Executive Summary

The Old Spences Bridge was constructed in 1931 and crosses the Thompson River providing a link between Highway 8 and Highway 1 in the Community of Spences Bridge, BC. In 1962, a new bridge was constructed approximately 900 m downstream that also connects Highway 8 and Highway 1.

The Old Spences Bridge is a single lane bridge composed of five truss spans and two girder spans. The truss spans vary in length with a single span of 21.0 m (69 ft.), two spans of 27.7 m (91 ft.) and two spans of 65.8 m (216 ft.). The girder spans are 11.3 m (37 ft.) and 12.2 m (40 ft.) making the total length of the bridge 231.6 m (760 ft.). Six concrete piers and two concrete abutments support the bridge.

Annual inspections of the Old Spences Bridge have been performed for many years and following the 2002 inspection the bridge was posted with a 25 tonne load limit. During the 2008 inspection, significant deterioration, corrosion and holes were identified in heavier structural components. Based on the 2008 visual inspection the bridge was closed to all vehicular traffic in 2009 in order to ensure public safety.

Subsequent to closing the crossing, the British Columbia Ministry of Transportation and Infrastructure (BC MoT) retained Buckland & Taylor Ltd. (B&T) to carry out a detailed inspection and load capacity evaluation of the structure. As part of their assignment, B&T was also tasked with developing conceptual rehabilitation options and cost estimates to restore the bridge to a range of acceptable levels of reliability.

Recommended maintenance, rehabilitation and evaluation items based on observations made during the detailed inspection are presented in B&T Report No. 1884-RPT-SPE-001-0, “Old Spences Bridge No. 2411 – Inspection Report.”

This report summarizes the findings of the load evaluation of the bridge, makes recommendations regarding conceptual rehabilitation options, and summarizes cost estimates to restore the bridge to a range of acceptable levels of reliability.

The results of the load evaluation for the various vehicular and pedestrian loadings applied to the bridge in its current state are summarized in Table 1.

It should be noted that in the evaluation, two pedestrian load cases have been established in order to satisfy the intent of the code, while at the same time being more representative of local conditions. Load case 1 is pedestrian loading applied to the sidewalk only, in accordance with CHBDC. Load case 2 is pedestrian loading applied anywhere on the bridge, but the loading, as

specified by BC MoT, is limited to a maximum of fifty (50) pedestrians. If the bridge is opened as a pedestrian-only bridge, BC MoT must post signage limiting the pedestrian load to a maximum of fifty (50) people on the bridge at any given time.

Table 1: Vertical Load Evaluation Conclusions – By Member Type

Item	Conclusions Regarding Live Load Models (without snow load)			
	CL1-625	**25 Tonne**	**5 Tonne**	**Pedestrians**
Concrete Deck [1]	Acceptable	Acceptable	Acceptable	N/A
Deck Stringers	**Not Acceptable**	Acceptable	Acceptable	Acceptable
Floorbeams	**Not Acceptable**	**Not Acceptable – some in bending**	Acceptable	Acceptable
Sidewalk	**Not Acceptable**	**Not Acceptable**	Acceptable	Acceptable
Truss System	**Not Acceptable**	**Not Acceptable – some diagonals**	Acceptable	Acceptable
Truss Bearings	**Not Acceptable**	Acceptable	Acceptable	Acceptable
Girders	**Not Acceptable**	**Not Acceptable – webs at bearings**	Acceptable	Acceptable
Concrete Piers	**Not Acceptable**	Acceptable	Acceptable	Acceptable
Overall Conclusion	**Not Acceptable**	**Not Acceptable**	Acceptable	Acceptable

Notes: 1. In addition to the conclusion that the strength of the deck is acceptable, there are potentially serviceability issues that may need to be addressed due to gaps that have developed between the stringers and the deck.

In its current condition, the bridge can be opened to 5 tonne vehicle traffic. However, it is recommended that repairs be carried out before the end of 2011 if the bridge is intended to remain in service beyond 2011.

In its current condition, the bridge can be opened as a pedestrian-only bridge, subject to a load limit of fifty (50) pedestrians. However, it is recommended that repairs to some of the concrete piers be carried out by the end of 2011 if the bridge is intended to remain in service beyond 2011.

Given the fact that the traffic barrier connection does not meet PL-1 requirements, if the bridge is opened to vehicular traffic, it is recommended that BC MoT assess the risks associated with the barrier and establish whether the barrier should be upgraded to a higher standard. The estimated cost associated with upgrading the barrier on both sides of the bridge is included in the summary of costs for various options with the bridge open to vehicles.

The results of the load evaluation demonstrate that it is important to perform snow removal if the bridge is reopened in order to ensure that maximum vehicular or pedestrian load is not coincident with maximum snow loads. If the bridge is open for vehicular loads, a maximum snow depth of 350 mm concurrent with vehicular load is established as the limit, beyond which snow removal is required. If the bridge is open as a pedestrian-only bridge, a maximum snow depth of 600 mm is established as the limit, beyond which snow removal by manual methods or lightweight equipment weighing less than 500 kg is required.

High-level cost estimates have been prepared for the different vehicle loadings considered in the evaluation and for the different rehabilitation design life options. The summary of the estimated costs is listed in Table 2.

Table 2: Summary of Costs for Various Rehabilitation Options

Option	Estimated Cost (2009 dollars)			Comment
	Project Costs: Rehabilitation, Construction & Management	**Maintenance Inspections**	**Total Project Cost[1]**	
1. Immediate Demolition	N/A	N/A	**$1.5 M**	
2. Repair				
(a) 2 years @ limited pedestrian	nil	$0.15 M	**$0.15 M**	
(b) 2 years @ 5 tonne	$ 0.55 M (optional barrier repairs)	$ 0.15 M	**$0.15 -$0.70 M**	
(c) 10 years @ limited pedestrian	$ 0.18 M (pier repairs)	$ 0.60 M (bi-annual detailed)	**$ 0.78 M**	
3. Rehabilitation				Does not include costs associated with mitigating seismic and wind risk
(a) 10 years @ 5 tonne	$1.90 M	$ 1.35 M	**$ 3.25 M**	
(b) 10 years @ 25 tonne	$ 3.29 M	$ 0.36 M	**$ 3.65 M**	
(c) 25 years @ 5 tonne	$ 24.84 M	$ 0.16 M	**$ 25.0 M**	
(d) 50 years @ 5 tonne	$ 26.64 M	$ 0.36 M	**$ 27.0 M**	
(e) 25 years @ 25 tonne	$ 25.34 M	$ 0.16 M	**$ 25.5 M**	
(f) 50 years @ 25 tonne	$ 27.14 M	$ 0.36 M	**$ 27.5 M**	
4. Replacement				
(a) New single lane bridge with sidewalk	$ 14.3 M	N/A	**$ 14.3 M[2]**	Seismic and wind risk mitigated
(b) New two lane bridge with sidewalk	$ 22.7 M	N/A	**$ 22.7 M[2]**	

Notes: 1 - For all options except immediate demolition, the life-cycle cost must be increased by $1.5 M to reflect demolition costs.

2 - An allowance of $0.5 M has been made for property acquisition, in the event that a revised location is chosen for the new structure.

Based on the estimated costs of rehabilitating Old Spences Bridge, it does not appear to be cost effective to upgrade the existing bridge beyond a 10 year life. If BC MoT intends to provide this extra crossing between Highway 1 and Highway 8, in addition to the bridge just downstream, replacement of the bridge should be considered within the next 10 years.

It is also noted that opening the bridge for a pedestrian-only crossing is more favourable than a vehicular crossing in terms of cost, public safety as well as confidence in achieving the estimated service life.