Director	Municipal Manager/Deputy Municipal Manager

COUNCIL AGENDA

Date: February 24, 2025 Item: 4.

4.

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

COUNCIL REPORT

Date:	February 10, 2025
From:	Sean O'Sullivan, Senior Manager, Roads & Transportation Dave Choo, Transportation Technologist
Subject:	Nelson Canyon Bridge and 26th Street Pedestrian Bridge
File:	1700.09

RECOMMENDATION

THAT the Council report titled "Nelson Canyon Bridge and 26th Street Pedestrian Bridge" dated February 10, 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 as Option 1 within the Council report titled "Nelson Canyon Bridge and 26th Street Pedestrian Bridge" dated February 10, 2025, from the Senior Manager, 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.

THAT staff be directed to proceed with the 26th Street Pedestrian Bridge Project by moving forward with the following next steps:

1. pursue the demolition of the existing structure, formalizing the alternative crossing points at 25th and 27th Streets; and
2. staff report back to Council with an update on available funding mechanisms, 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 regarding two major bridge structures within the District: the Nelson Canyon Bridge and the 26th Street Pedestrian Bridge. The report seeks Council direction to inform an approach for the future of the assets.

2.0 Executive Summary

Nelson Canyon Bridge

The original 80 metre long Nelson Canyon Bridge over Nelson Creek was constructed in 1956. When the Trans Canada Highway was constructed the highway was shifted south and the bridge was given to the District of West Vancouver. The bridge is now part of Trans Canada Trail network and carries a critical water transmission main that serves the western part of the District. According to the 2022 principal structural inspection report, the bridge is expected to reach end of its service life by 2031.

Since 2017, the staff have worked with various consultants to assess the structure's condition and review options to maintain its serviceability. The estimated capital budget required to renew the structure ranges from $1,200,000 to $4,300,000.

26th St Pedestrian Bridge

Constructed in 1937 by the District, the timber pedestrian bridge is located at the base of 26th Street, adjacent to Bellevue Avenue, and provides pedestrian access over the CN Rail track.

The District retained Professional Engineers to conduct the principal structural inspection in July 2024. According to the inspection report, various timber components have sustained advanced decay and are no longer considered reliable for any loads. Due to the identified safety issues, the bridge has been closed to the public since August 2024.

Staff have been working with a consultant and CN Rail to assess the engineering requirements of the rehabilitation, demolition, and replacement work. The capital budget requirement for the demolition portion is approximately $100,000, and the capital budget requirement for a replacement ranges from $500,000 to $2,000,000. Because of the advanced deterioration of the bridge structure, it was determined that rehabilitation of the existing bridge is not financially or technically viable.

3.0 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.

4.0 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.

5.0 Background

Nelson Canyon Bridge

Constructed in 1956 by the Ministry of Transportation and Transit, the Nelson Canyon Bridge was built on Trans Canada Highway 1 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 service life by 2031.

26th Street Pedestrian Bridge

Constructed in 1937 by the District, the timber pedestrian bridge is located at the base of 26th Street adjacent to Bellevue Avenue and provides only pedestrian access over the CN rail track. The bridge has been closed to the public since August 2024 due to the safety concerns identified during the principal inspection. Prior to the bridge closure, staff used an automatic counter to count how many pedestrians crossed the bridge between August 7 and 12, 2024. The data showed that there were 20-25 northbound pedestrians per day and 25 to 45 southbound pedestrians per day. No cyclists were observed during the data collection period.

5.1 Previous Decisions

Council at its **May 27, 2024, regular meeting**, passed the following resolution:

THAT

1. the report dated May 1, 2024, titled "Bridge Asset Management Update" be received for information;
2. the bridge asset management strategy be endorsed by Council; and
3. transportation related major structure and bridge asset funding requirements continue to be funded through the annual capital budgeting process.

Asset Management Update

This report is part of the annual financial review cycle, involving the assessment of the District's asset management program, as well as the condition and maintenance needs of the capital assets owned by the District. The asset management program is conducted throughout the year and supports the annual capital planning process by helping to identify critical needs and supporting the process to prioritize requests within the District's limited capital investment funding. The 2024 update was reviewed with Finance & Audit Committee on February 10, 2024.

6.2 History

Historically, the transportation bridge-related program funding needs have been addressed through annual capital budget requests. The budget funds the inspection, maintenance, and rehabilitation programs to ensure public safety.

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 strategy follows the inspection guidelines outlined by the Ministry of Transportation and Transit:

Principal Inspection
Conducted every five years, the principal inspection requires a complete, detailed visual inspection where the entire structure is thoroughly inspected using whatever means of access may be required.

Routine Inspection
Occurs annually, the purpose of the routine inspection is to inspect all components that are readily accessible. It does not include those areas that require climbing, extension ladders, or other specialized equipment for access.

Nelson Canyon Bridge

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 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 expedited to perform poorly during seismic event.

The inspection report is included as **Appendix A**.

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 Class C cost estimate, and develop the concept report with rendering images for the recommended options. The report is included as **Appendix B.**

26th Street Pedestrian Bridge

The District retained a structural engineering consultant in 2024 to conduct a principal inspection in accordance with the Ministry of Transportation and Transit's guideline, and identified the following issues:

- advanced decay was observed in various components, especially in structural load-bearing members; and
- component deterioration through weathering was identified in several transverse deck planks, railing members, stair treads, and the cribbing at the north abutment, as well as at the bottom of the staircase at the south end.

Based on the structures condition findings, the consultant recommended closing the bridge as soon as possible.

The report is included as **Appendix C**.

Following the principal inspection, the District retained engineering services from the consultant to assess the Class D cost estimate for replacement and rehabilitation options. The memo is included as **Appendix D.**

6.0 Analysis

6.1 Discussion

Nelson Canyon Bridge

Since 2022, staff have been working with structural engineers to determine the best available and cost effective renewal options for the structure, with a focus on extending the existing structure's service life; three options were considered in detail:

Option 1 – full-deck replacement with seismic upgrades

This option aims to remove the existing concrete deck and replace 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 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 with seismic upgrades

This option aims to remove the existing concrete deck and replace it with a 4-metre-wide timber deck. The position of the new deck is located on the south side 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. This option also includes installation of seismic rocking isolation features at the base of the foundations to address the seismic hazard. The existing watermain will be realigned 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 $1,200,000.

Option 3 – new bridge

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

26th Street Pedestrian Bridge

According to the 2024 Principal Inspection Report, the bridge has no remaining service life due to its age and various structural issues. In turn, staff have been working with structural engineers to assess renewal options.

Option 1 – use of the alternative level crossing points

In this option the existing bridge will be removed entirely to address the known safety issues. Pedestrians will be permanently redirected to level crossings at 25th Street and 27th Street, approximately 250 metres east and west of the bridge site. The demolition work is expected to take approximately one week to complete, and will require minimum impacts on CN Rail, pedestrian, cyclist, and vehicular traffic.

The required capital budget (Class D) for this option is approximately $100,000.

Option 2 – full rehabilitation

Staff reviewed a full rehabilitation option to preserve the structure and its historical value. However, the findings from the principal inspection confirm that structural issues and decay are present throughout the entire structure. In addition, the existing location of the piles does not comply with the latest railway clearance requirements. Thus, the rehabilitation option is not considered financially or technically viable.

Option 3 – new bridge

This option aims to build a new pedestrian bridge to replace the existing one. The new bridge would meet the latest engineering standards.

The required capital budget for this option ranges from $500,000 for a simple prefabricated bridge, and up to $2,000,000 if specific material, design features, and accessibility requirements are needed. It is important to note that there are various construction constraints, such as narrow roadways, CN Rail traffic control, hydro lines and their poles, watermain lines, and fire hydrants. This option also includes removal of the existing bridge.

Summary

Nelson Canyon Bridge

Staff recommend proceeding with a retrofitting option as the best value compared to the new bridge option, as the anticipated budget savings are approximately $3,000,000. Staff recommend pursuing Option 1 – full-deck replacement with seismic upgrades for to the following reasons:

- no aesthetic issues caused by the visible corroded steel components;
- no requirement for additional safety netting or fencing systems;
- the retrofit option(s) provide an estimated betterment translating to a 25-year design life, a third of the projected useful life of a new structure; and
- easier to perform future inspections, maintenance, and retrofit tasks, as the work can be completed in stages, which enables maintenance of pedestrian access during the work.

26th Street Pedestrian Bridge

Staff recommend proceeding with demolition of the existing bridge and relying on the level grade crossings at 25th and 27th Streets for the following reasons:

- eliminating the bridge crossing does not impact the overall local pedestrian network access;
- due to the limited space available it may not be technically feasible to construct a bridge that complies with current accessibility guidelines or accommodates cyclists;
- limited usage data suggests the asset was a low use asset; and
- changes with railway design criteria will drive a larger bridge footprint, introduce added constraints and design complexities and likely increase project costs.

7.0 Financial Implications

Nelson Canyon Bridge

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

- Option 1 - full-width timber deck replacement with seismic upgrades

  The anticipated required capital budget for this option is $1,500,000.

- Option 2 - partial-width timber deck replacement with seismic upgrades

  The anticipated required capital budget for this option is $1,200,000.

- Option 3 - new bridge

  The anticipated required capital budget for this option is $4,300,000.

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

26th Street Pedestrian Bridge

The required funding needs for the 26th St Pedestrian Bridge can be categorized as follows:

- Option 1– use of level crossings

  The anticipated required capital budget is approximately $100,000 for bridge demolition.

- Option 2 – full rehabilitation

  Not viable.

- Option 3 - new bridge

  The anticipated required capital budget ranges from $500,000 to $2,000,000, depending on the material, fabrication method, engineering, and accessibility requirements.

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

7.1 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.

7.2 Public Engagement and Outreach

Nelson Canyon Bridge - Not applicable.

26th Street Pedestrian Bridge

Letters were sent to the residents within one block of the bridge, and closure notification signs were installed, directing the public to contact the Engineering Department for more information.

8.0 Options

8.1 Recommended Option

THAT the Council report titled "Nelson Canyon Bridge and 26th Street Pedestrian Bridge" dated February 10, 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 as Option 1 within the Council report titled "Nelson Canyon Bridge and 26th Street Pedestrian Bridge" dated February 10, 2025, from the Senior Manager, 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.

THAT staff be directed to proceed with the 26th Street Pedestrian Bridge Project by moving forward with the following next steps:

1. pursue the demolition of the existing structure, formalizing the alternative crossing points at 25th and 27th Streets; and
2. staff report back to Council with an update on available funding mechanisms, a proposed project timeline, and detailed Class A cost estimate.

8.2 Considered Options

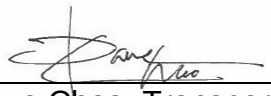
Council may request further information or provide alternate direction (to be specified).

9.0 Conclusion

This report considers and recommends renewal options for two major bridge structures that form part of the Districts pedestrian network. If a preferred option for the Nelson Canyon Bridge and the 26th Street Pedestrian Bridge has been selected and approved, it will provide staff with direction to inform an approach for the future of the two assets.

Author: 

Sean O'Sullivan, Senior Manager, Roads &Transportation

Co-Author 

Dave Choo, Transportation Technologist

Appendices:

Appendix A: 2022 Principal Inspection Report – Nelson Canyon Bridge
Appendix B: 2025 Concept Report – Nelson Canyon Bridge
Appendix C: 2024 26th Street Pedestrian Bridge Detailed Bridge Inspection Findings
Appendix D: 2024 Memorandum - 26th Street Pedestrian Bridge - Options

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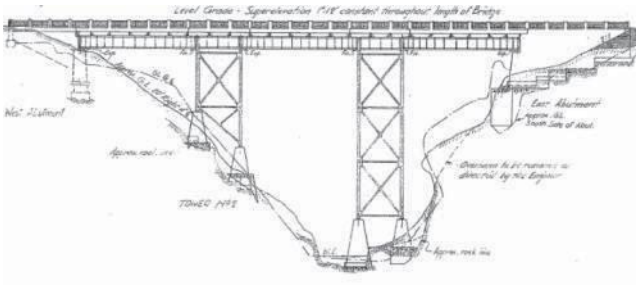
STRUCTURE ID: 106 – NELSON CANYON OVER NELSON CREEK **DATE:** 10/05/2022

DESCRIPTION



CONSTRUCTION DATE:	1956	
BRIDGE ORIENTATION:	East-West	
FEATURE SUPPORTED:	Marine Drive	
FEATURE CROSSED:	Cypress Creek	
SUBSTRUCTURE:	Abutments - Spread Footings on bedrock Pier Towers – Concrete pedestals on bedrock	
SUPERSTRUCTURE:	Riveted steel plate girders & floor beams, with lateral bracing and composite concrete	
WEARING SURFACE:	Concrete	
APPROACHES:	Bridge is superelevated and curved on an old alignment of Hwy 1	
GENERAL:	SPANS:	3-span: 12.9m, 24.3m, 21.9m
	TOTAL LENGTH:	68.0m
	DECK AREA:	656m^2
	BEARINGS:	Steel
	BANK/PIER PROTECTION:	Spill through abutments
	GUARDRAIL:	Concrete/steel
	CURB:	Concrete
	UTILITIES	Watermain (on bridge deck)
	CLEARANCE:	30m to girder soffit
	ROADWAY CLASS:	Closed to vehicle traffic
	SIGNAGE:	None
SEISMIC ASSESSMENT:	None	
DIAGNOSTIC TESTING/STUDY:	2017: Lifecycle Study 2019: Bridge Feasibility Study 2021: Load Rating for Film 2022: All-Span Bridge Assessment	
PAST REHABILITATION WORKS:	2016: Delaminated Concrete Removal 2018: RFP for Design-Build: Demolition & Replacement	

OVERALL CONDITION:	Poor-Fair Condition – Urgency Rating = 4
ESTIMATED REMAINING SERVICE LIFE:	9 yr (based on original construction date and inspection findings)
RECOMMENDED UPGRADE LIFE CYCLE TIMELINE:	1. Potential Concrete Deck Removal and Replacement with Lighter Structure (<5 yr) 2. Potential Rehabilitate and Recoat Highly-Corroded Elements (<5 yr) 3. Potential Retrofit of Select Bridge Components (<5 yr) 4. Potential Replacement of Bridge (<5 yr)
FIVE-YEAR REMEDIATION AND REHABILITATION PROGRAM:	1. Load Rating Analysis Study (~$30,000) 2. Seismic Assessment Study (~$125,000) 3. Retrofit Options Study (~$125,000)
RECOMMENDED INSPECTION FREQUENCY:	Monitoring Inspection Frequency: 1 / year Principal Inspection Frequency: 1 / 2 years
ANNUAL ROUTINE MAINTENANCE PROGRAM:	1. Monitoring Inspection (~$500; no associated specification). 2. Clean Gutters (~$1,000; no associated specification). 3. Clean Vegetation from Deck Overhangs (~$2,000; no associated specification). 4. Reseal Deck Joints ($2,000; MoTI 2020 Standard Specifications for Highway Construction Volume 1, Cl. 413.32.06b) 5. Clean Debris from Bearing Areas and Horizontal Non-Free-Draining Members (~$6,000; no associated specification). 6. Touch-Up Coating of Galvanized Steel Railings (~$1,000; BC MoTI 2020 Standard Specifications for Highway Construction Volume 1, Cl. 216.12.05a and SS 308 using corresponding BC MoTI Recognized Products List suppliers). 7. Tighten Loose Railing Bolts to Snug-Tight Condition, As Needed. 8. Remove Debris from Channel Under Bridge (~$1,500; no associated specification).

BRIDGE CONDITION INSPECTION

Inspection Type: ☐ Routine ☐ Partial ☑ Detailed

Structure Number	Structure Name	Inspection Date (yyyy/mm/dd)
106	Nelson Canyon over Nelson Creek	10/5/2022

	COMPONENT	E	G	F	P	V	X	N	CU	INSPECTION NOTES BY COMPONENT
	HYDROTECHNICAL									
1	Debris Risk			100					R	East pier pedestals are directly in hydraulic channel causing moderate debris accumulation.
2	Channel			70	30				R	Steep embankments founded on bedrock outcrops with loose topsoil. Skewed channel upstream obstructed by riprap and east pier. Bed levels appear stable.
3	Erosion Protection		50	50					R	Isolated areas of bank erosion.
4	Substructure Scour			100					R	Scour in between east pier pedestals has formed a pool approximately 1m deep at low flows.
	SUBSTRUCTURE									
5	Foundation Movement		70	30					R	Crack in concrete at southeast backwall of east abutment indicates minor settlement of abutment towards southwest direction.
6	Abutments		60	40					3	Light to medium scaling; medium sized cracks with prevalent hairline cracks.
7	Wing/Retaining Walls			50	30	20			2	Widespread efflorescence and cracking (medium to wide) at East abutment wing walls and West abutment. Exposed reinforcing and concrete void at West abutment side wall.
8	Embankment			50	50				R	Some undermining of footings due to erosion. Erosion contributing to exposure of bottoms of footings at west pier and abutment.
9	Footings/Piling			20	80				2	Widespread efflorescence and prevalent cracking of concrete pedestals and footings. Exposed reinforcing at west abutment.
10	Pier Columns/Walls/Cribs			70	20	10			4	Light corrosion with no noticable section loss on most elements. Localized section loss at northwest column base of West pier. Debris accumulation in pier column bracing.
11	Bearings			40	60				3	Medium or heavy corrosion of the exposed steel surfaces.
12	Caps			50	50				3	Exposed reinforcing at west abutment jump span cap beam.
13	Corbels			40	60				3	Widespread efflorescence, cracking, and exposed reinforcing at west abutment corbels.
14	Dolphins/Fenders							N		
	SUPERSTRUCTURE									
15	Floor Beams/Transoms			20	40	30	10		4	Floor beam sections along south profile at expansion joint locatins have heavy corrosion with occasional full-section loss pockets. Uniform corrosion are persistent on top and bottom flanges.
16	Stringers							N		
17	Girders			50	40	10			4	South girder has sections of heavy corrosion with significant delamination of top and bottom flanges.
18	Portals							N		
19	Bracing/Diaphragms			70	20	10			1	Diaphragms have light corrosion but in good condition overall. &nee braces for floor beams have have heavy corrosion with complete section loss at two locations along south profile.
20	Truss Chords/Arch Ribs			80	20				1	Moderate corrosion on most pier truss components, but significant for horizontal members.
21	Arch Ties							N		
22	Truss Diagonals			80	20				1	Light to medium corrosion of pier truss components.
23	Truss Rods/ Verticals			80	20				1	Light to medium corrosion of pier truss components.
24	Cables							N		
25	Panels							N		
26	Pins/Bolts/Rivets			35	50	15			4	Complete section loss of some rivets due to corrosion along top flange sections.
27	Camber/Sag			100						No significant superstructure camber issues.
28	Live Load Vibration			100						No significant live load vibration issues, although no active traffic crossing during inspection.
29	Coating (structure)			60	40					Advanced deterioration at several locations specfically along south profile floorbeams..
	DECK									
30	Sub Deck/Cross Ties			40	40	20		N	3	Spalling, cracking with exposed reinforcing at spot locations along deck soffit including large section of exposed reinforcing at midspan.
31	Wearing Surface			80	20				1	Minor cracking at localized areas on bridge deck. Wearing surface is in good condition overall.
32	Deck Joints		20	80					2	Cracking and spalling around deck joints. Incidences of joint misalignment.
33	Curbs/Wheelguards			80	20				2	Spalling and exposed reinforcing at localized sections of curb adjacent to deck drain locations on south profile.
34	Sidewalk(s)							N		
35	Railings/Parapets			80	20				1	
36	Median Barrier		80	20					R	
37	Drains/Pipes			100					R	
38	Coating (Railings)			50	50				R	
	APPROACHES									
39	Signing/Lighting							N		
40	Roadway Approaches			100						
41	Roadway Flares			100						

Conditions Codes			
E	Excellent	V	Very Poor
G	Good	X	Not Inspected
F	Fair	N	Not Applicable
P	Poor		

For Condition Guidelines see BMIS User Manual 15.2.2.

Urgency Rating

4

For definition see BMIS User Manual 15.2.8
"4" and "5" rating must be explained.

Brook Robazza PhD, PEng, PE, Jesse Gallop MEng, EIT
Inspector(s) (please type or print)

Signature

Posted Weight Restriction *(print actual message on sign(s))*

No posted weight restrictions.

Other Posted Hazard Warning Signs

No signage at time of inspection (note that the inspection timing coincided with the filming of a TV show, so on-deck fencing and other signage may have been removed).

Drainage Area Description *(water level fluctuation, logging debris, etc.)*

Drainage area extends to Black Mountain, with sections of steep gradient, but the creek has low to moderate gradient at the bridge site.

Scour Notes

There is moderate scour evident in between the east pier pedestals, where a 1m scour hole has developed. The scour does not appear to be affecting the current bridge performance or functionality.

Rehab Work Notes

Due to the lifeline nature of the bridge (carries a watermain) and it's reduce functionality from it's original design, extensive rehabilitation may be required. This is likely best carried out following a special study to investigate the adequacy of the existing structure. During the inspection, it was identified that both the gravity and seismic load-carrying systems could be relieved of significant demands by removing the existing concrete deck (accounting for ~85% of the gravity and seismic mass) and replacing it with an economical partial-width timber deck that could accommodate both the watermain and pedestrian and maintenance vehicle traffic. The special study could be discretized into three separate studies: a load rating analysis; a seismic assessment; and a retrofit options study. Aside from potentially removing the concrete deck, other rehabilitation items that likely need to be addressed are the floorbeams under the expansion joints, the horizontal members of the pier trusses, and the connections from the pier legs to the spread footing pier pedestals.

Maintenance Work Notes

Clean gutters, deck surface, and deck overhangs of vegetation and general forest debris. Reseal deck joints across entire deck, with particular focus at floor beam expansion joint locations. Clean debris from bearing areas and horizontal pier truss members that are not free to drain water effectively. Remove any debris build-up around east pier legs.

Additional Partial Inspection Notes

Only general inspection completed.

Additional General Inspection Notes

Note that the inspection timing coincided with the filming of a TV show, which is evident in some of the photosheet photos. Overall, the bridge is in fair-poor condition, with the primary members of concern being the expansion joint floor beams and the horizontal members of the pier trusses. Local deterioration is prevalent at both abutments, in a manner that suggests that the articulation of the bridge is not functioning as intended, with horizontal cracking at the east abutment back wall indicating that deck is imparting large demands to its top. All of the expansion joints on the bridge are in poor condition, and appear to have led to the extensive corrosion of the underlying floorbeams. Floorbeams not under the expansion joints make up the majority of these members and they are in much better condition, except occasionally at the abandoned watermain connections along the south profile of the bridge. The south profile girder's top flanges have also experienced significant corrosion in the vicinity of the expansion joints. The truss pier members are in generally good-fair condition, except for where water was not free to drain due to debris accumulation. It is recommended that detailed inspections be carried out for all future load rating analyses to ensure the observed deterioration is adequately taken into account.

Additional Utility Concern Notes

The watermain on the deck is loosely supported on aging timber blocks. These appear to have shifted over time due to thermal expansion and contraction. As a result, the connections may be under stress; however, due to the extra length provided on the bridge deck, there is likely enough spatial freedom to maintain the flexibility required. The watermain does appear to be uninsulated, which may pose a risk during cold-weather events.

Additional Urgency Rating Notes

The structure is a lifeline structure due to the presence of the watermain on the deck and therefore it is important that this bridge does not become damaged to a degree that could interupt the watermain's function. The complexity, age, and local deterioration of the bridge elevates it's risk beyond a typical pedestrian-only bridge. Currently the load carrying capacity of the bridge is unknown, aside from some limited load rating analyses conducted for specific filming purposes. Typical pedestrian traffic is likely not going to overload the bridge in its current condition.

Seismic Vulnerability Notes

This complex structure was designed during a period when seismic demands were not well understood or necessarily directly accounted for, and this is evident in the detailing of the structure. There is no clear or robust seismic force-resisting structure currently in-place, and therefore the structure is expected to perform poorly during seismic loading. Potential retrofit options include removing the concrete deck to reduce seismic demands on the substructure and installing rocking foundations at the pier pedestal connections to further reduce demands to the foundations.

Brook Robazza, Jesse Gallop

Inspector(s) (please type or print)

s. 22(1)

Signature(s)

Brook Robazza

Professional Engineer (EoR) (please type or print)

s. 22(1)

Signature(s)

STRUCTURE ID: 106 – NELSON CANYON OVER NELSON CREEK **DATE:** 10/05/2022

GENERAL ARRANGEMENT

001. Upstream

002. Downstream

003. North Elevation

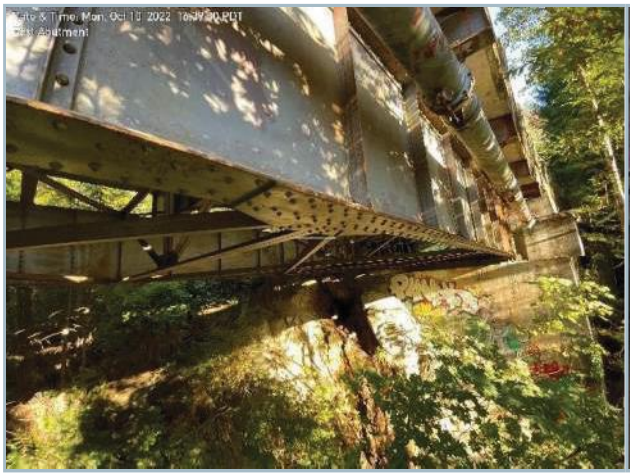
004. South Elevation (Note Existing Utility Pipe)

005. East Approach

006. West Approach

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

GENERAL ARRANGEMENT



007. East Abutment

008. West Abutment

009. West Pier Abutment

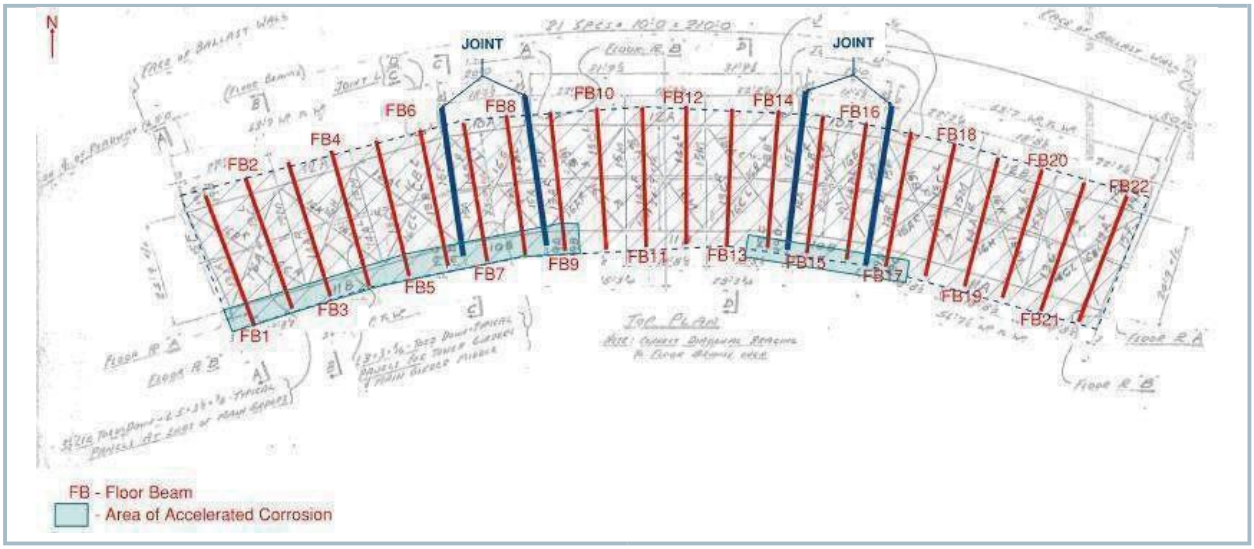
010. East Pier Abutment

011. Bridge Deck Viewing West

012. Bridge Soffit

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

GENERAL ARRANGEMENT



013. General Arrangement of Floor Beams

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

CONFIGURATION

014. Northeast Pier Pedestal at West End

015. Northwest Pier Pedestals at East End

016. Southeast Pier Pedestal at West End

017. Jump Span Cap Beam at West Abutment

18. Girder Connection to Accommodate Bridge Skew, Typ.

19. Pier Lateral Bracing Gusset Plate Connection, Typ.

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

CONFIGURATION

20. Northeast Pier Pedestal at West End

021. Northwest Pier Pedestals at East End

022. Pier Midspan Gusset Plate Connection, Typ.

023. Pier Corner Connection, Typ.

024. Plate Girder Lateral Bracing Connection

025. Pier Cross-bracing Connection, Typ.

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

CONFIGURATION

026. South Profile Parapet

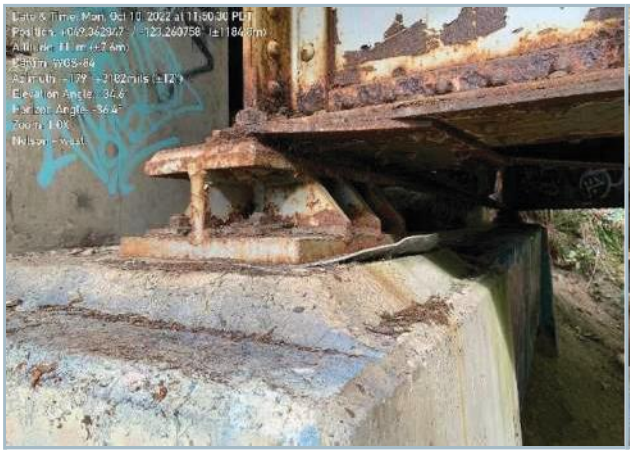
027. Expansion Joint Plate Detail, Typ.

028. Utility Power Line Viewing from East Abutment

029. Stormwater Outfall at North Section of East

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

SEISIMIC FORCE REISISTING SYSTEM



030. Anchored Bearing Plate Connection

031. Alternating Knee Bracing along South

32. Alternating Longitudinal Bracing Along North Profile, Typ.

33. Alternating Lateral Bracing, Typ.

34. Vertical Bracing over Pier Section, Typ.

035. Horizontal Cross-Bracing and Intermediate Vertical Lateral Bracing Elements, Typ.

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

NOTABLE DEFICIENCIES

36. Pitting Corrosion with ~3mm Section Loss at Bottom of Northeast Pier

37. Deposit Attack and Accumulation on Bottom Flange of South Girder, Typ. (Note: Deterioration of Rivets)

38. Accelerated Uniform Corrosion at Bottom Flange of Floor Beam 5

39. 3-5mm Section Loss on Bottom Flange of Floor Beam 9 (Note: Top Flange Corrosion, Typ.)

40. Accelerated Uniform Corrosion on Top Flange of Floor Beam 5, Typ.

41. 3-5 Section Loss at Bottom Flange of Floor Beam 5 Below Expansion Joint

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

NOTABLE DEFICIENCIES

42. Complete Section Loss at Floor Beam 7

043. Steel Delamination and Deposit Accumulation at South Girder, Typ.

044. Accelerated Uniform Corrosion at Bottom Flange of Floor Beam 6

045. 3-5mm Section Loss at Bottom Flange of Floor Beam 6

46. Top Flange Corrosion and Spalling of Deck Soffit at Floor Beam 14

47. Exposed Reinforcing Section of Deck Soffit at Floor Beam 15

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

NOTABLE DEFICIENCIES

48. South Girder Bottom Flange Corrosion, Typ.

049. Accelerated Corrosion and Deposit Attack on Floor Beam 2

50. 4mm Section Loss at Northwest Base of West Pier

51. Debris Accumulation at Pier Northwest Column Base of East Pier

52. Vegetation Growth on East Pier Connection, Typ.

053. Debris Accumulation on Pier Truss Elements of East Pier

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

NOTABLE DEFICIENCIES

054. Concrete Void at West Abutment South Side Wall

055. Exposed Reinforcing at South Wall of East Abutment

56. Exposed Reinforcing at South Section of West Abutment Side Wall

57. Concrete Spall and Exposed Reinforcing at Midspan of South Girder Profile

58. Localized Sections of Exposed Reinforcing at Midspan Along South Profile, Typ.

59. Extensive Efflorescence at Southeast Pedestal of West Pier

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

NOTABLE DEFICIENCIES

60. Efflorescence on Deck Soffit of West Abutment

061. Extensive Efflorescence at East Abutment Wing Wall

062. Extensive Cracking at East Abutment Side Wall

063. Cracking and Separation at Southeast Pedestal of West Pier, Typ.

64. Undermining and Aggregate Exposure East Abutment Wing Wall

65. Undermining and Aggregate Exposure West Abutment Wing Wall

STRUCTURE ID: 106 – NELSON CANYON **DATE:** 10/05/2022

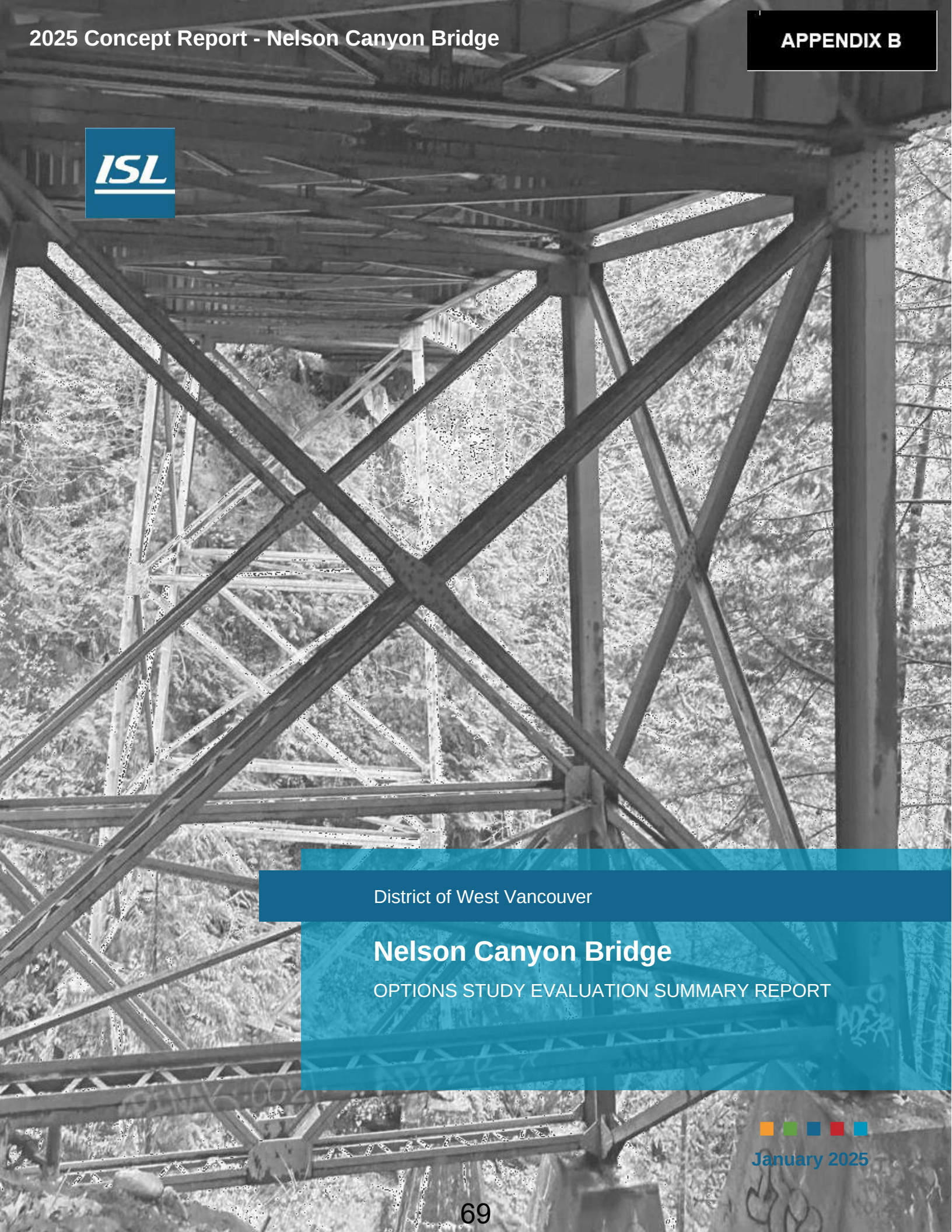
NOTABLE DEFICIENCIES

66. Cracking on Asphalt Wearing Surface at West Approach Deck Joint, Typ.

67. Localized Inconsequential Surface Corrosion on Northwest Railing, Typ.

68. Localized Exposed Reinforcing on Deck Parapet at Midspan

APPENDIX B



District of West Vancouver

Nelson Canyon Bridge

OPTIONS STUDY EVALUATION SUMMARY REPORT

January 2025

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 and anticipated demolition).
- Estimated Capital Cost.
- Estimated Annual Maintenance Costs: $15,000 (incl. deck washing, general upkeep, fastener replacement, and approach grading).

Rating:

1 - Poor

2 - Moderate

3 - Best

Background:

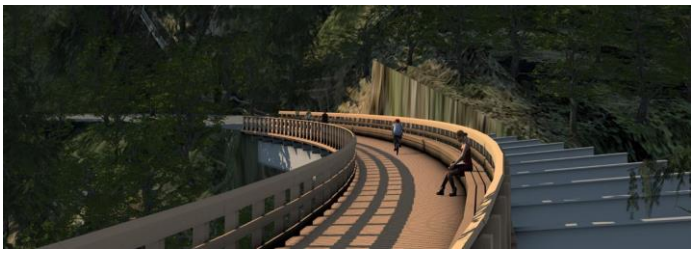
The Nelson Canyon Bridge, which supports a critical watermain for West Vancouver, is classified as a "lifeline structure" under the Canadian Highway Bridge Design Code CSA S6:2019 and the National Building Code of Canada 2020. The District of West Vancouver reviewed replacement and rehabilitation options 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.

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:

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: $1,5200,000 (incl. 20% contingency and anticipated demolition).
- 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.

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:

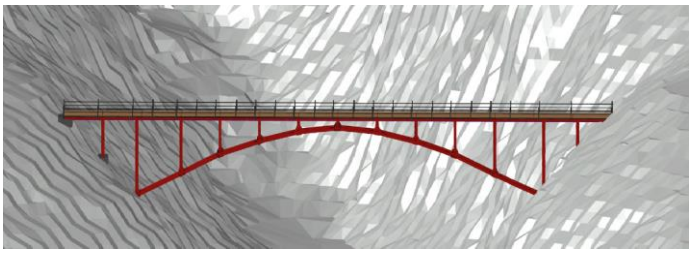
Criteria	Weighting	Opt. 1 Full Deck	Opt. 2 Partial Deck	Opt.3 New Bridge
Hydrotechnical Performance	10.00%	1	1	3
Geotechnical Performance	5.00%	1	2	3
Engineering Cost	5.00%	2	3	1
Construction Cost	25.00%	2	3	1
Functionality & Aesthetics	5.00%	3	1	2
Safety	30.00%	2	1	3
Environmental	5.00%	2	3	1
Constructability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

Rating:

1 - Poor

2 - Moderate

3 - Best



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: $4,3100,000 (incl. 20% contingency and anticipated demolition).
- Estimated Annual Maintenance Costs: $20,000 (incl. deck washing, general upkeep, fastener replacement, substructure cleaning, 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 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, included in the capital costs, may vary due to unforeseen 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:

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

TYLin

District of West Vancouver
3755 Cypress Bowl Road
West Vancouver, BC
V7S 3E7

2024 August 01

Attn: Mr. Dave Choo, Transportation Technologist

Subject: 26th Street Pedestrian Bridge – Detailed Bridge inspection findings

Mr. Choo,

TY Lin international Canada (TYLin) recently completed a detailed bridge inspection of the 26th Street Pedestrian Bridge across the CN rail tracks in West Vancouver, and this letter presents a summary of the inspection.

Description:

The 26th street pedestrian bridge is a 4 span timber structure constructed of creosote treated timbers. The bridge is supported on a timber cribbage abutment at its north end and four timber piers along its length. The south end of the bridge has a timber staircase connecting to Bellevue Avenue. For the purpose of this report, the piers are labelled Pier 0 through Pier 3 from north to south.

Pier 0 consists of two pier legs, each built up from two rectangular members, approximately 2" x 10" in size, topped with a cap beam consisting of 4 plys of 2x10 members. Transverse bracing member oriented in an X-shape with the bottom portion of the bracing members buried in soil are attached to the vertical members. Piers 1-3 consist of three timber piles topped with a single member timber cap beam. The outer piles at each pier are battered in the east west direction while the centre pile is vertical. X-shaped cross bracing and a horizontal member, located at approximately mid height of the piles provides bracing in the horizontal direction. Piers1 and 2 also contain timber braces in the north south direction that connect to the base of Pier 0 and Pier 3 respectively.

The bridge superstructure consists of three longitudinally oriented 6" x 12" timber stringers topped with transverse deck planks. A 3-rail timber railing runs along both sides of the deck and consists of a lower rail, mid-height rial and top rail. At the south end of the deck, the railing turns 90 degrees to the west and runs down along both sides of the approach stairway.

Findings:

TYLin

Elements of the 26th Street Pedestrian Bridge were found to range in condition from poor to good. Overall, the structure is considered to be in poor condition due to evidence of advanced decay in primary load carrying members.

Most significantly, sections of significant section loss were identified in multiple timber piles at all piers. At piers 1, 2 and 3, timber piles that were originally solid members now contain decay in the centres with sound material remaining only around the perimeter of the pile, effectively resulting in the member being a hollow tube. At Pier 0, advanced decay was identified in three of the members that make up the pier cap as well as the westernmost vertical member in the west pier leg and in the cross bracing members.

Shear blocks, located on each pier cap and intended to prevent the superstructure from moving laterally were generally found to contain advanced decay and could easily be dislodged. The timber stingers were found to generally be in good condition.

Criteria

In order to assess the impact of the inspection observations, TYLin consulted the "Procedures for inspection and assessment of fixed timber docks" prepared for the Canadian Coast Guard by RG Sexsmith Ltd, 1994 September – 4th Edition. This document provides useful guidance for interpreting the impact of decay on timber members. Specific guidance, applicable to the 26th street Pedestrian Bridge includes:

1. Where creosote of salt-treated wood has been examined for presence of decay and found sound an estimated life in excess of 8 to 10 years is appropriate.
2. Where some evidence of decay has been found, but very limited in extent, the element can be assumed to have a residual life on the order of 3 to 6 years on the southwest coast, 5 to 7 years on the north coast and interior.
3. Where an element has a weakened cross-section due to decay, based on visual observations or hammering and confirmed by drilling, the residual life should be taken as negligible, and the element should be considered unreliable for structural loads.

Summary

The timber piles identified with areas of advanced decay were confirmed by drilling using a 5/16" diameter auger bit. Based on the result of drilling and following recommendation #3 contained in the reference quote above, the vertical members in Piers 0 to 3 shall no longer be considered reliable for structural loads. In addition to pedestrian loads, structural loads also includes the bridge self-weight, wind loads and earthquake loads.

Decay and member deterioration through weathering were also identified in a number of transverse deck planks, railing members, stair treads and the cribbing at the north abutment and at the bottom of the staircase at the south end. The pedestrian railing was found to be easily deflected using nominal force, partially due to flexible transverse supports at each post. At the north end of the bridge, the transverse support and base of the post were missing due to decay and the post offered no resistance to a lateral force. In its current condition, the pedestrian railing does not provide the level of resistance for which it was originally designed.

Decay was also identified at the ends of the longitudinal braces connecting Pier 1 to Pier 0 in close proximity to the fastener connecting the brace to the Pier 1 piles. The capacity of that connection is believed to be negatively impacted by the presence of decay.

Based on the level and location of decay identified in elements of the 26th Street Pedestrian bridge, the ability of the bridge to safely carry structural loads is greatly reduced. It is recommended that the bridge be closed to the public until such time as rehabilitation or replacement can occur.

As requested by the District of West Vancouver, TYLin has developed high level budget estimates for the removal and replacement of the bridge. Our estimates are as follows:

Demolition and removal – this estimate assumes that the existing bridge is removed using a rail mounted excavator working form the CN rail lines and away from the overhead power lines. The excavator would remove the superstructure and substructure with the piles assumed to be cut off at ground level. A high-level estimate to demolish and remove the bridge is approximately $100,000- $150,000 which is assumed to also cover any permits required from CN.

A prefabricated replacement bridge superstructure, such as the type of bridges supplied by Algonquin Bridge, has been assumed as the replacement structure. On top of the new bridge superstructure, a reinforced concrete spread footing on the north end of the bridge and a concrete pier with access stairs at the south end of the bridge has been assumed. The south pier and staircase area assumed to be founded on micropiles. Based on a cost estimate for a similar bridge recently received from Algonquin bridge in Ontario, we estimate the new bridge, including piers and staircase to be approximately $500,000-$750,000.

In addition to the above estimates, there will be associated engineering costs to design the spread footing, pier and staircase. These costs will depend on the type of piers and stair selected as well as the extent of pilling that may be required based on soil conditions.

TYLin

Furthermore, we note that there are a number of overhead power lines in the vicinity of the existing crossing which will complicate construction which could add additional costs.

For budgeting purposes, we recommend carrying a budget estimate of between $1,000,000 and $1,500,000 to demolish, design and construct a replacement for the 26th Street Pedestrian Bridge which includes an allowance for internal District costs. If required, TYLin would be pleased to prepare a concept design for a new bridge along with a proposed demolition sequence to facilitate a more accurate cost estimate.

Yours truly,

s. 22(1)

2024 Aug 01

Terrence Davies, P.Eng.

TYLin

To:	**Mr. Dave Choo & Mr. Sean OSullivan**	**From:**	**Terrence Davies, P.Eng.**
	District of West Vancouver 3755 Cypress Bowl Road West Vancouver, BC V7S 3E7	**Date:**	January 20, 2025
Address:		**CC:**	
Re:	**26th Street Pedestrian Bridge Options**		

MEMORANDUM

Following a detailed bridge inspection of the 26th Street Pedestrian Bridge, conducted by TYLin in 2024 July, that identified advanced deterioration in many of the bridge's timber components, the District of West Vancouver removed the bridge from public use. This memo discusses options for the future of the 26th Street Pedestrian Bridge and includes a summary of CN rail requirements for work at the bridge site. A conceptual new bridge option is also presented along with a high - level cost estimate for both demolition and reconstruction.

Bridge Rehabilitation

During TYLin's inspection, advanced deterioration was identified in a number of critical components in the structure, including a number of support piles. Due to the extent of deterioration, and the constraints associated with replacing support piles within the CN rail right of way, rehabilitation of the existing structure is not believed to be economically viable, and demolition of the structure is recommended to mitigate adverse impacts to the operational railway.

Bridge Demolition and associated CN requirements

A preliminary demolition procedure has been assumed by TYLin that involves removing all bridge components above ground. It is envisioned that the decking and handrails will be removed from the bridge by workers at deck level using hand tools. Following this stage, the timber stringers will be removed using a rubber-tired excavator or hi-rail excavator from track level. These components will be placed in a rubber-tired dump truck for removal. Finally, the piers and piles will be removed by cutting the piles at ground level and loading the timbers into the dump truck. TYLin proposes to leave the portions of the timber piles below grade in the ground as part of the demolition procedure although the retention of components below ground will require CN approval.

CN's requirements for the demolition of the existing timber structure were presented during a meeting held with railway representatives on 2024 October 02. The requirements are outlined in detail in TYLin's memo titled "3021.010025_CN Rail requirements", dated 2024 October 07, and are summarized below.

The safety of trains and train tracks is a primary concern for CN Rail and any work occurring within 30 feet of the tracks requires on-site flagging personnel and must be performed in accordance with a work permit issues by CN Rail. Rubber tired equipment or hi-rail equipment is acceptable but the use of tracked equipment is prohibited.

New Bridge Option including CN requirements

Due to constraints associated with constructing new bridge elements within the CN Rail right-of-way, the preliminary concept for the replacement bridge is based on clear spanning the entire right-of-way and constructing bridge supports adjacent the right-of-way limits, refer to the attached concept sketch. A detailed survey of the bridge site, including the CN right-of-way extents is not yet available, so the preliminary layout of the replacement bridge assumes that the extents are marked by the chain link fences along the sides of Bellevue Avenue.

The ground profile at the bridge site drops significantly in elevation from Bellevue Avenue on the north side of the rail tracks down to Bellevue Avenue on the south side. Based on topographic maps available on the District's website, the vertical elevation change is estimated at approximately 4 meters. As a result of the elevation difference, the north end of the new bridge is supported at grade on a spread footing while the south end is supported on a concrete pier. A concrete stairway has been included in the preliminary design to connect the south end of the bridge to Bellevue Avenue, similar to the timber staircase on the existing bridge. Alternatively, a steel staircase could be used.

The preliminary bridge concept includes a prefabricated steel thru-truss, similar to the example shown in Figure 1 below. A weathering steel finish has been assumed in the cost estimate presented below, but other options are available, including a painted or galvanized finish.

Figure 1 - Example of a Weathering Steel truss from Algonquin Bridge

CN Requirements for new construction

The construction of a replacement bridge is required to follow the same flagging and permitting requirements as demolition.

In terms of the new structure itself, CN has both vertical and horizontal clearance requirements as well as drainage requirements. A minimum vertical clearance of rail of 7.01m is required between the underside of a new bridge and the top while a minimum horizontal clearance of 5.485m from the centerline of the tracks to the face of abutment or pier is required according to CN Rail drawing titled "Protection and Minimum Clearances for Overhead Bridges Revision A".

Based on an approximate measurement taken on site using a tape measure, the deck on the existing bridge is believed to be approximately 7.3m (24 feet) above the top of rail. It is therefore anticipated that a new bridge could be constructed in approximately the same position and would meet CN vertical clearance requirements. However, there appears to be a discrepancy between the measurements taken on site at the existing bridge and the topographic information available on the District's website and a detailed survey will be required to advance the project further.

Horizontally, the new bridge supports are placed outside of the rail right of way at a distance greater than 5.485m from the centerline of tracks. In this location, the new supports would also be located outside of the zone where crash protection would be required.

TYLin

Based on past project experience, TYLin also expects that CN will require assurance that the new bridge will not impact drainage in and around the tracks. A new replacement bridge is not expected to significantly impact the existing drainage due to it narrow width, and no deck drains are proposed.

CN has stated that they will also require signed and sealed drawings of the new bridge.

Cost Estimates

TYLin has developed high level cost estimates for both the demolition and construction of a new bridge as follows. These estimates are based on the assumptions outline above using estimated durations and unit costs from projects recently completed in the region. The estimates are not intended as detailed engineering estimates but instead are provided for budgeting purposes.

Item:	**Budget Estimate**
Bridge demolition	$50,000
New Bridge	$500,000
Total	$550,000

Additional costs related to permitting, surveys, geotechnical investigation, testing and interpretation, CN Rail interactions, contingencies and owner's costs have not been included.

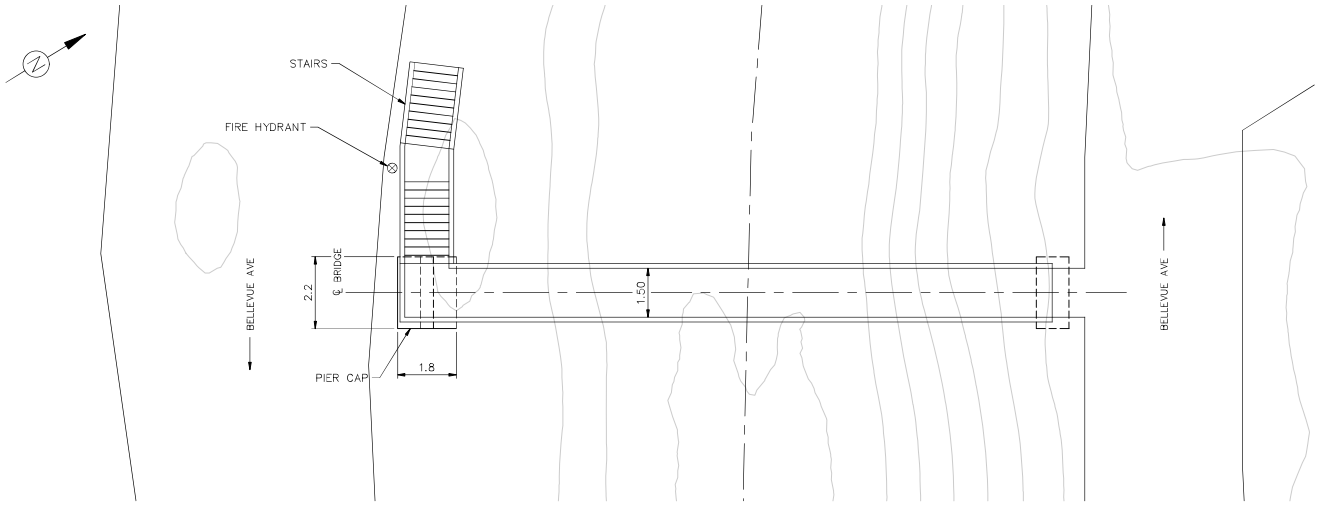
A fire hydrant is currently located adjacent to the existing timber staircase and the construction of a new bridge pier may require the relocation of the underground pipe servicing the hydrant which will add to the project costs.

For the purposes of project budgeting, we recommend that the District carry an overall estimate of between $1.5 and $2.0 million for the demolition and replacement of the 26th Street Pedestrian Bridge.

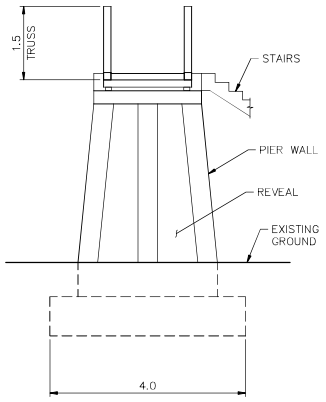
s. 22(1)

2025 Jan 20

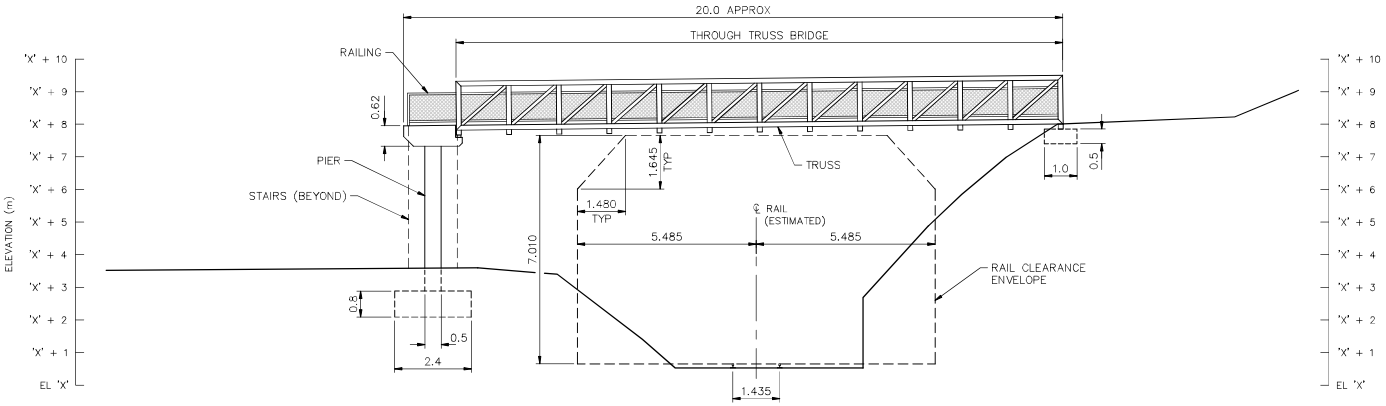
Terrence Davies, P.Eng.
T.Y. Lin International Canada Inc.
EGBC Permit to Practice # 1000203



PLAN



PIER ELEVATION
(LOOKING WEST)



ELEVATION

TYLin

DISTRICT OF WEST VANCOUVER
26th STREET PEDESTRIAN BRIDGE REPLACEMENT
GENERAL ARRANGEMENT
CONCEPT 1

REV	DATE	DESCRIPTION	INITIALS
-	DD-MM-YYYY	-	-

PRELIMINARY NOT FOR CONSTRUCTION

DESIGNED TD DATE
CHECKED DATE
DRAWN DC DATE

SCALE	PROJECT No.	DRAWING No.	REV No.
AS SHOWN	XXXXX	XXXX	-

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