment over Nelson Creek. In 1974, following the completion of the new highway, the District assumed ownership of the existing bridge due to the critical water transmission main that serves the western part of the District. The bridge has been closed to vehicular traffic for nearly 50 years and now forms part of the Trans Canada Trail. Findings from the previous inspections confirm that the bridge is no longer suitable for vehicular traffic due to ongoing deterioration of various components. According to the 2022 principal inspection report, the bridge is expected to reach its end of service life by 2031.

In order to assess current public usage, pedestrian traffic data was collected using an automatic counter between April 16 and 20, 2025. The data showed that there were 47 to 139 westbound pedestrians per day and 29 to 87 eastbound pedestrians per day. The usage is expected to increase during the peak summer months.

### 4.1 Previous Decisions

Council at its **February 24, 2025, regular meeting**, passed the following resolution:

THAT the Council report titled Nelson Canyon Bridge and 26th Street Pedestrian Bridge dated February 10, 2025, from the Senior Manager of Roads & Transportation and the Transportation Technologist, be received for information.

THAT staff be directed to proceed with the Nelson Canyon Bridge Project by moving forward with the following next steps:

1. pursue the renewal of Nelson Canyon Bridge, which includes both full-deck and half-deck replacement options, preventative fencing that may be required, and seismic upgrades described as Options 1 and 2 within the Council report titled Nelson Canyon Bridge and 26th Street Pedestrian Bridge dated February 10, 2025, from the Senior Manager of Roads & Transportation and the Transportation Technologist; and
2. staff report back to Council with an update on available funding mechanisms, a proposed project timeline, and detailed Class A cost estimate.

## 4.2 History

Historically, the transportation bridge-related program funding needs have been addressed through the annual capital budget. The budget funds the inspection, maintenance, and rehabilitation programs to ensure public safety, regulatory compliance and a planned approach to asset needs can be met.

The District's Bridge Asset Management Strategy was endorsed by Council in May 2024. The strategy was developed based on a 75- year structural design life, in accordance with the latest Canadian Highway Bridge Design Code. It outlines how the structures are inspected, maintained, and planned for rehabilitation or replacement.

The most recent principal inspection of the structure was conducted in 2022, and the following issues were identified.

- The bridge is estimated to reach its end of service life by 2031.
- The bridge received an urgency rating of 4 out of 5 according to the Ministry of Transportation Inspection Manual. This rating indicates that the structure requires moderate-priority structural repairs to remain in long-term service and has moderate safety concerns.
- The bridge currently has no seismic force-resisting features in place, and therefore, the structure is expected to perform poorly during a seismic event.

In 2022, following the principal inspection, the consultant proposed that the District review rehabilitation options focused on reducing the existing dead load and installing seismic resistance features to extend the bridge's useful life, which would minimize capital investments.

In 2024, the District retained engineering services from the consultant to continue with the preliminary design tasks, develop a Class C cost estimate, and develop a concept report with rendering images for the recommended options.

Following the February 2025 direction from Council, staff engaged the consultant to explore the alternative deck materials and assess the feasibility of the half-width deck option with the required protective fence system. The updated options study evaluation report is included as **Appendix A.**

## 5.0 Analysis

### 5.1 Discussion

Three options for the bridge were considered:

**Option 1** – Full-Deck Replacement and Seismic Upgrades
***(unchanged from previous report)***

This option removes the existing concrete deck and replaces it with a full 8-metre-wide timber deck. In addition, seismic rocking isolation features will be installed at the base of the foundations to address the seismic hazard. The existing watermain will be realigned to the centre of the deck under a protective bench . To retain the bridge's historical value, as well as to seek additional cost savings, the plan aims to reuse the existing steel railings.

The required capital budget (Class C) for this option is approximately **$1,500,000.**

**Option 2** – Partial Width Deck Replacement and Seismic Upgrades
***(updated from previous report)***

This option removes the existing concrete deck and replaces it with a 4-metre-wide timber deck. The new timber deck is on the south side of the bridge to minimize the impacts on the ocean view. While this option offers the most cost-effective approach, the steel floor beams that have been damaged and corroded will be visible on the north side, which raises various public safety risks. To address the risks, the installation of unique protective fencing is required. Three options for protective fencing are detailed below.

This option also includes installation of seismic rocking isolation features at the base of the foundations to address seismic hazard. The existing watermain will be located under a protective bench on the north side of the new 4 metre wide timber deck. To retain the bridge's historical value, as well as to seek additional cost savings, the plan includes reusing the existing steel railings.

The required capital budget (Class C) **without** a protective fence system is **$1,200,000**.

**Option 3** – New Bridge
***(unchanged from previous report)***

This option aims to build a new lightweight pedestrian bridge south of the existing bridge. The new bridge meets the latest seismic and structural standards. The original watermain will be decommissioned, and a new watermain will be installed beneath the deck. Once the new bridge is in service, the old bridge will be demolished and removed. While this option offers the longest desired service life, it also carries various risks, including but not limited to:

- environmental assessment, permitting, and monitoring;
- tree removals;
- archeological assessment;
- removal of the contaminated demolished structural components;
- construction access review; and
- third-party utility relocation.

The estimated required budget (Class C) for this option is **$4,300,000.**

Protective Fence System

With the Partial-Width Deck Replacement, option 2, the floor beams will be exposed on the north side of the Bridge. The beams are wide enough that people may try to walk on them. Recognizing the paramount concern for public safety, a protective fencing is required to meet the Duty and Standard of Care established by legislation. Accordingly, staff have been working with structural engineers to explore the constructability of the half-width deck option with a protective fence to meet the legislative thresholds.

The following three protective fence options were considered:

**Option A** - 1.8 metre tall reinforced chain-link fence with a 0.4 metre barbed-wire extension on top

The additional estimated budget (Class C) required for this option is **$100,000.**

*Figure 1 – **Option A** - chain-link fence with barbed wire on top*

**Option B** - A 1.8 metre tall durable expanded metal fence with a 0.4 metre barbed-wire extension on top.

The additional estimated budget (Class C) required for this option is **$200,000.**

*Figure 2 – **Option B** – expanded metal fence with barbed wire on top*

**Option C** - A 2.2 metre tall, specialized barrier, such as the one implemented on the Second Narrows Bridge

The additional estimated budget (Class C) required for this option is $300,000.

*Figure 3 – **Option C -** specialized barrier on Second Narrows Bridge*

The updated estimated budget required for the half-deck option **with a protective fence** range from **$1,300,000 to $1,500,000.**

Deck Material

Staff worked with structural engineers to explore alternative available deck materials identified previously (Glulam timber), to provide for enhanced durability and limited life-cycle concerns as raised by Council. In general, Glulam timber was selected as part of the original developed design concept because it delivers exceptional structural performance through strategically engineered laminations that distribute loads evenly while eliminating the weak points, as well as offering enhanced fire resistance compared to traditional lumber. Properly manufactured and installed Glulam can last for more than 50 years without requiring significant attention or replacement, unlike standard timber material. The prefabricated system also significantly reduces installation time and labour costs.

As an alternative deck material, composite fibre-reinforced polymer solution (Composite) was considered. The material offers several performance advantages, including a non-slip epoxy aggregate surface, durability against corrosion and degradation, and faster installation timeline. However, the anticipated cost increase, up to 3 times, installation

complexity, and load limitation make it a less effective solution as compared to the proposed Glulam option.

Summary

Staff recommend proceeding with a rehabilitation option, as the anticipated budget savings are approximately $3,000,000 compared to the replacement option. Staff considered two rehabilitation options:

**Option 1** – full-deck replacement and seismic upgrades

- no aesthetic issues caused by the visible corroded steel components and safety fence with barb wire not required
- reduces the progression of steel corrosion due to weather exposure
- reduces the need for maintenance or repair work on the exposed steel components due to exposure to weather and vandalism/graffiti
- no requirement for additional protective fence systems
- the retrofit option provides an estimated betterment translating to a minimum of 25-year design life
- properly maintained bridge may extend the useful life by up to 50 years, as a comparison, the design life of a new structure is 75 years
- during inspections, maintenance, and retrofit tasks bridge can be partially closed enabling pedestrian access during the work
- the full deck option costs approximately 7% more than option 2

**Option 2** – half deck replacement with 1.8 m expanded metal fence with a 0.4 m barbed-wire extension on top and seismic upgrades

- lower cost option, with approximately $100,000 in savings compared to Option 1
- the expanded metal fence offers enhanced durability against vandalism compared to the traditional chain-link fence
- the retrofit option provides an estimated betterment translating to a minimum of 25-year design life
- properly maintained bridge may extend the useful life by up to 50 years, as a comparison, the design life of a new structure is 75 years

## 6.0 Financial Implications

The required funding needs for the Nelson Canyon Bridge can be categorized as follows:

- **Option 1** - full-width timber deck replacement and seismic upgrades

  $**1,500,000**

- **Option 2** - with expanded metal fence - partial-width timber deck replacement with a 1.8 metre tall, expanded metal fence with a 0.4 metre barbed-wire extension on top seismic upgrades

  **$1,400,000**

- **Option 3** - new bridge

  **$4,300,000**

The budget for each option was prepared in accordance with the Class C requirements and includes engineering, construction, demolition, and contingency.

It is important to note that the consultant recommended accounting for a potential 30% increase to the base price for each option due to tariff implications.

### *Available Funding Sources*

Funding sources for renewal of the considered bridge assets outlined in this report is limited to the asset levy (general taxation) or unrestricted Community Amenity Contributions; to the extent the Nelson Canyon Bridge supports a critical water transmission line, funding contribution from the water utility could be considered.

Asset Management is a fundamental program related to the maintenance of District assets. As the owner of complex and costly infrastructure networks, the District has adopted a series of asset management plans for infrastructure within and making up its road network, including the Bridge Asset Management Plan endorsed by Council. The limited asset levy will support maintenance and replacement projects prioritized by condition and risk, as outlined in the asset management plans.

Due to the failure risk and the criticality of the water main, the Nelson Canyon Bridge rehabilitation is considered a high priority.

### 6.1 Climate Change & Sustainability

The Council's Strategic Plan supports the environment and climate change by protecting our natural environment, reduce greenhouse gas emissions, and adapt our community to become more resilient in a changing climate.

### 6.2 Public Engagement and Outreach

*Not* applicable.

## 7.0 Options

### 7.1 Recommended Option

THAT the Council report titled "Nelson Canyon Bridge Update" dated June 23, 2025, from the Senior Manager, Roads & Transportation and the Transportation Technologist, be received for information.

THAT staff be directed to proceed with the Nelson Canyon Bridge Project by moving forward with the following next steps:

1. pursue the renewal of Nelson Canyon Bridge, which includes a full-deck replacement, and seismic upgrades described in Option 1 of this report; and
2. staff report back to Council with refined cost funding options, a proposed project timeline, and detailed Class A cost estimate.

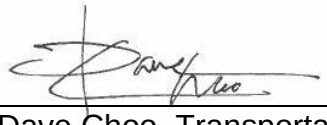
### 7.2 Considered Options

Council may request further information or provide alternate direction (to be specified).

## 8.0 Conclusion

This report considers and recommends renewal options for the Nelson Canyon Bridge structure that forms part of the Districts pedestrian network and water mainline support infrastructure. If a preferred option for the Nelson Canyon Bridge has been selected and approved, it will provide staff with direction to inform an approach for the future of the asset.

Sean O'Sullivan, Senior Manager, Roads &Transportation

Co-Author 

Dave Choo, Transportation Technologist

Appendices:

Appendix A: Options Study Evaluation Report – Nelson Canyon Bridge

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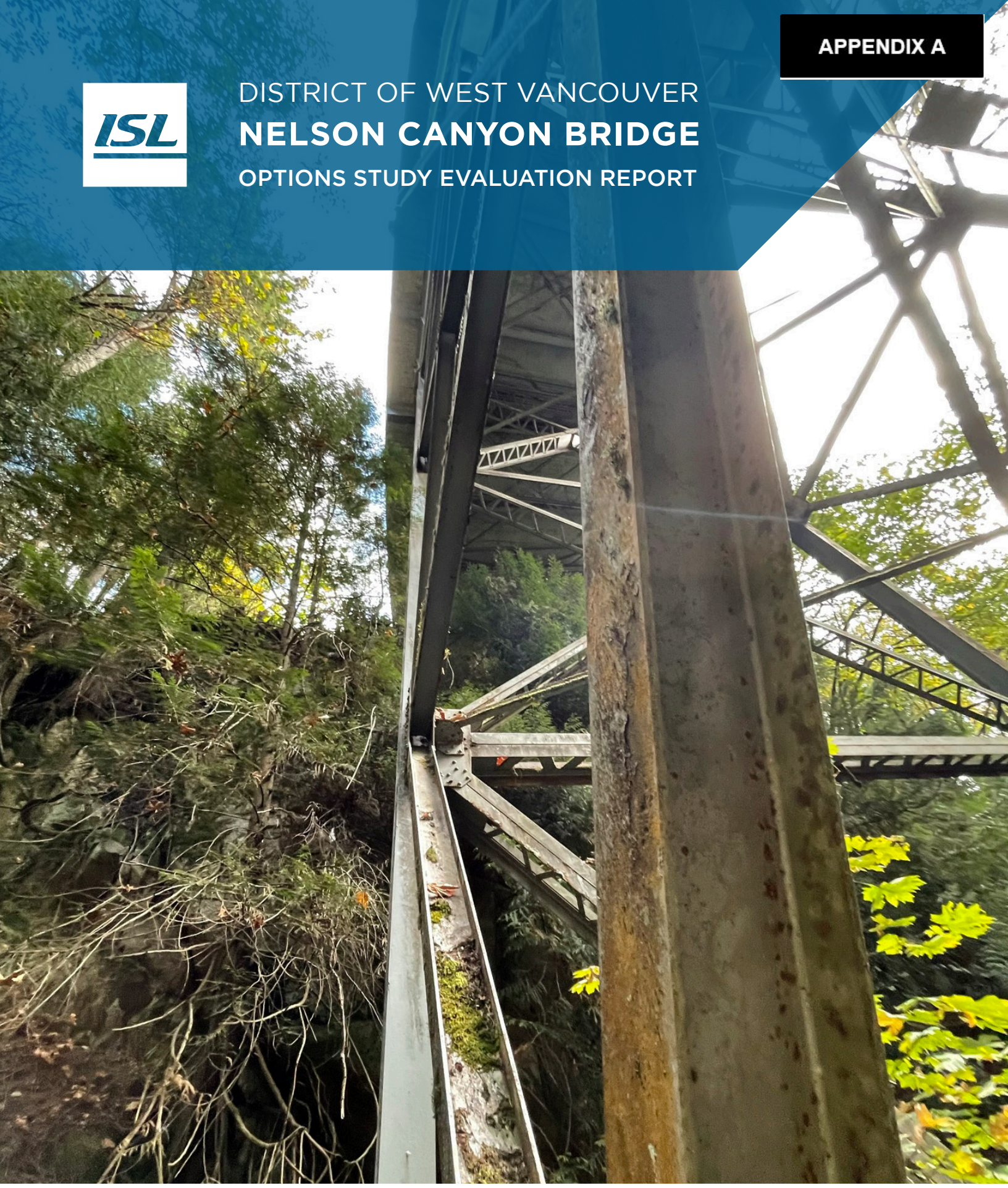
APPENDIX A

DISTRICT OF WEST VANCOUVER

# NELSON CANYON BRIDGE

## OPTIONS STUDY EVALUATION REPORT



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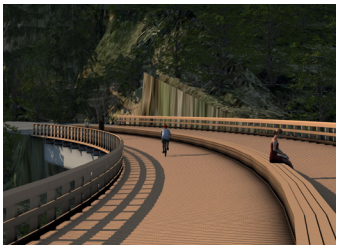
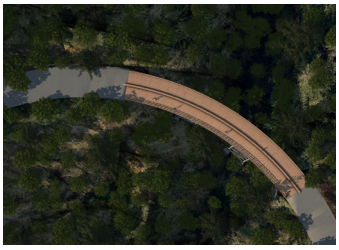
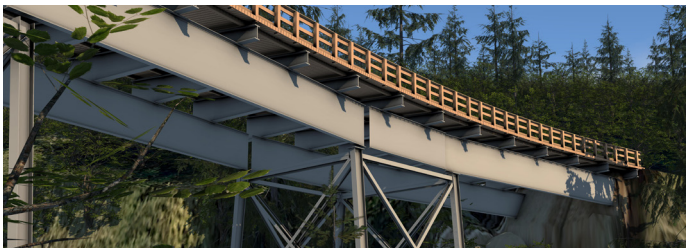






## Nelson Canyon Bridge

# Full-Width Timber Deck Replacement

### District of West Vancouver

**Scope of Work:**

- Replace concrete deck with a full-width 8 m timber deck.
- Implement seismic rocking isolation foundations.
- Recoat corroded floor beams and girder top flanges.
- Perform isolated seismic retrofit of vulnerable members.
- Realign the water main under a protective bench.
- Reuse existing railings.
- Estimated Capital Cost: $1,500,000 (incl. 20% contingency); please note that it is recommended to account for a potential 30% increase to the base price due to tariff implications.
- Estimated Annual Maintenance Costs: $15,000 (incl. deck washing, general upkeep, fastener replacement, and approach grading).

**Background:**

The Nelson Canyon Bridge, which supports a critical watermain for West Vancouver, is classified as a “lifeline structure” under the Canadian Highway Bridge Design Code CSA S6:2019 and the National Building Code of Canada 2020. The District of West Vancouver reviewed replacement and rehabilitation options in 2017 and 2019, but no preferred option was chosen due to the projected high capital costs. Inspections in October 2022 revealed structural issues, including deck delamination, spalling, cracking, steel corrosion, and seismic vulnerabilities that could compromise the watermain during an earthquake. Seismic analysis identified weaknesses in the substructure, and a geotechnical assessment highlighted the risk of an overhanging rock feature. A proposed seismic retrofit includes replacing the concrete deck with a lightweight timber alternative to reduce dead load and seismic stress. However, large tension demands at the pier pedestal foundations, with unknown bedrock connections, remain a concern. Seismic rocking isolation connections at the pier pedestals are recommended to protect these foundations. The full-width timber deck option is proposed for its seismic advantages, improved aesthetics, safety, and functionality.

## Engineered Deck System

### *Glulam Deck Panels*

Glulam deck panels were selected because it delivers exceptional structural performance through strategically engineered laminations that distribute loads evenly while eliminating the weak points common in traditional lumber. Properly manufactured and installed glulam can last for more than 50 years without requiring significant attention or replacement unlike standard timber decking. Its superior span capabilities and dimensional stability in varying environmental conditions make it ideal for pedestrian bridges, while the prefabricated panel system significantly reduces installation time and labor costs. The material’s inherent resistance to corrosion from de-icing agents, coupled with its renewable sourcing and reduced carbon footprint, creates a sustainable solution that balances environmental responsibility with long-term durability and minimal maintenance requirements.

### *Alternate Decking System - Composite Fiber-Reinforced Polymer (FRP) Solution*

As an alternative to glulam deck panels, high-performance Fiber-Reinforced Polymer (FRP) panels—manufactured by Creative Composites Group’s Dayton Molding Division and used on the Columbia River Skywalk Bridge in Trail, BC—offer several performance advantages, including a non-slip epoxy aggregate surface for improved safety, excellent durability against corrosion and environmental degradation, and faster installation timelines due to their prefabricated nature and minimal on-site labor requirements. However, glulam deck panels remain the more suitable option for most pedestrian bridge applications due to their significantly lower upfront cost—FRP panels can cost up to three times more—as well as their ability to accommodate variable deck geometry, facilitate drainage integration, and allow for straightforward handrail connections without the need for specialized attachment methods. Furthermore, glulam panels offer greater design flexibility and are better suited for scenarios requiring occasional vehicular access, such as emergency or maintenance vehicles, whereas FRP panels are limited in their load-bearing capacity. While FRP systems may offer long-term maintenance benefits, the higher capital cost, complexity of installation, and load limitations make glulam panels the more practical and cost-effective choice in the majority of applications.

### Risks and Feasibility:

- Elevated seismic hazard, tolerating 7% exceedance in a 50-year event.
- Increased lateral resistance from full-width deck.
- 25-year design life.
- Increased hydrotechnical risks reduce climatic resilience.
- Increased geotechnical risks reduce seismic resilience.
- Periodic re-decking adds maintenance costs.
- Improved safety as access prevention fencing is not required to block unauthorized entry to exposed floor beams.
- Greater water main realignment required.
- Improved bridge aesthetics.
- Bridge location retained to leverage canyon rock outcrops.
- Minimal environmental impact to surrounding area.

### Summary of Multiple Accounts Evaluation:

**Rating:**
1 - Poor
2 - Moderate
3 - Best

| Criteria | Weighting | Opt. 1 Full Deck | Opt. 2 Partial Deck | Opt.3 New Bridge |
|---|---|---|---|---|
| Hydrotechnical Performance | 10.00% | 1 | 1 | 3 |
| Geotechnical Performance | 5.00% | 1 | 2 | 3 |
| Engineering Cost | 5.00% | 2 | 3 | 1 |
| Construction Cost | 25.00% | 2 | 3 | 1 |
| Functionality & Aesthetics | 5.00% | 3 | 1 | 2 |
| Safety | 30.00% | 2 | 1 | 3 |
| Environmental | 5.00% | 2 | 3 | 1 |
| Constructability & Demolition | 10.00% | 3 | 3 | 1 |
| Schedule | 5.00% | 2 | 3 | 1 |
| **Total Score** | **100.00%** | **2.00** | **2.05** | **1.95** |

## Nelson Canyon Bridge

# Partial-Width Timber Deck Replacement

### District of West Vancouver

**Scope of Work:**

- Replace concrete deck with a partial-width 4 m timber deck.
- Implement seismic rocking isolation foundations.
- Recoat corroded floor beams and girder top flanges.
- Perform limited isolated seismic retrofit of vulnerable members.
- Realign the water main under a protective bench.
- Reuse existing railings.
- Estimated Capital Cost: $1,200,000 (Without Bridge Safety Barriers), $1,300,000 (Reinforced Chain-Link System), $1,400,000 (Durable Expanded Metal Barrier), $1,500,000 (Safety Prevention Barrier); please note that all expected capital costs include a 20% contingency, and it is recommended to account for a potential 30% increase to the base price due to tariff implications.
- Estimated Annual Maintenance Costs: $10,000 (incl. deck washing, general upkeep, fastener replacement, and approach grading).

**Background:**

The Nelson Canyon Bridge, a critical watermain support for West Vancouver, is classified as a “lifeline structure” under the Canadian Highway Bridge Design Code CSA S6:2019 and the National Building Code of Canada 2020. The District of West Vancouver reviewed replacement and rehabilitation options in 2017 and 2019, but no preferred option was chosen due to the projected high capital costs. Inspections in October 2022 revealed significant structural issues, including deck delamination, spalling, cracking, steel corrosion, and seismic vulnerabilities that could threaten the watermain during a major earthquake. Seismic analysis confirmed weaknesses in the substructure, while a geotechnical assessment identified additional risks from an overhanging rock feature on the canyon’s east slope. A seismic retrofit is proposed, replacing the concrete deck with a lightweight timber alternative to reduce dead load and stress on the substructure. Significant tension demands at the pier pedestals remain a concern due to unknown bedrock connections, with seismic rocking isolation foundations recommended to mitigate the risk. A partial-width timber deck is also considered for its reduced seismic retrofit requirements, cost-effectiveness, and easier construction.

## Engineered Deck System

### *Glulam Deck Panels*

Glulam deck panels were selected because it delivers exceptional structural performance through strategically engineered laminations that distribute loads evenly while eliminating the weak points common in traditional lumber. Properly manufactured and installed glulam can last for more than 50 years without requiring significant attention or replacement unlike standard timber decking. Its superior span capabilities and dimensional stability in varying environmental conditions make it ideal for pedestrian bridges, while the prefabricated panel system significantly reduces installation time and labor costs. The material’s inherent resistance to corrosion from de-icing agents, coupled with its renewable sourcing and reduced carbon footprint, creates a sustainable solution that balances environmental responsibility with long-term durability and minimal maintenance requirements.

### *Alternate Decking System - Composite Fiber-Reinforced Polymer (FRP) Solution*

As an alternative to glulam deck panels, high-performance Fiber-Reinforced Polymer (FRP) panels—manufactured by Creative Composites Group’s Dayton Molding Division and used on the Columbia River Skywalk Bridge in Trail, BC—offer several performance advantages, including a non-slip epoxy aggregate surface for improved safety, excellent durability against corrosion and environmental degradation, and faster installation timelines due to their prefabricated nature and minimal on-site labor requirements. However, glulam deck panels remain the more suitable option for most pedestrian bridge applications due to their significantly lower upfront cost—FRP panels can cost up to three times more—as well as their ability to accommodate variable deck geometry, facilitate drainage integration, and allow for straightforward handrail connections without the need for specialized attachment methods. Furthermore, glulam panels offer greater design flexibility and are better suited for scenarios requiring occasional vehicular access, such as emergency or maintenance vehicles, whereas FRP panels are limited in their load-bearing capacity. While FRP systems may offer long-term maintenance benefits, the higher capital cost, complexity of installation, and load limitations make glulam panels the more practical and cost-effective choice in the majority of applications.

**Risks and Feasibility:**

- Elevated seismic hazard, tolerating 7% exceedance in a 50-year event.
- 25-year design life.
- Increased hydrotechnical risks reduce climatic resilience.
- Increased geotechnical risks reduce seismic resilience.
- Periodic re-decking adds maintenance costs.
- An access prevention fencing system is required to prevent unauthorized access to exposed floor beams.
- Shortened construction window.
- Greater water main realignment required.
- Improved bridge aesthetics.
- Bridge location retained to leverage canyon rock outcrops.
- Minimal environmental impact to surrounding area.

**Summary of Multiple Accounts Evaluation:**

**Rating:**
1 - Poor
2 - Moderate
3 - Best

| Criteria | Weighting | Opt. 1 Full Deck | Opt. 2 Partial Deck | Opt.3 New Bridge |
|---|---|---|---|---|
| Hydrotechnical Performance | 10.00% | 1 | **1** | 3 |
| Geotechnical Performance | 5.00% | 1 | **2** | 3 |
| Engineering Cost | 5.00% | 2 | **3** | 1 |
| Construction Cost | 25.00% | 2 | **3** | 1 |
| Functionality & Aesthetics | 5.00% | 3 | **1** | 2 |
| Safety | 30.00% | 2 | **1** | 3 |
| Environmental | 5.00% | 2 | **3** | 1 |
| Constructability & Demolition | 10.00% | 3 | **3** | 1 |
| Schedule | 5.00% | 2 | **3** | 1 |
| **Total Score** | **100.00%** | **2.00** | **2.05** | **1.95** |

***Bridge Safety Barriers***

Due to the presence of exposed floorbeams, safety barriers are required. To address this, we have developed three protective barrier options—ranked in order of increasing cost—each offering varying levels of protection and serving as a visual and physical deterrent to prevent access to unsafe areas above the exposed floorbeams.

1. Reinforced Chain-Link System - 1.8-meter tall chain-link fence with 0.4-meter barbed-wire extension, creating an effective 2.2-meter (material & construction: ~ $600 per lineal meter)

2. Durable Expanded Metal Barrier - 1.8-meter tall expanded metal fencing complemented by 0.4-meter barbed-wire extension, providing a robust 2.2-meter (material & construction: ~ $1000 per lineal meter)

3. Safety Prevention Barrier - 2.2-meter tall specialized barrier such as the one implemented on the Second Narrows Bridge (material & construction: ~ $1600 per lineal meter)

*Photo: Expanded Metal Security Fence | Boegger*

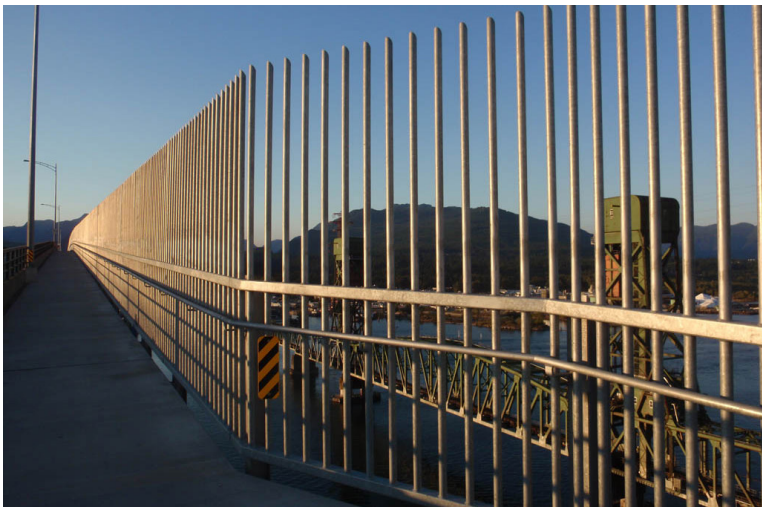
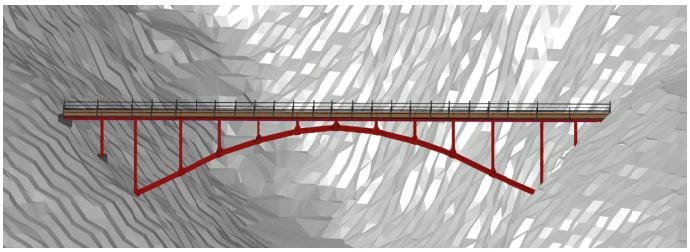


*Photo: Second Narrows Bridge Ironworker railing | www.nsnews.com*



## Nelson Canyon Bridge

# New Bridge

### District of West Vancouver

**Scope of Work:**

- Install an all-timber or hybrid steel-timber new bridge.
- Optimize bridge alignment and water main layout.
- Regrade bridge approaches for better access.
- Clearing limited area of forest near the structure for bridge re-alignment.
- Estimated Capital Cost: $4,300,000 (incl. 20% contingency); please note that it is recommended to account for a potential 30% increase to the base price due to tariff implications.
- Estimated Annual Maintenance Costs: $20,000 (incl. deck washing, general upkeep, fastener replacement, substructure cleaning, and approach grading).

**Rating:**

1 - Poor

2 - Moderate

3 - Best

**Background:**

The Nelson Canyon Bridge, a critical watermain support for West Vancouver, is classified as a “lifeline structure” under the Canadian Highway Bridge Design Code CSA S6:2019 and the National Building Code of Canada 2020. The District of West Vancouver reviewed replacement and rehabilitation options in 2017 and 2019, but no preferred option was chosen due to the projected high capital costs. Inspections in October 2022 revealed structural issues, including deck delamination, spalling, cracking, steel corrosion, and seismic vulnerabilities that could compromise the watermain during a major earthquake. Seismic analysis identified weaknesses in the substructure, while a geotechnical assessment noted risks from an overhanging rock feature. A proposed full replacement encompasses a single-span 55-meter glulam underdeck arch bridge, positioned 5 meters downstream and below the current deck. Treated with CCA/CZA, the glulam arch offers a 50-year design life, low carbon footprint, and can be designed for improved hyrotechical performance beneficial for fish habitats and climatic resiliency. The design would meet modern seismic standards, address existing structural vulnerabilities, and require minimal maintenance.

**Risks and Feasibility:**

- Designed to withstand a 2% probability of exceedance in a 50-year seismic event with minimal service interruption and repairable damage.
- 50-year design life.
- Improved hydrotechnical performance and geotechnical performance.
- Periodic re-decking adds maintenance costs.
- Enhanced user safety
- Extended construction window.
- Improved aesthetics.
- Water main realignment.
- Significant material and construction costs for a new structure.
- Demolition of the existing bridge not included, posing potential hazards.
- Potential relocation of the new bridge downstream.
- High probability for unknown risks associated with new construction, including addressing slope instability concerns, environmental permitting, third-party utility relocation, and archaeological assessments, all of which could lead to delays and increased costs.

**Summary of Multiple Accounts Evaluation:**

| Criteria | Weighting | Opt. 1 Full Deck | Opt. 2 Partial Deck | Opt.3 New Bridge |
|---|---|---|---|---|
| Hydrotechnical Performance | 10.00% | 1 | 1 | **3** |
| Geotechnical Performance | 5.00% | 1 | 2 | **3** |
| Engineering Cost | 5.00% | 2 | 3 | **1** |
| Construction Cost | 25.00% | 2 | 3 | **1** |
| Functionality & Aesthetics | 5.00% | 3 | 1 | **2** |
| Safety | 30.00% | 2 | 1 | **3** |
| Environmental | 5.00% | 2 | 3 | **1** |
| Constructability & Demolition | 10.00% | 3 | 3 | **1** |
| Schedule | 5.00% | 2 | 3 | **1** |
| **Total Score** | **100.00%** | **2.00** | **2.05** | **1.95** |