



U.S. Department
of Transportation
**Federal Highway
Administration**

Memorandum

**WESTERN FEDERAL LANDS HIGHWAY DIVISION
610 EAST FIFTH STREET
VANCOUVER, WA 98661-3801**

Subject: Lake River Bridge
Ridgefield National Wildlife Refuge
WA RRP RIDG 100(2)

Date: March 28, 2012

From: Jeff Berg
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In Reply Refer to: HFL-17

To: Mike Traffalis
Project Manager

This memo is presented to assess the existing condition of the Lake River Bridge and to clarify the anticipated remaining life of the existing bridge. This assessment is based on the review of Bridge Inspection and Appraisal Reports from 2008 and 2010 and an underwater inspection of bridge pilings from 2008. These reports were produced by consultants Geocal, Inc. and Short Elliott Hendrickson, Inc. of Denver, CO for the U.S. Fish & Wildlife Service (USFWS).

The existing Lake River Bridge is a 331.5 foot long, single lane, timber trestle structure with 19 spans originally built in 1970, and in 1980 two spans were replaced with a single span through an agreement between the Refuge and a private contractor to facilitate movement of barged equipment along Lake River. The 55.5 foot main span is composed of steel beams and the 18 other spans vary in length from 8 feet to 17 feet and are spanned by timber beams. The 16 foot wide deck consists of transverse timber planks, longitudinal timber running planks with timber bridge rail and curbs. The trestle bents and abutments contain timber piles, bracing and caps. All timber is noted to be treated.

Summary of 2008 Bridge Inspection and Appraisal Report:

The report characterized the bridge's overall condition as FAIR, generally finding items for the deck, superstructure, approaches, and channel to be in satisfactory or good condition, and finding the substructure items to be in poor condition. The poor condition is an indication of advanced deterioration. The report included an Estimated Remaining Life of 5-10 years (at current load limits without major repairs or rehabilitation).

Recommendations contained within the report:

- install approach signs; reduced load capacity and object markers (priority assessment 3);
- make minor repairs to bridge rail (priority assessment 3);
- remove approach vegetation (priority assessment 4);
- remove soil and gravel from the bridge deck and replace 50' of timber running plank (priority assessment 5);

- remove drift logs from the channel that were hung up on the bridge substructure (priority assessment 5); and
- replace horizontal and diagonal bracing where split, broken, rotted or missing from the timber trestle portion of the structure (substructure) (priority assessment 6).

The recommendations were noted to have been made in the order of importance listed above, and with the priority assessment listed above based on a 1 (highest priority) to 7 (lowest priority).

The recommendation to post the bridge for reduced load capacity was based on the evaluation of the west abutment timber cap. Although the rehabilitation/repair of the west abutment timber cap was not specifically mentioned in the recommendations, the condition of the west abutment was documented in the report as “Poor” due to rot, decay, splits and some deflection of the timbers members composing the abutment. Specifically, the center pile of the west abutment was noted to have heavy rot such that its ability to support the timber cap was compromised and deflection of the cap was apparent. Bulkhead planks which retain the approach fill were also rotted. This poor condition of the timber components at the west abutment warranted the inspection team to downgrade the overall substructure rating from “Fair” to “Poor”.

Timber members composing other portions of the substructure were also noted to be in poor condition. At the east abutment a pile supporting the south wingwall had failed, the north and south piles at the east abutment were heavily rotted, and a horizontal brace had failed with other bracing showing heavy rot. Older bent piles were found to have deep checks and moderate to heavy rot above the water line. Horizontal bracing within the bents had minor splits with one isolated failure noted.

Summary of 2008 Underwater Inspection:

Bent piles were inspected from the mud line to the water line in this supplemental inspection. All piling were noted to be in good condition within this region with the only deficiencies noted to be some drift logs hung up within the bent piles & bracing. The report/form contained little narrative and was limited to the piling condition in water.

Summary of 2010 Bridge Inspection and Appraisal Report:

This report also characterized the bridge’s overall condition as FAIR, again finding items for the deck, superstructure, approaches, and channel to be in satisfactory or good condition while upgrading the substructure items to a fair condition. The report included an Estimated Remaining Life of 5-10 years (at current load limits without major repairs or rehabilitation).

Identified as still in poor condition were substructure elements including one pile at the south wingwall of the east abutment, horizontal bracing in the east abutment, and older piles in the trestle bents above the water line.

The west abutment was reconstructed sometime after the 2008 inspection with new piling and bulkhead planks. This work raised the condition assessment of the substructure from poor to fair, and also removed the recommendation to post the bridge for a reduced load capacity. The bridge railing was also updated during this timeframe with new curb and steel w-beam bridge rail elements for the full length of the bridge; this work raised the condition assessment of the deck from satisfactory to good.

Recommendations contained within the report were virtually the same as contained in the 2008 report:

- install approach signs; object markers (priority assessment 3);
- make minor repairs to bridge rail (priority assessment 3);
- remove approach vegetation (priority assessment 4);
- remove soil and gravel from the bridge deck and replace 50' of timber running plank (priority assessment 5);
- remove drift logs from the channel that were hung up on the bridge substructure (priority assessment 5); and
- replace horizontal and diagonal bracing where split, broken, rotted or missing from the timber trestle portion of the structure (substructure) (priority assessment 6).

Current assessment:

Based on the reports summarized above, there is still a condition issue with the existing structure that will need to be addressed in the not so distant future, and is certainly likely to affect the future load carrying capacity of the structure. This issue is the fact that a majority of the timber piling that compose the trestle bents have been in place since 1970, and that these older piles are considered to be in poor condition with moderate to heavy rot above the water line. A trestle rehabilitation would likely be costly and result in a significant bridge closure for construction activities. Although not identified in the inspection reports as an immediate need, it would be prudent to anticipate a significant rehabilitation of the bents within the next 5 to 10 years in order to maintain the current load carrying capacity. This is consistent with the inspection report findings and the Estimated Remaining Life presented within each report.

The continued deterioration of the timber members which compose the east abutment and wingwalls is also of ongoing concern, but is a condition that is more easily addressed from a cost and closure time standpoint than that of a trestle rehabilitation.

The US Forest Service's 1990 publication *Timber Bridges: Design, Construction, Inspection, and Maintenance* indicates that timber trestle bridges have "an average service life of 40 years or more" and that "trestles were used for vehicle bridges through the 1950's, but their use has since declined because of the high cost of bent construction and the longer clear-span capabilities of glulam." In the case of this trestle structure at some 42 years of age, the inspection report findings should alert us to the fact that significant elements of this bridge are approaching the end of their useful life, and will likely need major repair or rehabilitation in the near future.

Sufficiency Rating:

Based on requirements laid out in the National Bridge Inspection Standards (23 CFR 650.301), a Sufficiency Rating is calculated for each bridge inspected. The Sufficiency Rating is indicative of a bridge's sufficiency to remain in service. The result is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent any entirely insufficient or deficient bridge. The current Sufficiency Rating for the Lake River Bridge is 44.7% (based on the 2010 bridge inspection data). Amongst other USFWS bridges submitted to the National Bridge Inventory, this ranks 35th lowest nationally out of 290 bridges and 8th lowest regionally out of 44 bridges (AK, ID, MT, OR, WA, WY). This rating is up from a 26.6% Sufficiency Rating the bridge had as a result of the 2008 inspection data.