Associated Engineering | 75 YEARS

BRIDGE ASSESSMENT REPORT

Municipal District of Lesser Slave River

Bridge File 71600
Athabasca River

NOVEMBER 2022

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1 INTRODUCTION

The Municipal District of Lesser Slave River (MDLSR) retained Associated Engineering (AE) to complete a Bridge Assessment of Bridge File (BF) 71600, located on a local road over the Athabasca River (NW 23-70-01-W5M). The watercourse crossing serves as an alternate route to the Town of Slave Lake 55 km north of the Hamlet of Smith. It also provides access for gas and timber exploration and for recreational users to Fawcett Lake. A location map can be found in **Appendix A.**

Recent bridge inspections have identified that the structural condition of the bridge and pier scour is a concern. Level 1 Bridge Inspection and Maintenance (BIM) inspections have shown a continual decrease in Sufficiency Rating, with the structure now considered to have a lower than acceptable level of service. The purpose of this assessment is to provide MDLSR with the information necessary to make an informed decision regarding future considerations and strategies for the bridge site. Factors such as the current condition of the structure, current and future requirements, channel hydraulics and environmental considerations will be evaluated as part of this report.

In preparation of this report, AE conducted a site investigation on July 12, 2022, which confirmed the current condition of the bridge. The completed photo sheet can be found in **Appendix B**.

2 BRIDGE DESCRIPTION

The existing bridge was originally constructed in 1945 over the Athabasca River on a local road, in the Hamlet of Smith. The road previously served as Highway 2 before it was relocated in the 1970s on its present alignment 15 km west.

The bridge consists seven spans with three interior steel through trusses of length 61 m – 76.2 m – 61 m, three – 8.5 m long timber approach spans at the south and one – 4.9 m steel approach span at the north end, for an overall length of 229 m. The substructure consists of massive concrete piers supporting the truss, treated timber piers and steel piers at the north and south approach spans and concrete caps on piles at the abutments. The bridge has a single lane with a clear width of 5.5 m and a height restriction of 4.4 m. The existing bridge structure had an occurrence of flooding in 1986, and a follow-up inspection noted scour between the two vertical units that make up the east pier.

The bridge is situated within a large slide that extends about 500 m upstream and 1200 m downstream of the bridge, which has displaced the original north abutment cap approximately 8.5 meters toward the river and a moderate amount at the south embankment. As a consequence, the north abutment has had to be reconstructed, and the bearings reset approximately every 10-15 years.

Figure 2-1
BF71600 Bridge Components

3 BRIDGE HISTORY

In preparation of this report, AE reviewed the most recent inspections and conducted a review of AT's Bridge Files. The following historical information was noted from referenced documents:

- **1946:** Bridge first constructed on the present alignment over the Athabasca River.
- **1957:** North pier extended.
- **1963:** North pier extended and bearing reset, new piles driven at the north abutment.
- **1971:** Expansion bearings over-expanded allowing truss spans to push against each other.
- **1981:** BIM Inspection – Steel structure sweeps approximately 160 mm west, towards the downstream side.
  - Structural Rating: 38.0%, Sufficiency Rating: 20.5%
- **1983:** 2nd cap replacement completed.
- **1986:** Flooding event that resulted in a 3.88 m high water mark below the deck and scour between the two vertical units that make up the south pier. Slope movement estimated at 150 mm per year by Alberta Transportation. Bearings over-expanded and anchor bolts in bearings are missing.
- **1989:** Bottom chord of truss strengthened with Dywidag threadbar to accommodate legal loads.
- **1992:** BIM Inspection – Recommended installation of clearance tabs on the bridge.
  - Structural Rating: 77.0%, Sufficiency Rating: 60.8%
- **1994:** BIM Inspection – Wind bracing members to be replaced. Recommended bearings to be reset and turndowns to be replaced. The bridge was site of a serious accident between a logging truck and a car.
  - Structural Rating: 61.0%, Sufficiency Rating: 52.5%
- **1997:** BIM Inspection - Steel structure sweeps. Heavy scaling of Piers 2 and 3. Recommended bearings to be reset.
  - Structural Rating: 50.0%, Sufficiency Rating: 44.4%
- **1999**: Scour survey was conducted and determined that the approach alignment upstream has not changed since the early 1950's and there has not been significant change in the general shape of the channel, except around Pier 3. There is scour around this pier with a rate 0.2 m/year. The survey identified this deficiency as high priority and suggested additional surveys to be conducted every two years.
- **2000:** BIM Inspection – All posted loadings missing, deteriorated batter posts, sway braces, portals and connections. Recommended to straighten/replace members as per UT form, remove debris from piers, reset north abutment and treat and band piles.
  - Structural Rating: 44.0%, Sufficiency Rating: 41.9%
- **2001:** A preliminary slope stability assessment of the north slope was carried out and confirmed that the north abutment has been moving at an average rate of 150mm per year over the last 55 years. Most of the ongoing movement is caused by the toe of the slope being subjected to erosion. The assessment recommended the placement of riprap to mitigate the effects of erosion, and further geotechnical investigation to determine the present soil and groundwater conditions at the north abutment area.
- **2003:** BIM Inspection – Instability at north embankment due to soil movement. Head slopes eroded, deteriorated timber decking, missing timber blocking and posts, minor damage to portals, superficial rusting, over-expanded bearings, steel structure sweeps approximately 160 mm west, worn deck. Heavy scaling on Piers 4 and 5. Bent of treated timber piling at south approach. Underside of timber blocking at north approach span splitting. Recommended repair bearings at Spans 3 and 6 and repair grout pads.
  - Structural Rating: 38.0%, Sufficiency Rating: 36.4%

- **2005:** BIM Inspection – UT Report identified 11 truss members that have minor damage requiring heat straightening. Strip deck developing potholes at plank ends, and damaged timber blocking was noted. 5% of steel members have superficial rusting, five of six exposed bearings are ineffective and skidding instead of rolling. Broken alignment plates at Pier 4, one pile cracked and banded at Pier 1. Recommended to reset Pier 6, pull back trusses, patch pier concrete, replace all expansion bearings, replace three welded girder planks and blocks, and repair erosion gully.
  - Structural Rating: 38.9%, Sufficiency Rating: 30.0%
- **2007:** BIM Inspection – Damaged and missing timber blocking, noted high load damage to bottom wind brace elements, damaged north and south portals in Span 4, north of Span 5, and south of Span 6. Noted instability at north embankment and debris accumulated at piers. Recommended to replace all blocks, rehabilitate pier cap concrete, repair damaged portals, and straighten railing and stringers at bridge ends.
  - Structural Rating: 38.9%, Sufficiency Rating: 30.0%
- **2009**: 3rd cap replacement completed. Replacement of bearings and replacement of north approach span with a steel jump span.
- **2010, 2011, 2014:** BIM Inspection – 2010 UT Report identified various steel members to be replaced. South approached was noted to be 60 mm lower than the deck, moderate corrosion at isolated stringers and floor beams. Recommended to replace all missing bolts and patch south approach.
  - Structural Rating: 50.0%, Sufficiency Rating: 33.8%
- **2015:** BIM Inspection – Erosion at Pier 3 noted. 2015 UT Report identified members that need to be straightened or replaced. 15% superficial rusting identified on lower members, worn deck covered with gravel at the south end, and heavy scaling on Piers 4 and 5. Timber bracing rotted at the west end. Recommended to replace damaged wheel guard, repair damaged portal, repair approach rail and regrade both approaches.
  - Structural Rating: 38.9%, Sufficiency Rating: 30.4%
- **2017:** BIM Inspection – Recommended placing additional rip rap, replace two sway braces and band abutment piles.
  - Structural Rating: 38.9%, Sufficiency Rating: 30.4%
- **2020:** BIM Inspection - Worn deck with potholes, damaged wheel curbs, high load damage noted to bottom sway brace elements and portals. Wind braces display damage, and the bottom chord of truss is twisted at the north end. All portals appear to be damaged. 2020 UT report identified members that need to be straightened or replaced. Several stringers have cracks and minor twist. Bearings anchor bolts are bent. Instability at the north embankment has pushed north abutment, but it appears to have stabilized. Heavy scaling on Pier 4 and 5. Timber bracing at Pier 2 is rotten. There are signs of scour around Pier 3 and presence of debris around Pier 5. Recommended to patch deck, replace bridge rail, straightened and replace members as per 2020 UT report, remove drift around Pier 5, provide weight restriction signs at advance of bridge, place additional rip rap, and seal pier repairs at Pier 4 and 5.
  - Structural Rating: 38.9%, Sufficiency Rating: 29.4%
- **2021:** Level II Pier Scour Inspection – No progression of scour was noted in Piers 1 and 2. Both of these piers have a low risk of scouring. Scour around Pier 3 has significantly increased since 2018 due to accumulation of debris. The general scour area at this pier is 20 m x 12 m with a depth of 2.6 m. The remaining cover at the pier nose is approximately 0.8 m above the bottom elevation. Scour inspections were recommended to take place every 3 years. Debris to be removed prior to every scour inspection.

4 BRIDGE CONDITION

The basis of this assessment was formed on the following:

- Previous Level 1 BIM inspection reports
- Previous Level 2 Ultrasonic Truss inspection reports
- 2021 Scour Survey by TSB
- 2001 Slope Stability Assessment by Thurber Engineering
- Bridge File review conducted in 2021 by AE
- 2022 Site Inspection by AE

4.1 Level 1 BIM Inspection

The most recent Level 1 Bridge Inspection, in accordance with Alberta Transportation's (AT) BIM, was carried out on July 6, 2020, as part of the 39-month inspection cycle. The inspection noted deficiencies with respect to the components that make up the trusses, piers, north embankment, decking and approaches. Table 4-1 shows the general ratings of the bridge elements obtained during Level 1 BIM inspections since 2014. The most recent Level 1 BIM inspection report can be found in Appendix C.

Table 4-1
BIM Inspection Results

Bridge Elements	2014 BIM Rating	2017 BIM Rating	2020 BIM Rating
Approaches	4	4	4
Superstructure	4	3	3
Substructure	5	4	4
Channel	4	4	4
Structural Condition	50.0%	38.9%	38.9%
Sufficiency Rating	33.8%	30.4%	29.4%

The Structural Condition Rating (SCR) is the ratio of the sum of the general ratings to the sum of the maximum possible ratings for the superstructure and substructure only.

The Sufficiency Rating (SR) represents the present condition, level of service, safety of a bridge and its approach roads, relative to the acceptable standard of a new bridge at the same location.

The SCR progressively decreased between 2014 and 2017 but has remained the same since. The estimated replacement year for BF 71600 is 2035, based on the latest Level 1 BIM inspection report. The SR has decreased

slightly over the years. It is important to note that the general ratings for the bridge components do not consider the results from the 2021 Scour Survey, thus lower ratings can be expected for the substructure.

The major deficiencies noted in the latest Level 1 BIM inspection are summarized in **Table 4-2.**

Table 4-2
2020 Level 1 BIM Major Deficiencies

Bridge Element	Major Deficiencies
Approaches	Poor sight line from the north side. Sharp curve and settlement in south approach.
Superstructure	High load damage to sway brace elements and portals. Nicks recorded to various components. Batter posts and stringers have cracks. The bottom chord of truss is twisted at the NE side. Missing bolts at several connections of bridge rail. Steel structures sweeps approximately 160 mm to the west. Deck has deteriorated and developed potholes. There are multiple missing curb blocks and guardrails are damaged. Several bearing anchor bolts are bent.
Substructure	Instability at the north embankment has pushed north abutment towards the river. Heavy scaling on Piers 4 and 5. Wide checks were recorded in timber piles. Timber bracing is rotten at Pier 2. Large drift caught on Pier 5.
Channel	The embankment is sloughing and large debris drifting in the channel.

The maintenance work recommended in the latest inspection is summarized in Table 4-3.

Table 4-3
2020 Level 1 BIM Inspection Results

Bridge Element	2020 BIM Rating	Maintenance List
Approaches	4	• Erect proper weight restrictions at advance and north bound entrance of bridge.
Superstructure	3	• Install missing splice bolts, rail bolts and truss blocking. • Replace strip deck. • Conduct repairs as per 2020 UT report (replace three portals). • Replaced damaged wheel guards.
Substructure	4	• Provide Class 1M riprap on headslopes. • Remove drift at Pier 5. • Repair scaling at Piers 4 and 5.
Channel	4	• None.

4.2 Level 2 Ultrasonic Truss Inspection

A Level 2 Ultrasonic Truss inspection was carried out on July 6, 2020 by AECOM Canada and Bredo Consulting. The inspection found several truss members with some degree of damage. The damaged members may be found in both A150 and A139 trusses. Table 4-4 summarizes the damages recorded in the Level 2 Ultrasonic Inspection.

Table 4-4
2020 Level 2 UT Deficiencies

Truss Element	Major Deficiencies	Recommendations	Urgency
Batter Posts	Notches Cracked wedge washer	Grind smooth Replace wedge washer	Low (to be repaired within 5 years)
Sway Bracing	High load damage with bracing bent	Heat straighten member	Medium (to be repaired within 3 years)
Diagonals	3 mm crack (no change since 2015)	Assess growth or replace member	High (to be repaired within 1 year)
Verticals	40 mm crack at cross bracing Minor bends at sway bracing connections	Reweld connection Heat straighten members	Medium (to be repaired within 3 years)

Truss Element	Major Deficiencies	Recommendations	Urgency
Verticals	Notched and dented member Inside flange of member bent	Heat straighten members	High (to be repaired within 1 year)
Portals	Bottom flange dented with sheared rivets Stretch marks on backside with crack in bottom flange Dents and bends at bottom flange High load damage with dent on bottom side	Replace members	Medium (to be repaired within 2 years)
Bottom Chord	Lower outside angle bent Chord filled throughout with gravel	Heat straighten member Wash bottom chord	High (to be repaired within 1 year)

The Level 2 Ultrasonic Truss inspection also reviewed the condition of the gusset plates and their susceptibility to corrosion. The inspection found the gusset plates to be in 'adequate' and with a low probability of corrosion becoming an issue for the next decade. A copy of the Level 2 Ultrasonic Inspection, with exact location of damages, can be found in **Appendix D**.

4.3 2021 Scour Survey

A scour survey was conducted on November 8, 2021 by TSB to determine the risk of scouring at each pier. The survey found the following:

- Pier 3 has a low risk of scouring as its located near the channel bank and mostly dry.
- Pier 4 has no progression of scouring when compared to a 2018 survey. The risk of scouring at Pier 4 is low, and it currently has a cover of approximately 2.6 m above the footing.
- Pier 5 (labelled Pier 3 in **Figure 4-1**) has a significant accumulation of debris that has affected the water flow around the pier. Compared to the 2018 survey, the scour around the pier has increased. The scour depth at the pier nose is approximately 2.6 m and has an area of 20 m x 12 m just upstream of the pier nose and along the right side of the pier. The current cover at the pier nose is approximately 0.8 m about the footing elevation.
- Pier 6 has a low risk of scouring as its located near the channel bank and mostly dry.

The numbering system used in the 2021 Scour Survey report has been updated to meet the format of this report.

Figure 4-1 shows a cross section at the piers noting the scouring recorded in previous inspections.

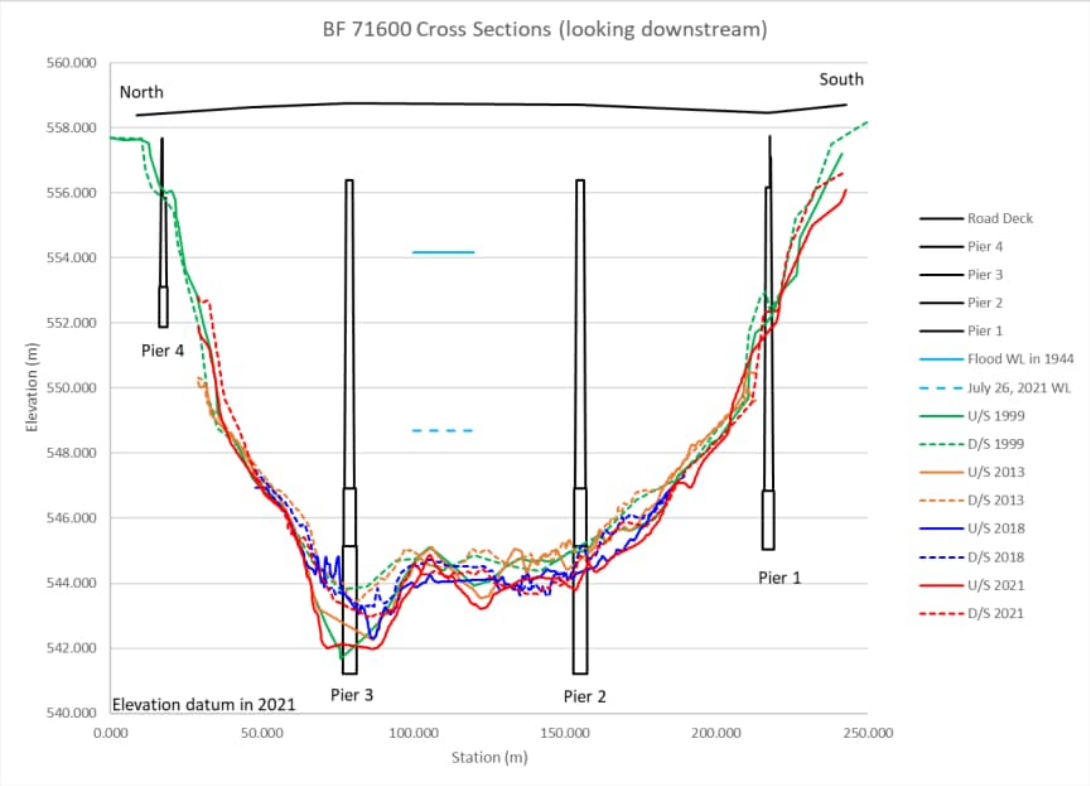


Figure 4-1
Cross Section from 2021 Scour Survey

The scour survey recommended the removal of the accumulated debris at Pier 5, and to carry out scour surveys every 3 years to closely monitor the scour development. Drift removal should take place prior to every inspection.

In September 2022, the MDLSR completed emergency removal of the drift at Pier 3. The scour hole depth from the nose of Pier 5 measured 3.81 m. Based on the 2021 Scour Survey report there is only approximately 4 m from the nose of Pier 5 to the base of the pier. With the new depth of the scour hole the likelihood of the pier undermining and putting the bridge at risk is high.

A copy of the 2021 Scour Survey report can be found in **Appendix E**.

5 CONTROLLING FACTORS

The controlling factors discussed in this section will be used to evaluate and select a rehabilitation strategy and a replacement option for BF 71600 given the constrains imposed by each controlling factor.

5.1 Structural Condition

The following is an overview, from the previous Level 1 BIM Reports, Level 2 Ultrasonic Inspection Reports, and most recent site visit, related to the condition of the structure:

- Substructure:
  - The north embankment is in 'poor' condition as it is located within an area of unstable soil. Although there has been recurring maintenance and repairs to the north approach, average slope moment is recorded to be 150 mm per year.
  - Heavy scaling was recorded on Piers 4 and 5.
  - Significant debris has accumulated at Pier 5, as shown in **Figure 5-1**, allowing scour to further develop.
  - The bridge was rehabilitated in 2009 which included retrofitting the concrete piers to accommodate the replacement bearings.

Figure 5-1
General View of Pier 5 – Looking South

- Superstructure:
  - There are several steel components that have some degree of damage and need to be either straightened or replaced. These elements include a number of bent sway braces and the portals, batter posts with nicks and minor bending, diagonal members with minor cracks, deteriorated welds at cross bracing connections, minor dents and bending at vertical members, cracked or missing bolts and a twisted bottom chord at NE due to improper jacking of the truss. **Figure 5-2** shows the typical damage on all the portal struts located at the entrance of the trusses.

- Several bearing anchor bolts are bent or missing, demonstrating how the north embankment has progressively pushed the bridge.
- Wheel guards have worn out with several sections missing through the bridge.
- Top deck planks have deteriorated and developed potholes and rotten spots.
- North entrance guardrail is damaged.
- The bridge was rehabilitated in 2009 which included the replacement of the bearings and replacement of north approach span with a steel jump span.

Figure 5-2
General View of Portal at North Entrance of Span 6

Based on the condition of the bridge components, **the structural condition is considered a controlling factor.**

5.2 Hydrotechnical Considerations

The bridge site is located just downstream of the confluence of the Athabasca River and the Lesser Slave River. Although the area is subject to high water, no high water marks were noted during recent BIM's. There is only one record of flooding that took place on July 23, 1986 and resulted in a 3.88 m high water mark below the deck and scour between the two vertical units that make up the south pier. A complete hydrotechnical analysis would be required as part of preliminary design for the rehabilitation or replacement of this structure and will inform design options.

Hydrotechnical considerations are a controlling factor for the repair, rehabilitation, or replacement strategies.

5.3 Geotechnical Considerations

A preliminary slope stability assessment of the north slope was conducted by Thurber Engineering and resulted in a report dated March 13, 2001. The following observations were made:

- the slope is on a large slide that continually moves down towards the river.
- the slide extends approximately 500 m upstream and 1200 m downstream of the site.
- the north abutment has been moving at an average rate of 150 mm per year.

- most of the ongoing movement is caused by the toe of the slope being subjected to erosion.

Recommended actions included:

- the placement of riprap armouring on the headslopes to mitigate the effects of erosion, and
- further geotechnical investigation to determine the present soil and groundwater conditions at the north abutment area. A copy of the slope stability assessment can be found in **Appendix F**.

No further geotechnical investigations were found in the record documents. Some of the concerns at the north abutment were addressed during the 2009 rehabilitation with the installation of a steel jump span and the replacement of all the bearings with sliding bearings. The bearings were designed to accommodate the movement with the condition that they are reset every 10-15 years.

A complete geotechnical analysis would be required for as part of preliminary design for the rehabilitation or replacement of this structure and will inform design options.

Based on the above, **geotechnical considerations are a controlling factor** for repair, rehabilitation or replacement strategies.

5.4 Environmental Requirements

The Athabasca River is a Class 'C' watercourse at this location, with a restricted activity period from September 16 to July 15, as defined by Alberta Environment's Code of Practice for Watercourse Crossings. The Athabasca River is considered navigable and is a major fish-bearing habitat; as such, authorization will be required from the Department of Fisheries and Oceans Canada, Navigable Waters and Alberta Environment & Parks involving work within the stream.

Regulatory permit requirements depend on the extent of bridge work proposed, specifically whether work is required on the superstructure versus the abutments, which would require instream work. At a minimum, the environmental permits outlined in **Table 5-1** should be revised for the selected bridge option.

The expected compliance requirements of these permits/approvals include:

- Follow the Measure to Protect Fish and Fish Habitat prescribed by Fisheries and Oceans Canada (DFO);
- Respect the restricted activity period as much as possible;
- Follow the recommendations of a Qualified Aquatic Environmental Specialist (QAES); and
- Develop an Erosion and Sediment Control Plan specific to the project, prepared by appropriately qualified professionals.

This summary assumes that a Historical Resource Act Approval would not be required because the crossing site is not within a Historical Resource Listing.

Other environmental compliance considerations may also apply with the presence of wildlife, treed/vegetated areas, and any potential sources of contamination. The environmental requirements should be revisited once updated construction footprints, and plans have been identified. If ground disturbance requires vegetation clearing, project timing restrictions to protect breeding wildlife may also apply (e.g., migratory birds, owls, or raptor species). If instream isolation has the potential to trap fish, a Fish Research Licence under the Fisheries (Alberta) Act may also be required.

Table 5-1
Environmental Permits to be Revisited Depending on the Bridge Option Selected

Act	Permit	Trigger	Timeline
Water Act Code of Practice for Watercourse Crossings Wetland Policy	Code of Practice Notification with a Wetland Assessment Impact Form	Disturbance to the bed and shore of a waterbody, with potential temporary wetland disturbance.	14 days
Public Lands Act	Temporary Field Authorization	Temporary construction footprint (including rip rap) if required outside of the Range Road Right-of-Way (Approximately 20 m wide)	2-3 weeks
Fisheries Act	Project Review/Letter of Advice	Work below the high water mark of the waterbody beyond routine bridge maintenance	8-12 weeks

Based on the above, **environmental requirements are a controlling factor**.

5.5 Traffic Accommodation

The community of Smith is divided over the two sides of the Athabasca River. The bridge provides access for about 265 residents to the highway system and to the Hamlet of Smith including both municipal and other employees and school students. This crossing also provides the most direct access to the Marten Hills Oil Fields through the West Fawcett Lake Road

It provides an alternate service route for the residents of Smith and Hondo travelling to the close major commercial centre in the Town of Slave Lake, located approximately 55 km north of Smith.

Closure of this bridge would significantly impact usage by local residents and the resource industry in the Smith and Hondo area that need access to Slave Lake and to the nearby recreational facilities at Fawcett Lake. The closest highway bridge is BF 76034 at Highway 2, approximately 15 km upstream; however, there is no reasonable alternate route without travelling first to Slave Lake and returning on Muskeg Road, which has an estimated detour length of approximately 100 km.

There is also an existing railway crossing 2 km upstream of BF 71600. Depending on the extent of repairs or replacement, railway bridges have been retrofitted to accommodate roadway traffic during such works.

Based on the above, **traffic accommodation is a controlling factor**.

5.6 Geometry

The bridge is adequately aligned to the banks but has poor sightlines due to sharp horizontal curves immediately in advance of the north and south approaches. The bridge is a single lane with a width of 5.4 m and height restricted to 4.4 m at the portals. The 4.4 m height is marginal for legal height loads but does not allow for any oversized loads to use the bridge.

The bridge has had a long history of repairs due to geometric restrictions and has been the topic at a number of local meetings with the MDLSR, which have included discussions of traffic lights at the bridge and possible bridge replacement schemes.

Based on the factors above, **geometry is considered a controlling factor**.

5.7 Climate Change

Changing environmental conditions, brought about through climate change, may lead to detrimental impact on the geographical features of the bridge and the materials it has been constructed by. The bridge has a history of flooding and slope instability as noted above. With the warmer temperatures associated with global warming, a significant increase in runoff can be expected in the long-term that will rise the existing rate of scour and slope instability in the area. With the current scour depth at the bridge, the bridge is at risk in the case of an extreme high flow event on the Athabasca. Similarly, as various superstructure components are in poor conditions, significant changes in temperature, CO_2 levels, and moisture content will increase degradation of materials.

For a project of this potential scale there would be a possibility of using a PIEVC analysis to assess the vulnerability of the existing or proposed structure to climate change in an analytical way. Consideration should be given to the emissions due to the impact of closure (due to traffic detour) and an embodied carbon analysis of replacement options. Level of service can be weighted against carbon footprint and potentially offset through the use of innovative materials.

Based on the above, **climate change is a controlling factor.**

5.8 Social / Economic Impacts

In 2015 the UN laid out 17 Sustainable Development Goals. Many of these goals are impacted by the replacement of the bridge, below are just a few of the goals that are affected:

- Good health and well-being – Residents in nearby communities that live north of the river use the bridge to access health services in Smith; a significant reduction of travel distance to healthcare accessed in Smith versus travelling to Slave Lake, including for emergency and ambulance services.
- Quality Education – Residents in nearby communities that live north of the river use the bridge to access education in Smith; travel time would be vastly increased if they had to travel to Slave Lake.
- Clean Water and Sanitation - Residents in nearby communities that live north of the river use the bridge to access and use the water fill station in Smith.
- Decent work and economic growth.
- Industry, Innovation & Infrastructure.
- Safe, resilient & sustainable communities – the bridge provides an alternative exit route for communities south of the river and north of the train tracks, where the train tracks could potential block the primary access to the

communities, without the bridge the communities would be trapped in the event of an emergency (wildfire, environmental disaster, etc.).

- Climate Action - Requiring all traffic that currently crosses the bridge to divert to Hwy 2 will have a significant and ongoing impact on emissions due to increased travel distance.

The best, most reliable access to the Marten Hills Oil Field is through West Fawcett Road which is accessed via either the Smith Bridge or the Old Smith Highway. This region is one of the fastest growing, most lucrative oil fields in Alberta. This year alone there has been 220 well licenses and 120 drill licenses issued in this Municipal District compared to an average of 50 and 30 in other areas of the province. This activity will generate significant revenues for the provincial and federal government for years to come.

Additionally, the logging industry cannot use this crossing due to bridge height and width restrictions and are detoured to the Old Smith Hwy. Feedback from some of the mill operations is they would prefer to use Highway 2 if the logging vehicles could fit on the bridge. Redirecting this traffic could mitigate safety risks in the area since there are very few residents on Highway 2 between Slave Lake and the Smith turn off. In comparison there are over 200 on the alternate route on Old Smith Highway.

There have been several reports of near misses on the bridge (drivers hitting the ditch in the winter when they notice traffic on the bridge too late, drivers having to back up because larger trucks will not yield, etc.) in addition to high load impact incidents.

A benefit cost analysis is recommended to account for social and economic costs related to the functionality of the crossing. Engagement with stakeholders is recommended as part of preliminary design to determine level of service requirements.

Based on the above, **social/economic impacts are considered a controlling factor**.

6 OPTIONS

The controlling factors identified in Section 3, including structural condition, geotechnical considerations, hydrotechnical considerations, geometry, climate change, environmental requirements, social/economic impacts, and traffic accommodation inform the rehabilitation and replacement strategy development. The environmental considerations are not a controlling factor but will be considered as part of any rehabilitation or replacement strategy.

The existing bridge has been in service for 77 years and is in 'poor' condition due to the damage of the trusses, the instability at the north embankment, and the issues associated with the debris accumulation at Pier 5. For this structure, three strategies have been developed:

- Option 1: Bridge Rehabilitation
  - Option 1A: Do Minimal - Load Restriction, Minor Superstructure & Substructure Repairs
  - Option 1B: Minor Substructure & Superstructure Repairs
- Option 2: Superstructure Replacement

A Do-Nothing option is not considered feasible due to the 'poor' condition of the superstructure and does not include completion of repairs to the existing bridge structure. Should the Do-Nothing option be chosen, it is recommended that the MDLSR consider closure and decommissioning of this structure to eliminate the risk to the public associated with failure. Based on the weakened structural integrity of this bridge and the potential for scour at the piers, the likelihood of failure of this structure continues to grow. The expected remaining life of this structure is 3 years provided the scour at Pier 5 is addressed at which point rehabilitation will no longer be an option.

6.1 Option 1: Bridge Rehabilitation

The following bridge rehabilitation strategy has been developed to address the current structural defects, bring the bridge to its intended level of service, prolong the service life of the existing structure, and attain an overall 'adequate' level of service. This option will not address the following controlling factors; geometry, climate change, traffic accommodation and social and economic impacts.

6.1.1 Option 1A –Do Minimal - Load Restriction, Minor Superstructure & Substructure Repairs

The scope of work for this bridge rehabilitation includes the following:

- Replace damaged guardrails;
- Replace damaged wheel guards;
- Place adequate weight restriction signs at advance of bridge and at both entrances to the bridge;
- Place adequate signage indicating the bridge is a One Trucked Bridge, allowing only one vehicle on the bridge at a time;
- Replace vertical clearance signs;
- Replace missing splice bolts, rail bolts and truss blocking;
- Replace and repair minimum truss members to maintain stability:
  - Repair connection weld at bracing on Span 4 U5L5E;
  - Replace Span 4 U7L6E diagonal;
  - Replace Span 4 U5U5 bracing; and
  - Replace cracked wedge washers on Span 6 U9L10E and U9L10W.

- Reset bearings;
- Fill scour hole at Pier 5 and armour with riprap; and
- Stock pile riprap on embankments for emergency repairs.

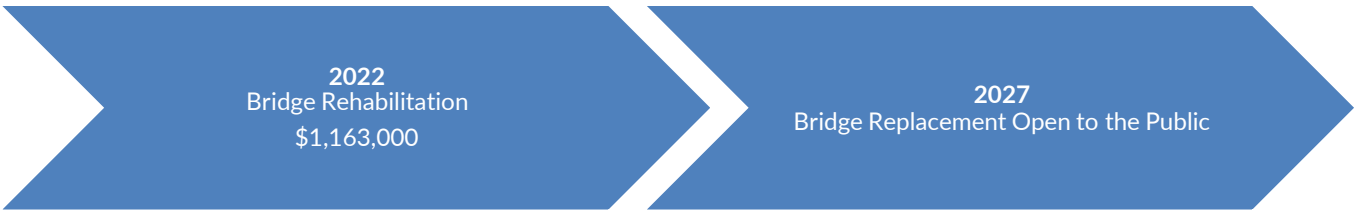
To successfully bring the bridge to a safe level of service with minimal repair work, safety deficiencies need to be addressed in a prompt manner. Supply of missing splice bolts, rail bolts and truss blocking should first be carried out to ensure an 'adequate' connection of the bridge members. Replacement of cracked washers and one diagonal (U7-L6E Span 4) is required to maintain stability of the truss system. This work should be followed by the replacement of guardrail, wheel guards, vertical clearance signs, One Trucked Bridge signs, and adequate weight restriction signs. A completed load rating will inform the detailed design of this option and the possible load restrictions required. Once these deficiencies have been addressed, the trusses will need to be jacked to allow the bearings to be reset. Based on the scope of work required, a temporary bridge closure would be required to accommodate construction activities.

The ongoing scouring rate at Pier 5 should be minimized by backfilling and armouring the scour hole with riprap. In order to be prepared for emergency repairs due to the scour, it is recommended to stockpile riprap on the embankments. The scour risk at Pier 5 should be minimized by ongoing removal of debris and monitoring of the scour. The appropriate permits and approvals are in place to remove drift off the ice during the winter, however the MDLSR may want to update permits for year-round removal. Although permits are in place, appropriate notifications are still required prior to commencing with this work and the contractor will be required to follow the QAES recommendations. The QAES recommendations will need to be specific to the contractors work plan. Depending on the methodology, debris removal is anticipated to take less than 1 week.

As part of this option an additional annual cost has been added to the life cycle cost analysis to allow for critical truss repairs that may need to be addressed as they occur until the bridge can be replaced.

The estimated initial cost to complete the work mentioned above is **$1,163,000**, including 30% for contingency, an allowance for engineering fees including environmental permits and regulatory approvals.

Assuming ongoing maintenance work is completed, the bridge's lifespan would be increased by an additional 6 years to 2027, at which time the complete replacement of the bridge should be completed or the existing bridge should be closed. The following timeline depicts the bridge asset management strategy:



6.1.2 Option 1B – Minor Superstructure & Substructure Repairs

The scope of work for this bridge rehabilitation includes the following:

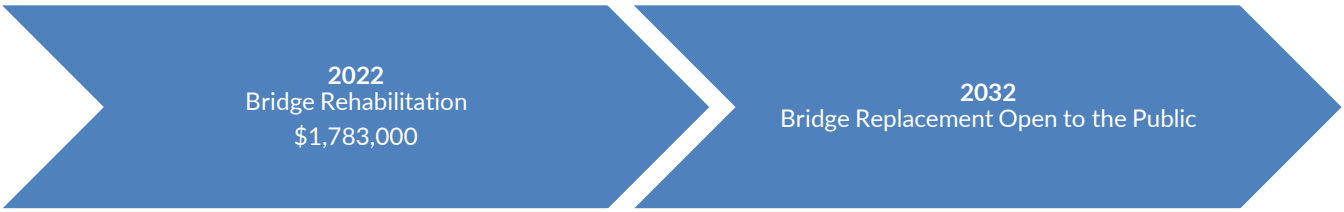
- Replace damaged guardrails;
- Replace damaged wheel guards;
- Place adequate weight restriction signs at advance of bridge and at both entrances to the bridge;

- Place adequate signage indicating the bridge is a One Trucked Bridge, allowing only one vehicle on the bridge at a time;
- Replace vertical clearance signs;
- Replace damaged strip deck;
- Replace missing splice bolts, rail bolts, and truss blocking;
- Backfill and riprap armour scour hole located around Pier 5;
- Stock pile riprap on embankments for emergency repairs;
- Reset bearings;
- Complete the following truss repairs as per Ultrasonic Inspection report:
    - Replace portal struts;
    - Replace wedge washers;
    - Grind smooth batter post;
    - Heat straighten sway bracing and vertical members;
    - Reweld damaged vertical connection; and
    - Heat straighten lower outside angle bent of bottom chord.

To extend the life of BF 71600 to have an additional 4 years to access funding and complete the design of a replacement bridge option, additional repairs to those included in Option 1A would need to be carried out. These repairs include the replacement and heat straightening of damaged truss members. These repairs should be carried out prior to the reset of bearings. A completed load rating will inform the detailed design of this option and the possible load restrictions required.

Based on the scope of work required, a temporary bridge closure would be required to accommodate construction activities. The estimated initial cost to complete this work is **$1,783,000**, including 30% for contingency, an allowance for engineering fees including environmental permits and regulatory approvals.

Assuming ongoing maintenance work is completed similarly to Option 1A, the bridge's lifespan would be increased by an additional 10 years to 2032, at which time the complete replacement of the bridge should be completed or the existing bridge should be closed. The following timeline depicts the bridge asset management strategy:



6.2 Option 2: Bridge Replacement

This strategy has been developed to address all controlling factors improving the existing service level of the bridge.

In order to identify the best replacement option for BF 71600, a detailed preliminary design should be undertaken. The purpose of the preliminary design would be to gather the information required to develop a comprehensive understanding of the benefits and disadvantages that possible replacement options will have on the crossing, considering all the project constraints.

The preliminary design would begin with the development of site base maps to identify constrains including utilities, property right-of-way, and other relevant features. With this base map in hand, additional information required to complete the project preliminary and detailed design may be gathered; including: Investigation and assessment of existing substructure, a detailed survey capturing all relevant information, geotechnical investigation and recommendations, hydrotechnical analysis, and an environmental field review.

For preliminary design, a geotechnical investigation will involve a field review, site reconnaissance and drilling, and a laboratory testing program. Activities included in this scope are:

- Review of all available subsurface information for the area.
- Carry out a site reconnaissance.
- Complete a field drilling program.
- Complete a slope monitoring program.
- Complete preliminary engineering and reporting including recommendations for foundation design and earth pressures.

The environmental scope of work during preliminary design will involve:

- Combination of desktop review and field assessment to complete an Environmental Impact Assessment.
- Coordinate submittals for environmental permits and approvals.

The hydrotechnical scope of work during preliminary design will involve:

- Hydrotechnical analysis of the channel for the proposed bridge, including review of pier positions and shapes and a scour analysis.

During the preliminary design stage, it is imperative that all utilities are identified, and the necessary approvals and agreements are acquired in a timely manner to minimize any potential impacts on the construction schedule. Additionally, consultations with MDLSR to determine future requirements for the bridge should be carried out to establish an adequate design criteria and service levels. Items of specific consideration should include bridge design codes and reference guidelines, design loading such as permit vehicles, service level and usage of the bridge, and operations and maintenance considerations, including provisions for bridge inspection. Constructing bridge crossings over major rivers such as the Athabasca River is challenging, and the preliminary design will review the constructability of all options considered including seeking input from experienced Alberta bridge contractors.

Important considerations during the development of the preliminary design include:

- **Aesthetics:** We will present options that while cost-effective have an aesthetic quality appropriate to the scale of the crossing and location, including investigating the impact of the bridge on the view from a range of vantage points and consider the possibilities for highlighting the historical significance of the site.
- **Social and Economic Impacts**: We will present options that can accommodate the level of service required for the area, providing access to the oil fields, for logging trucks, and other industrial users in the area, including options that limit and mitigate damage to the bridge due to over sized vehicles and eliminate the safety concerns associated with the existing crossing.

- **Constructability and Scheduling**: We will consider the constructability of each design option, including assess construction access, environmental restrictions, and timing construction activities around restricted activity periods.
- **Accurate Preliminary Design Cost Estimates:** Total project cost, life cycle cost analysis, and benefit cost analysis, including other aspects such as landscaping, roadway work, lighting, environmental permitting, etc. will be completed as need for the preliminary design options.
- **Scour Concerns:** Deep foundations designed to accommodate the levels of scour seen on the existing bridge will be assessed for all replacement options.
- **Slope Stability:** Slope stability concerns will be addressed through a geotechnical slope monitoring program and be designed for in detailed design for all replacement options.

Feasible structural options for this site, typical of current Alberta bridge construction practice, include:

- Steel I-Girders with a concrete deck with a maximum span of 80 m
- Concrete NU Girders with a concrete deck with a maximum span of 55 m

Further structural options and an optimized span arrangement should be reviewed during preliminary design working with hydrotechnical and environmental to minimize the number of piers within the river. The extent of demolition of the existing bridge should also be reviewed with hydrotechnical, environmental, and regulators for cost saving opportunities by leaving some bridge elements in place.

If the critical repairs listed in Option 1A are not completed, it is recommended that the MDLSR close and decommission this structure while the new structure is constructed to eliminate the risk to the public associated with failure.

6.2.1 Single Lane Options

These options would consist of a single 3.5 m wide lane with two 1 m wide shoulders for a clear width of 5.5 m. The AT Bridge Conceptual Design Guidelines recommends the following be met for a single lane bridge:

- A bridge width of between 4.5 m and 5.5 m
- An AADT of less than 500 vpd for the lifespan of the structure
- Sufficient sight distance should be provided to see oncoming traffic
- Identify signage to be provided along with any other strategies to mitigate hazards
- Maximum bridge length of 100 m
- Operating speed should be a maximum of 50km/hr to enable vehicles to yield and minimize the severity of potential collisions

A replacement bridge will be around 250 m long, and thus a single lane bridge would be an exception to the design guidelines. As such, inclusion of traffic control measures would be required. Historically, this bridge has been a single lane bridge and residents and industry using the bridge are accustomed to the requirements to use a single lane bridge.

6.2.1.1 Option 2A: Single Lane on Similar Alignment

This option would have the new bridge placed parallel to the existing bridge following a similar alignment. This would minimize the changes required to the approaching roadways and the pier positions could be optimized within environmental and hydrotechnical parameters.

It is important to note that this option will continue to have poor sightlines from the north approach, and a sharp curve from the south approach, as the alignment will be similar to the existing alignment.

The replacement bridge would have a design service life of 75 years. The estimated cost for this option is estimated to be **$43,932,000**, based on the latest unit price averages for steel girder bridges determined by AT, including engineering fees, 30% for contingency, and an allowance for environmental and regulatory approvals.

6.2.1.2 Option 2B: Single Lane on New Alignment

This option would have the single lane bridge placed on an optimized roadway alignment. This would optimize the approaching roadways and the pier positions within environmental and hydrotechnical parameters. This alignment would allow for improvements to the sight distances for the bridge and allow for additional traffic calming measures in advance of the bridge to enforce the 50 km/hr speed limit recommended by AT.

The replacement bridge would have a design service life of 75 years. The estimated cost for this option is estimated to be **$60,585,000**, based on the latest unit price averages for steel girder bridges determined by AT and provisions for road work, including engineering fees, 30% for contingency, and an allowance for environmental and regulatory approvals.

6.2.2 Option 2C: Two Lanes

This option would consist of two 3.5 m wide lanes with two 1 m wide shoulders for a clear width of 9 m parallel to the existing bridge having a similar roadway alignment. The AT Bridge Conceptual Design Guidelines recommends a minimum bridge clear width of 9 m for two-lane highways. This option would minimize the changes required to the approaching roadways, allowing for two directions of traffic on the bridge at the same time. The pier positions could be optimized within environmental and hydrotechnical parameters.

The replacement bridge would have a design service life of 75 years. The estimated cost for this option is estimated to be **$55,875,000**, based on the latest unit price averages for steel girder bridges determined by AT, including engineering fees, 30% for contingency, and an allowance for environmental and regulatory approvals.

6.2.3 Option 2D: Two Lanes on New Alignment

This option would consist of two 3.5 m wide lanes with two 1 m wide shoulders for a clear width of 9 m on an optimized roadway alignment. This would optimize the approaching roadways, allowing for two directions of traffic on the bridge at the same time and improving sightlines. The pier positions could be optimized within environmental and hydrotechnical parameters.

The replacement bridge would have a design service life of 75 years. The estimated cost for this option is estimated to be **$81,615,000**, based on the latest unit price averages for steel girder bridges determined by AT and provisions for road work, including engineering fees, 30% for contingency, and an allowance for environmental and regulatory approvals.

7 SCHEDULE

The construction schedule discussed in this section is based on Option 1A repairs and Option 2A replacement as those options are on the most critical path. The repairs in Option 1A extend the bridge life six years, at which time the replacement structure should be opened to the public and the existing bridge decommissioned and closed. Based on the scope of work required for Option 2A, the anticipated construction of the bridge is expected to be completed over the course of two years.

The primary risk to schedule is completing the new bridge prior to the existing bridge needing closed and achieving the berm construction within the identified instream construction windows, the fall break in the RAP from August 1 to September 15 in any given year. The anticipated design & construction schedule, based on the construction techniques for a steel girder superstructure, is as follows and shown in **Figure 7-1**:

- 2022:
  - Complete detailed design of the minor superstructure & substructure repairs
  - Confirm permits for scour repairs are in place
- 2023:
  - Complete scour repairs and stock pile riprap in winter months
  - Complete minor superstructure & substructure repairs
  - Complete preliminary engineering investigations starting in June or July to take advantage of the fall break in the RAP from August 1 to September 15
  - Complete preliminary design of the replacement option
  - Start the permit and approvals process for the replacement option
- 2024:
  - Complete detailed design of the replacement option
  - Complete the permits and approvals process to include the details in the tender package
- 2025:
  - Tender and award the project by the end of April
  - Start construction in early June in order to take advantage of the fall break in the RAP from August 1 to September 15 for berm construction
- 2026:
  - Continue construction of the replacement bridge
- 2027:
  - Finish construction of the replacement bridge
  - Demolition of the existing bridge
  - Berm removal
  - Restoration and construction completion

In preliminary design, a more detailed review of construction schedule risks should be completed.

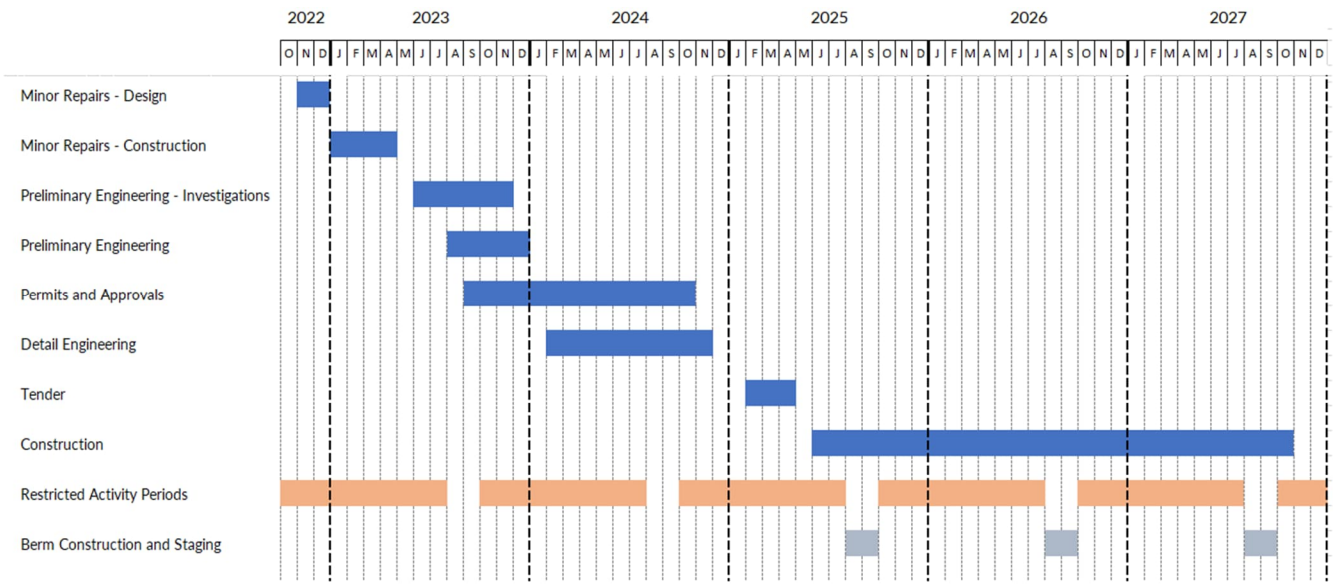


Figure 7-1
Project Schedule

8 COST ESTIMATES

This section presents opinion of probable costs (Class 'A' estimate) for each option outlined in **Section 6** and are presented below in **Table 8-1**. The estimates are based on AE's previous experience with maintenance rehabilitation costs, contractor quotes, historical tender summaries and Alberta Transportation's unit price averages. Class 'A' estimates have a level of accuracy of +/- 50%. Due to the preliminary nature of this work, the volatility in pricing at this time due to supply chain issues and residual issues from the pandemic, and the understanding that there exists unknown variables beyond the scope of this work, the estimates presented herein include engineering fees and a contingency allowance of 30% of the total estimated capital costs. AE does not guarantee the accuracy of these opinions of probable cost. The actual final costs will be determined through the bidding and construction process following detailed design. Detailed breakdowns of the cost estimates for **Options 1A, 1B, 2A, 2B, 2C, and 2D** can be found in **Appendix G**.

A Life Cycle Cost Analysis (LCCA) was performed to determine the Adjustment Net Present Value (ANPV) of each option. The following assumptions were made for the analysis:

- Discount Rate: 4%
- Term of Assessment: 50 years (2022 – 2072)
- The replacement bridge structure has a life span of 75 years
- The replacement cost for options 1A and 1B was assumed to be $43,932,000

Table 8-1
Class A Cost Estimates

Options	Current Capital Estimate ($)	Adjusted Net Present Value ($)	Summary
1A – Load Restriction, Minor Superstructure and Substructure Repairs	**$1,163,000**	**$36,060,000**	• Rehabilitation in 2022 • Replacement in 2027
1B – Minor Superstructure & Substructure Repairs	**$1,783,000**	**$31,551,000**	• Rehabilitation in 2022 • Replacement in 2032
2A – Full Replacement – Single Lane	**$43,932,000**	**$43,945,000**	• Replacement in 2022
2B – Full Replacement – Single Lane on New Alignment	**$60,585,000**	**$60,598,000**	• Replacement in 2022
2C – Full Replacement – Two Lanes	**$55,875,000**	**$55,888,000**	• Replacement in 2022
2D – Full Replacement – Two Lanes on New Alignment	**$81,615,000**	**$81,628,000**	• Replacement in 2022

A detailed breakdown of the LCCA can be found in **Appendix H**.

9 RECOMMENDATIONS

Based on the financial evaluation of the options developed for BF 71600, we recommend proceeding with **Option 1B – Bridge Rehabilitation: Minor Superstructure & Substructure Repairs** which results in the lowest ANPV. This bridge rehabilitation strategy will address the current concerns with the truss elements and scouring at Pier 5. As well, it will allow MDLSR to start to procure funding and complete detailed design of the replacement structure prior to needing to close the bridge. Rehabilitation of the existing structure will prolong the lifespan and allow the structure to continue providing an adequate level of service to the roadway users for the time needed to procure funding and complete the replacement of the bridge. It is recommended that MDLSR complete routine inspections and ongoing maintenance while planning the bridge replacement.

Based on the Class 'A' Cost Estimates in Table 8-1, **Option 1B – Bridge Rehabilitation: Minor Superstructure & Substructure Repairs** has an estimated initial cost of **$1,783,000**. If the structure is rehabilitated in 2022, with ongoing maintenance, it is anticipated that in/or before **2032** the replacement structure should be in service and the existing bridge closed.

It is recommended that MDLSR proceeds with the following:

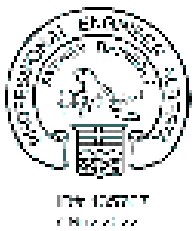
- Detailed design of the bridge rehabilitation work and submit all related environmental and regulatory permits;
- Fill scour hole at Pier 5 and armour with riprap;
- Ongoing removal of the drift around Pier 5, in accordance with requirements of permits and approvals incorporating QAES recommendations;
- Procurement of funding for the replacement structure; and
- Preliminary design of the replacement structure.

CLOSURE

This report was prepared for the Municipal District of Lesser Slave River to present the Bridge Assessment completed for BF 71600 located on a local road over the Athabasca River.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering Alberta Ltd.



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Structural Engineer

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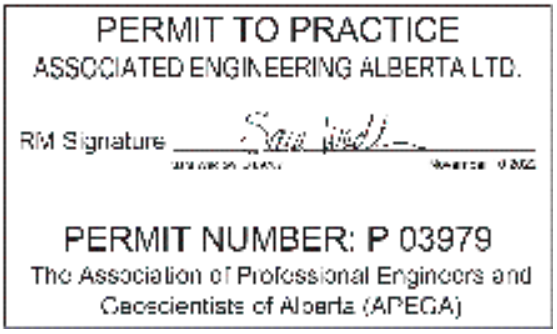
Project Manager



APPENDIX A – LOCATION MAP

LOCATION MAP – BF 71600

APPENDIX B – SITE INVESTIGATION REPORT

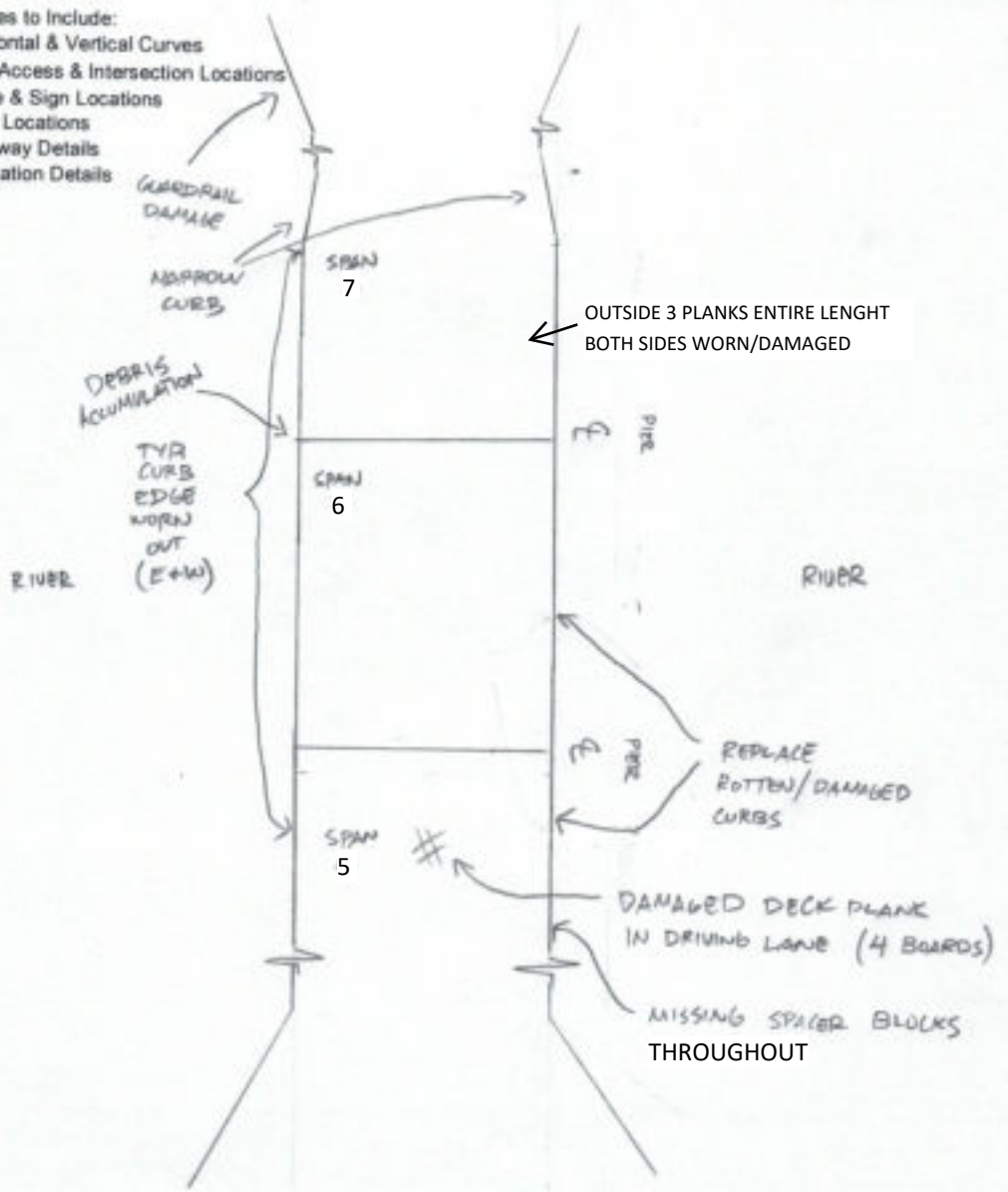
Associated Engineering | GLOBAL PERSPECTIVE LOCAL FOCUS.

SITE INVESTIGATION REPORT

BRIDGE FILE #:	71600	DATE:	JULY 12, 2022
PROJECT:	HDLSR BRIDGE PROGRAM 2022	PROJECT NO.:	2021 - 3190
OWNER:	ATHABASCA COUNTY		
LOCATION:	54° 31' 45", -112° 53' 05"	LEGAL LAND DESCRIPTION:	NW SEC 23 TWP 71 RGE 1 W5M
WATERCOURSE:	ATHABASCA RIVER	# VEHICLES / DURATION	1
STRUCTURE DESCRIPTION:	7 Span (3 Timber - 3 Truss - 1 Steel)		STRUCTURE

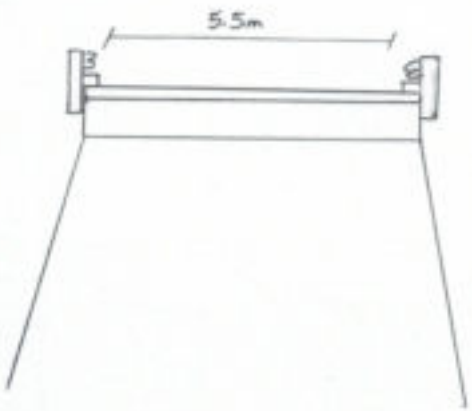
SITE LAYOUT

- Sketch and Notes to Include:
  - Horizontal & Vertical Curves
  - Field Access & Intersection Locations
  - Fence & Sign Locations
  - Utility Locations
  - Roadway Details
  - Vegetation Details



ROADWAY & STRUCTURE CROSS SECTION:

- Sketch and Notes to Include:
  - Roadway Width
  - Side Slopes
  - Roadway Material
  - Cover Depth (Culvert)
  - Structure Height (Bridge)
  - Special Features



CHANNEL CROSS SECTION:

- Sketch and Notes to Include:
  - Cross Section Details (Bed Width, Top of Bank Width, Bank Height, Bank Slopes)
  - Vegetation Details (Type, Location)
  - Channel Bottom Material (Cobbles, Vegetation, Etc.)

Required Photos:

- ☐ Roadway Alignment
- ☐ Structure Approaches
- ☐ General Structure
  - Upstream End of Structure
  - Downstream End of Structure
  - Looking Through Culvert Barrel/Under Side of Bridge
- ☐ Structure Defects (Close-Up & Context)
- ☐ Channel Information
  - Typical Cross Section at Crossing
  - Typical Cross Section 100 m Upstream
  - Typical Cross Section 100 m Downstream

1. S6 - U1U1 damaged

2. S6 – U2U2 damaged

3. S6 – U3U3 damaged

4. S6 – L3U3 damaged

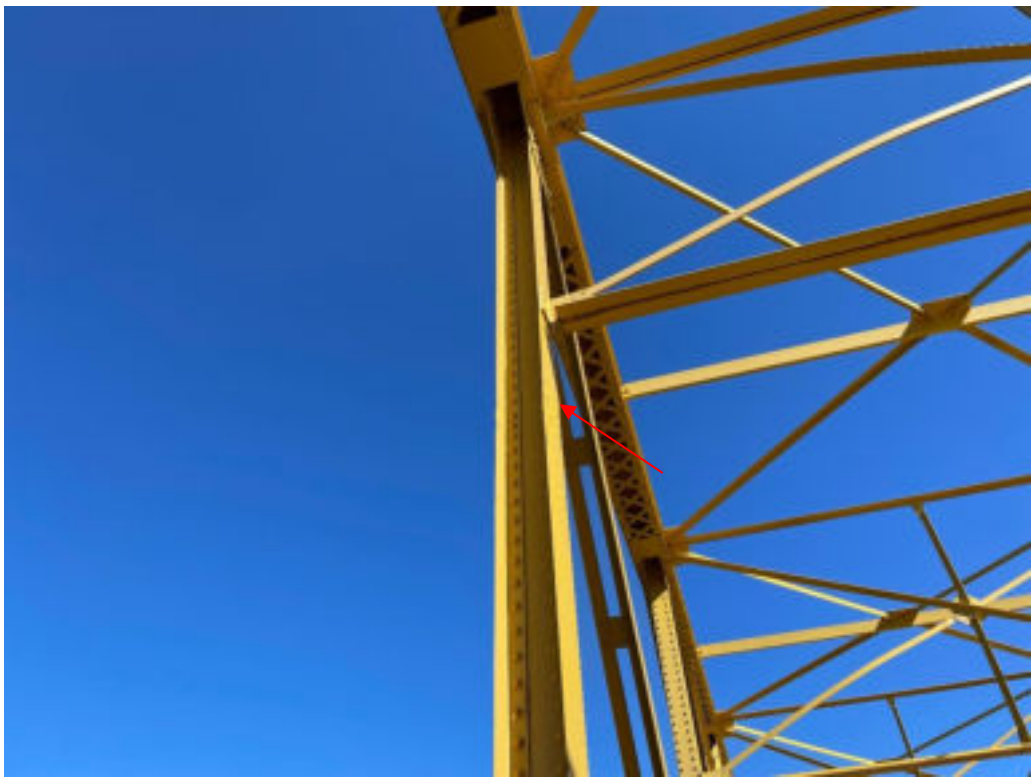
5. S6 -U9U9 damaged

6. S6 – U9L10 W damaged

7. S6 – U9L10 E damaged

8. S5 – U1U1 E damaged

9. S5 – U11U11 E damaged



10. S5 – L8U8 damaged

11. S5 – L9U9 damaged

12. S4 – U1U1 damaged

13. S4 – U5U5 damaged

14. S4 – U5L5 E damaged

15. S4 – L6U7 E damaged

16. S4 – U9U9 damaged

APPENDIX C – LEVEL 1 BIM INSPECTION REPORT

Bridge Inspection

Bridge File Number	71600 -1 Bridge	Form Type	TH TT
Year Built/Year Supstr	1945/1944	Lot No.	
Bridge or Town Name	SMITH	Inspector Name	Colin Roy
Located Over	ATHABASCA RIVER, 8.11, WATERCRS-ST	Inspector Class	BR CLS A
Located On	LOCAL ROAD	Assistant Name	Randy Bredo
Water Body Cl./Year		Assistant Class	BR CLS A
Navigabil. Cl./Year		Inspection Date	06-Jul-2020
Legal Land Location	NW SEC 23 TWP 71 RGE 1 W5M	Arrive Time	08:00
Longitude, Latitude	-114:02:38, 55:10:12	Depart Time	17:00
Road Authority	M.D. OF LESSER SLAVE RIVER NO. 124	Data Entry By	Jennifer Erickson
Contract Main. Area	UNDEFINED CMA	Data Entry Date	22-Feb-2021
Clear Roadway/Skew	5.5 /	Reviewer Name	Mario Amero
AADT/Year	280 / 2020 (E)	Review Date	29-Oct-2020
Road Classification	RLU-210G-90	Dept. Reviewer Name	Brian Adams
Detour Length (km)	60	Dept. Review Date	26-Feb-2021
		Follow-Up By	

Allowable Load (t):	Single	H 32 FLOOR BEAM	Semi	HS 45 FLOOR BEAM	Train	CS3 64 U2U3	---> On Critical Spans --->Critical Member
Design Loading:		HS20					---> Primary Span

Posting Information

Required Vert. Clearance Posting (m)											
Posted Vertical Clearance (Y/N)				Yes							
Posted:	Lane	NB	On Bridge (m)	4.4	In Advance (Y/N)	Yes	Lane	SB	On Bridge (m)	4.4	In Advance (Y/N)	Yes
Remarks	Measured 4.702 and 4.692m. Confirmed measurements.										

Required Load Posting (t)			Single		Semi		Truck Train	
Posted Loading (t)			Single	32.0	Semi	45.0	Truck Train	64.0
Posted:	Lane	NB	At Junction (Y/N)	Yes	In Advance (Y/N)	No	At Bridge (Y/N)	No
Posted:	Lane	SB	At Junction (Y/N)	Yes	In Advance (Y/N)	No	At Bridge (Y/N)	Yes
Remarks	Required where missing. NOT TO STANDARD. NB junction is close to bridge							

Hazard Marker At Bridge (Y/N)	Yes
Remarks	
Other Sign Types	Narrow bridge, Stop if oncoming traffic on bridge, Max 30, Curve.

Utilities (Located at)

Utility Attachments			
Telephone	2 wires 20m E and 1 wire 10m E	Gas	
Power	3 wires 20m W	Municipal	
Others		Problem (Y/N)	No
Remarks			

Approach Road

		Last	Now	Explanation of Condition
Horizontal Alignment		4	4	Sharp curve S side.
Vertical Alignment		4	4	Steep hill N side. Limited sight distance.
Roadway Width (m)	10.000			Settlement/bump on South approach.
Approach Bump		4	4	
Guardrail (Y/N)	Yes			Minor damage of ends.
Guardrail		3	5	
Length (m)	8.000			
Current Standard (Y/N)	No			
Termination Type	Turned Down			
Drainage		4	4	Headslope gully on South and North related to approach drainage. Approach windrows force drainage onto headslopes.
Approach Road General Rating		**4**	**4**	

Superstructure

Bridge Component	Last	Now	Explanation of Condition
(Primary Span : **TH, 7 Spans, Lengths(m): 8.5-8.5-8.5-61-76.2-61-4.9, A-Ident Number: A0150-07;A0139-05;A0150-08**)			
Special Features			
Special Feature		7	Dywidag Strengthening. Spans 4-6. On bottom chord, covered by gravel deposit.
(Type :)			
Special Feature		X	
(Type :)			
Wearing Surface/Deck Top Detail Ratings			
	N (%) / 1 (%) / 2 (%) / 3 (%)		Planks have worked loose 10% of deck.
Last	20 / 0 / 0 / 5		
Now	0.0 / 0.0 / 0.0 / 20.0		
Wearing Surface/Deck Top	3	3	Ends are fracturing due to movement and slot with potholes developing.
(Material Type : **UNTREATED TIMBER**)			
(Plank Thickness(mm) : **75**)			
(Plank Width(mm) : **300**)			
Deck Rideability	5	3	Potholes
Deck Joints	N	5	Steel cover plate over pier 6 joint.
Temperature (deg. C) 18			
(Expansion Type :)			
(Fixed Type :)			
Gap Size (mm) / Gap Location			
Curbs/Wheel Guards	4	4	1 damaged sections on span 5 with missing connections. 150x300x6100mm
(Curb Type : **Standard**)			
(Type : **TREATED TIMBER**)			
(Thickness(mm) : **150**)			
(Width(mm) : **300**)			
Bridge Rail	4	4	Triple layer. Incorrect splices. Missing 4 bolts per splice. Timber blocking. Numerous missing blocks, many never installed. Flexbeam only, blocks are treated timber. Sp4LUE post cracked at bottom.
(Type : **GALVANIZED STEEL FLEX BEAM**)			
Bridge Rail Posts/Blocking	3	3	
(Type : **GALVANIZED POST STEEL;GALVANIZED POST STEEL**)			
Bridge Rail/Posts Coating	6	6	
(Type : **GALVANIZED**)			
Sidewalk	X	X	

Superstructure

Bridge Component		Last	Now	Explanation of Condition
(Primary Span : **TH, 7 Spans, Lengths(m): 8.5-8.5-8.5-61-76.2-61-4.9, A-Ident Number: A0150-07;A0139-05;A0150-08**)				
Wide Load Damage (Y/N)	Yes			Minor nicks. High load damage to bottom sway brace elements and portals
High Load Damage (Y/N)	Yes			
Top Chord		7	7	
Batter Posts		4	4	Span 4 - U7-L6 E - 3mm long crack. U3L4E SP6 dented. Damage to all wind bracing but still adequate.
Sway Bracings		4	4	
Diagonals		3	4	9 bolts @ N portal-1 bolt at NE near bottom chord missing. All portals damaged. 3 require replacement.
Verticals		4	4	
Portals		3	3	17 stringers/bay. Bottom chord twisted at NE - photo.
Connections		4	4	
Floor Beams		7	7	
Bottom Chord		4	4	See 2020 UT inspection report for full details.
(No. of Stringers : **170;204;170**)				Surface corrosion.
Stringer Detail Ratings				Cracked members. U5U4E-S4 - 40mm ck in weld F. U7L6E-S4 - 3mm ck. U1U1-S6 - 60mm ck in bottom flange. U9U9-S4 - 60mm ck in bottom flange.
	N (count) / 1 (count) / 2 (count) / 3 (count)			
Last				
Now				
Stringers		6	6	
(Type : **STEEL**)				
(Width(mm) : **125**)				
(Depth(mm) : **305**)				
(Spacing(mm) : **350**)				
Paint Condition		5	5	15% superficial rusting on lower members.
(Colour Description : **YELLOW**)				
(Colour Code : **13538**)				
Touchup Required (Y/N)	No			
Bearings		4	5	Span 4 exp anchor bolts bent. Span 6 anchor bolt bent.
Temperature (deg. C)	20			
(Expansion Type : **SLIDING PLATE**)				
(Fixed Type : **PINNED BEARING**)				
Functioning (Y/N)	No			
Sub Deck/Deck Underside		5	5	
(Material Type : **TREATED TIMBER**)				
(Plank Thickness(mm) : **100**)				
(Plank Width(mm) : **300**)				
Defects (Percent Area)	2			
Span Alignment Problems				
Vertical (Y/N)	No			North hill is pushing bridge. Looking from North to South. Steel structures sweeps est 160 mm to the West.
Horizontal (Y/N)	Yes			
Superstructure General Rating		**3**	**3**	

Superstructure

Bridge Component		Last	Now	Explanation of Condition
(Secondary Span : **TT**)				
Special Features				
Special Feature			X	
(Type :)				
Special Feature			X	
(Type :)				

Superstructure

Bridge Component		Last	Now	Explanation of Condition
(Secondary Span : **TT**)				
Wearing Surface/Deck Top Detail Ratings				
	N (%) / 1 (%) / 2 (%) / 3 (%)			
Last	10 / 0 / 0 / 5			
Now	0.0 / 0.0 / 0.0 / 20.0			
Wearing Surface/Deck Top		3	3	Forming potholes at plank ends due to rot.
(Material Type : **UNTREATED TIMBER**)				
(Plank Thickness(mm) : **75**)				
(Plank Width(mm) : **300**)				
Deck Rideability		5	3	
Wheel Guards		4	3	Grader damage West wheelguard, North span & both on South span.
(Curb Type : **Standard**)				3 damaged sections on SP1-3.
(Type : **TREATED TIMBER**)				
(Thickness(mm) : **150**)				
(Width(mm) : **300**)				
Bridge Rail		4	3	Single layer flexbeam on all TT spans.
(Type : **GALVANIZED STEEL FLEX BEAM**)				Missing bolts at several connections. NE 1 spacer bent.
Bridge Rail Posts		4	3	Posts not bolted securley to timbers on SP2. Posts splayed outwards from plow pressure.
(Type : **TREATED TIMBER;GALVANIZED POST STEEL**)				
Bridge Rail/Posts Coating		5	5	
(Type : **GALVANIZED**)				
(No. of Stringers : **11;11;11;14**)				
Stringer Detail Ratings				
	N (count) / 1 (count) / 2 (count) / 3 (count)			North span 150 x 300 at 440 OC-steel stringers
Last	0 / 0 / 0 / 0			
Now	0 / 0 / 0 / 0			Minor twists/rotation.
Stringers		5	6	
(Type : **TREATED TIMBER**)				
(Width(mm) : **500**)				
(Depth(mm) : **200**)				
(Spacing(mm) : **630**)				
Sub Deck/Deck Underside		6	6	
(Material Type : **TREATED TIMBER**)				
(Plank Thickness(mm) : **100**)				
(Plank Width(mm) : **300**)				
Defects (Percent Area)	0			
Span Alignment Problems				
Vertical (Y/N)	No			North approach is pushing slightly West.
Horizontal (Y/N)	Yes			
Superstructure General Rating		**5**	**6**	

Substructure

Bridge Component		Last	Now	Explanation of Condition
Abutments				
(Extended Backwall Piles (Y/N) : **N**)				Abutments covered in fill.
(Extended Backwall Piles Spacing(mm) :)				

Substructure

Bridge Component		Last	Now	Explanation of Condition
(Total Number of Caps/Corbels : **1:1**)				AB1 buried in fill. AB2 concrete, limited access/view.
Bearing Seats/Caps/Corbels Detail Ratings				
	N (count) / 1 (count) / 2 (count) / 3 (count)			
Last	2 / 0 / 0 / 0			
Now	2 / 0 / 0 / 0			
Bearing Seats/Caps/Corbels		N	N	
(Type : **CONCRETE**)				
(Depth(mm) :)				
(Width(mm) :)				
Backwalls/Breastwalls		5	5	Timber breast wall at North
Greatest Height (m)	0.30			
Wingwalls		6	6	
(Total Number of Bearing Piles : **0:0**)				
Piles Detail Ratings				
	N (count) / 1 (count) / 2 (count) / 3 (count)			
Last	999 / 0 / 0 / 0			
Now	100 / 0 / 0 / 0			
Piles		N	N	
Paint/Coating		X	X	
Abutment Stability		5	5	North abutment has been pushed, appears to be stabilized.
Scour/Erosion		4	4	Erosion gullies, both abutments.
Piers/Bents				
(Type : **PIER-SOLID**)				Heavy scaling on piers 4 & 5 on top P1-1 steel H pile double cap. P2-2 timber caps. P3,4,5- conc P6 concrete
(Total Number of Caps/Corbels : **2:2:2:1:1:1**)				
Bearing Seats/Caps/Corbels Detail Ratings				
	N (count) / 1 (count) / 2 (count) / 3 (count)			
Last	0 / 0 / 0 / 0			
Now	0 / 0 / 0 / 0			
Bearing Seats/Caps/Corbels		4	4	
(Type : **CONCRETE**)				
(Total Number of Bearing Piles : **6:10:2:1:1:2**)				P1-Steel H pile. P2 - TT, P3-P6 concrete. Wide checks in timber piles.
Piles Detail Ratings				
	N (count) / 1 (count) / 2 (count) / 3 (count)			
Last	0 / 0 / 0 / 0			
Now	0 / 0 / 0 / 0			
Pier Shaft/Piles		4	4	
Greatest Height (m)	16.50			
Bracing/Struts/Sheathing		4	4	Timber bracing is rotten at P2 W ends.
Nose Plate		6	6	
Paint/Coating		7	7	
(Colour Description :)				
(Colour Code :)				
Pier Stability		4	5	
Scour		N	N	Erosion of slope around Pier 3.
Debris (Y/N)	Yes			Large drift caught on P5.

Substructure				
Bridge Component		**Last**	**Now**	**Explanation of Condition**
Substructure General Rating		**4**	**4**	
Structure Usage				
		Last	**Now**	**Explanation of Condition**
Channel				
(U/S Direction : **W**)				
(D/S Direction : **E**)				
Alignment		8	8	
Bank Stability		4	4	The North hill continues to move towards river. Sloughing embankment ~50m2
HWM (m below Top of Curb)				HWM not visible. Large trees during flood.
Drift (Y/N)	Yes			
Slope Protection		4	4	Erosion gullys both headslopes.
(Type : **NONE; NONE**)				
Guidebank/Spurs		X	X	
Adequacy of Opening		8	8	
(Fish Compensation Measure 1 : **NONE**)				
(Fish Compensation Measure 2 : **NONE**)				
Channel General Rating		**4**	**4**	

Maintenance Recommendations

Completed Work	OTHER ACTION (Feb-2021)
Planned Work	

	Work Type	Status	Rec. Year	Target Year	Inspector Comments	Department Comments
	REPAIR/REPLACE BRIDGE RAIL	PRIORITY REQUIRED	2021		Install missing splice bolts ~200, rail bolts ~20, truss blocking ~10	
	PATCH DECK	PRIORITY REQUIRED	2021		Replace strip deck	
	STRAIGHTEN/REPLACE MEMBERS	PRIORITY REQUIRED	2021		Repairs as per 2020 UT report (replace 3 portals)	
	WASHING	PRIORITY REQUIRED	2021		Deck and bottom chord.	
	PLACE ADDITIONAL RIP RAP	PRIORITY REQUIRED	2021		~20m3 Class 1M on headslopes	
	REMOVE DRIFT ACCUMULATION	PRIORITY REQUIRED	2021		At pier 5	
	OTHER ACTION	PRIORITY REQUIRED	2021		Erect proper weight restriction signs at advance and N/B at Bridge	
	OTHER ACTION	PRIORITY REQUIRED	2021		Replace damaged wheel guard 30m	
	OTHER ACTION	PRIORITY REQUIRED	2021		Install missing bolts in connections (6)	
	OTHER ACTION	PRIORITY REQUIRED	2021		Seal piers PD repairs to P4/P5 ~4m2	

Structural Condition Rating (Last/Now) (%)	**38.9/38.9**	**Sufficiency Rating (Last/Now) (%)**	**30.4/29.4**	Est. Repl. Yr	2035	Maint. Reqd. (Y/N)	Yes

Special Comments for Next Inspection	Monitor 2 cracks in members (U5U5E-S4 and U7L6E-S4)	Department Comments	HUC6 BOUNDARY: TAWATINAW RIVER; RISK ZONE: YELLOW

Previous Inspector's Name	Rory Zhao	Previous Assistant's Name	
Next Inspection Date	06-Oct-2023	Previous Inspection Date	07-May-2020
Inspection Cycle (Default) (months)	39		
Comment			

APPENDIX D – LEVEL 2 UT INSPECTION REPORT

BF 71600-1 Athabasca River Bridge on Local Road near Smith

Level II Inspection

Ultrasonic Testing Inspection Report

Athabasca River Bridge on Local Road near Smith

Bridge File 71600-1
NW23-71-1-W5M
Peace Region

Prepared for:

Alberta Transportation

AECOM
101, 18817 Stony Plain Rd
Edmonton, AB
Canada T5S 0C2
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Inspection Date: July 6, 2020

Table of Contents

AECOM

2020 Specialized Level 2 Inspection Report Introduction

- Level 1 BIM Inspection
- Level 2 Specialized Steel Inspection – Ultrasonic Testing

A Level 1 BIM Inspection and specialized Level 2 Ultrasonic Testing were completed at Bridge File 71600-1 by AECOM Canada and Bredo Consulting (744969 Alberta Ltd). The bridge consists of three through truss spans in the center, one treated timber span on the north and three treated timber spans on the south, located at NW23-71-1-W5M, on Local Road over Athabasca River near Smith, Alberta. Ultrasonic Testing was conducted on the end connections of select truss members.

Senior team members were Colin Roy of AECOM as the project manager and senior inspector, Randy Bredo as lead inspector, Bob Ramsay as reviewer, and Stanley Pon as assistant inspector. Ultrasonic Testing support was provided by Marcel Chesterman of Metalogic Inspection Services. Stanley Pon of AECOM assembled the reports for review and acceptance by the senior team members.

The previous Level 2 inspection was completed in 2015. One diagonal member was detected with a crack indication. There has been no change to the crack indication since the previous inspection. We recommend to assess or replace the cracked member. There are 4 portals with significant high load damage that require replacing.

The current Level 1 and Level 2 inspection cycles are 39 months and 5 years respectively. We recommend the Level 1 and Level 2 inspection cycles to stay the same.

This final report is for record purposes and shall not be revised without the express approval of the review engineer under whose authority the document was issued.

If additional information is required, please contact the project manager or review engineer with your questions.

Prepared by:

Colin Roy, P.Tech Eng.
Class A Bridge Inspector, Bridge Inspection Group Lead
AECOM

Reviewed by:

Bob Ramsay, M.Eng., P.Eng
Review Engineer, Bridge Technical Director
AECOM

Level 2 Specialized Steel Inspection Information Summary

BRIDGE FILE: 71600-1
LOCATION: Athabasca River Bridge on Local Road near Smith
SPANS & TYPE: 8.5-8.5-8.5-61-76.2-61-4.9 m | TH & TT
REGION: North Central

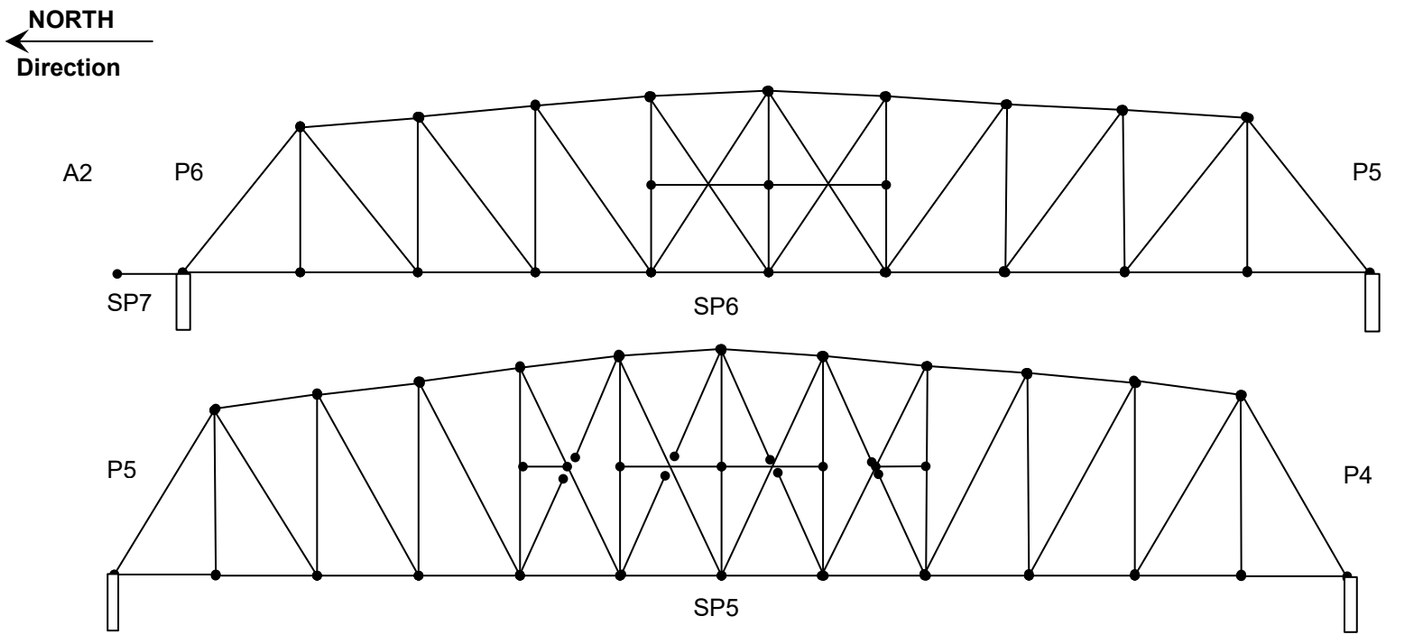
INSPECTED BY: Randy Bredo and Colin Roy
INSPECTION DATE: July 6, 2020
LEVEL 2 INSPECTION CYCLE (YEARS): 5
CONTRACT NO.: CON0020982

Executive Summary: Ultrasonic testing was conducted on the end connections of select truss members. This bridge accesses a resource area and residents. It also provides an alternate route to Slave Lake. The bridge is in good condition as is. The north hill used to slide at this location causing damage at abutments and some piers.

BIM SECTION	SPAN NO.	BIM ELEMENT	MEMBER	EXPLANATION OF CONDITION	RECOMMENDATION	PHOTO	PRIORITY	DEPARTMENT REMARKS
POSTING_INFORMATION		LOAD_POSTING		Missing load posting in advance for southbound and northbound. Missing load posting at bridge for northbound.	Place proper weight restriction signage in advance and at bridge.	N/A	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE		WEARING_SURFACE		About 10% of strip deck planks are loose with ends of planks fractured from movement. Lots of planks are developing potholes.	Replace strip deck.	4-6	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE		CURBS_WHEEL_GUARDS		Wheel guard damaged at spans 1-3, 5, and 7. Span 5 west wheel guard blocks twisted.	Replace damaged wheel guard sections.	6-7	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE		BRIDGE_RAIL		Bridge rail missing 4 bolts at each splice location. Numerous missing blocks and many never installed. Span 4 L0E bridge rail post cracked at bottom.	Install missing splice bolts and rail bolts, approximately 220. Install missing truss blocking, approximately 10. Replace cracked post.	8-9	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE	4	BATTER_POSTS	L0-U1W	L0U1W - Two 20 mm notches.	Grind smooth.	11	4-LOW (WITHIN 5 YEARS)	
SUPERSTRUCTURE	6	BATTER_POSTS	U9-L10W	U9L10W - Cracked wedge washer.	Replace wedge washer.	13	4-LOW (WITHIN 5 YEARS)	
SUPERSTRUCTURE	6	BATTER_POSTS	U9-L10E	U9L10E - Cracked wedge washer.	Replace wedge washer.	14	4-LOW (WITHIN 5 YEARS)	
SUPERSTRUCTURE	4	SWAY_BRACINGS	U5W-U5E	U5U5 - High load damage with bracing bent.	Heat straighten sway bracing.	15	3-MED (WITHIN 3 YEARS)	
SUPERSTRUCTURE	6	SWAY_BRACINGS	U2W-U2E	U2U2 - High load damage with bracing bent.	Heat straighten sway bracing.	16	3-MED (WITHIN 3 YEARS)	
SUPERSTRUCTURE	6	SWAY_BRACINGS	U3W-U3E	U3U3 - High load damage with bracing bent.	Heat straighten sway bracing.	17	3-MED (WITHIN 3 YEARS)	
SUPERSTRUCTURE	4	DIAGONALS	U7-L6E	U7-L6E - 3mm crack at U7. Old crack with no change.	Assess crack for growth or replace member.	18	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE	4	VERTICALS	U5-L5E	U5L5E - 40mm crack at cross bracing connection.	Reweld connection.	19	3-MED (WITHIN 3 YEARS)	
SUPERSTRUCTURE	5	VERTICALS	U8-L8E	U8L8E - Notched and dented 25x500mm.	Heat straighten member.	20	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE	5	VERTICALS	U9-L9E	U9L9E - Inside flange bent 20mm by wheel guard.	Heat straighten member.	21	2-HIGH (WITHIN 1 YEAR)	
SUPERSTRUCTURE	6	VERTICALS	U3-L3W	U3L3W - Minor bends at sway bracing connection.	Heat straighten member.	22	3-MED (WITHIN 3 YEARS)	

Level 2 Specialized Steel Inspection Information Summary

BIM SECTION	SPAN NO.	BIM ELEMENT	MEMBER	EXPLANATION OF CONDITION	RECOMMENDATION	PHOTO	PRIORITY	DEPARTMENT REMARKS
SUPERSTRUCTURE	4	PORTALS	U1W-U1E	U1U1 - Bottom flange dented with sheared rivets.	Replace member.	23	3-MED (WITHIN 2 YEARS)	
SUPERSTRUCTURE	4	PORTALS	U9W-U9E	U9U9 - Stretch marks on backside. Dented 160 x 1500 mm with cracks and 3 rivets broken - total 7 tears up to 25 mm in length. Bowed 45 mm overall. 60mm crack in bottom flange.	Replace member.	25-28	3-MED (WITHIN 2 YEARS)	
SUPERSTRUCTURE	5	PORTALS	U1W-U1E	U1U1 - 24 x 800 mm dent and 25 x 150 mm tear to lower flanges at centerline creating a 10 mm overall bow.	Replace member.	29-31	3-MED (WITHIN 2 YEARS)	
SUPERSTRUCTURE	5	PORTALS	U11W-U11E	U11U11 - High load damage and bottom flanges dented.	Heat straighten member.	32	3-MED (WITHIN 2 YEARS)	
SUPERSTRUCTURE	6	PORTALS	U1W-U1E	U1U1 - High load damage with multiple dents and bends at bottom flange. 60mm crack in bottom flange.	Replace member.	33-38	3-MED (WITHIN 2 YEARS)	
SUPERSTRUCTURE	6	PORTALS	U9W-U9E	U9U9 - High load damage with dent on bottom side.	Heat straighten member.	39-41	3-MED (WITHIN 2 YEARS)	
SUPERSTRUCTURE	4	BOTTOM_CHORD	L2-L3E	L2L3E - Lower outside angle bent 30x200mm.	Heat straighten member.	42	3-MED (WITHIN 3 YEARS)	
SUPERSTRUCTURE	6	BOTTOM_CHORD	L9-L10W	Full of gravel - typical of bottom chords throughout.	Wash deck and bottom chord.	43	2-HIGH (WITHIN 1 YEAR)	
SUBSTRUCTURE		ABUT_SCOUR_EROSION		Erosion gullies at both abutments.	Place approximately 20 m^3 of class 1M riprap on headslopes.	85-87	2-HIGH (WITHIN 1 YEAR)	
SUBSTRUCTURE		PIER_BEARING_SEATS_CAPS		Severe scaling at the top of piers 4 and 5.	Partial depth repairs of piers 4 and 5.	75-83	2-HIGH (WITHIN 1 YEAR)	
SUBSTRUCTURE		DEBRIS		Large amount of drift on the west side of pier 5.	Remove drift buildup.	82-84	2-HIGH (WITHIN 1 YEAR)	



STREAM FLOW

UPSTREAM: WEST

DOWNSTREAM: EAST

Alberta Transportation

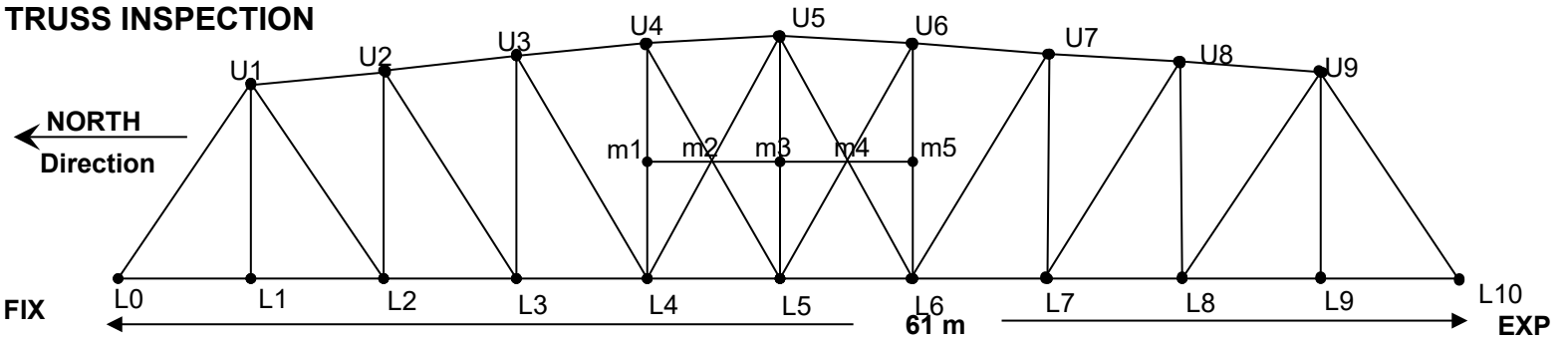
AECOM

ULTRASONIC BRIDGE INSPECTION SUMMARY
OVERALL DIAGRAM
Athabasca River Bridge
Local Road near Smith

BF71600-1

Truss ID:	**A0150-07**	**A0139-05**	**A0150-08**
Spans:	**7**		
Length:	**228.6**	**m**	
Inspection Date:	**6-Jul-20**		

TRUSS INSPECTION



Span 4

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-07

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER A- END B-END	ULTRASONIC INS. A-END No Crack	A-END Crack Under Rivet Head	A-END Crack Beyond Rivet Head	B-END No Crack	B-END Crack Under Rivet Head	B-END Crack Beyond Rivet Head	OTHER ITEMS	MEMBER Acceptable Member	MEMBER Rejected Member
Top Chord									
L0-U1W							L0U1W - Two 20 mm notches.	✔	
U1-U2W								✔	
U2-U3W								✔	
U3-U4W								✔	
U4-U5W								✔	
U5-U6W								✔	
U6-U7W								✔	
U7-U8W								✔	
U8-U9W							Missing bolt at U9 inside.	✔	
U9-L10W							Minor scrapes	✔	
Verticals									
U1-L1W	●			●			Missing bolt at lower inside.	✔	
U2-L2W								✔	
U3-L3W								✔	
U4-L4W								✔	
U5-L5W							Stretch marks at connection and at top inside bolt at U5. Last inspection noted it has a minor bend inside flange.	✔	
U6-L6W								✔	
U7-L7W								✔	
U8-L8W								✔	
U9-L9W	●			●				✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-07

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Diagonals									
U1-L2W	●			●				✔	
U2-L3W	●			●			Missing 6 bolts	✔	
U3-L4W	●			●			Missing 4 bolts	✔	
U4-L5W	●			●				✔	
U5-m2W	●			●				✔	
m2-L4W	●			●				✔	
U5-m4W	●			●				✔	
m4-L6W	●			●				✔	
U6-L5W	●			●				✔	
U7-L6W	●			●			Missing 4 bolts	✔	
U8-L7W	●			●			Missing 6 bolts	✔	
U9-L8W	●			●				✔	
m1-m2W	●			●				✔	
m2-m3w	●			●				✔	
m3-m4W	●			●				✔	
m4-m5W	●			●				✔	
Bottom Chord									
L0-L1W	●							✔	
L1-L2W								✔	
L2-L3W							Bottom outside flange with minor dent at L3.	✔	
L3-L4W								✔	
L4-L5W								✔	
L5-L6W								✔	
L6-L7W								✔	
L7-L8W								✔	
L8-L9W								✔	
L9-L10W				●				✔	
Top Chord Bracing (Note Truss Direction)									
U2W-U2E								✔	
U3W-U3E							High load damage	✔	
U4W-U4E							High load damage has bent the bottom angle, bracing is wavy.	✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-07

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
U5W-U5E							High load damage with bracing bent.	✔	
U6W-U6E							High load damage has bent the bottom angle up	✔	
U7W-U7E							High load damage has bent the bottom angle up	✔	
U8W-U8E							Top angle has upward dent, bracing is wavy.	✔	
U1W-U2E								✔	
U1E-U2W								✔	
U2W-U3E								✔	
U2E-U3W								✔	
U3W-U4E								✔	
U3E-U4W								✔	
U4W-U5E								✔	
U4E-U5W								✔	
U5W-U6E								✔	
U5E-U6W								✔	
U6W-U7E								✔	
U6E-U7W								✔	
U7W-U8E								✔	
U7E-U8W								✔	
U8W-U9E								✔	
U8E-U9W								✔	
u1W-u1E								✔	
u2W-u2E							High load damage at middle portion.	✔	
u3W-u3E							High load damage at middle portion.	✔	
u4W-u4E							High load damage at middle portion.	✔	
u5W-u5E							High load damage at middle portion.	✔	
u6W-u6E								✔	
u7W-u7E								✔	
u8W-u8E							High load damage at middle portion.	✔	

PORTALS

U1W-U1E							U1U1 - Bottom flange dented with sheared rivets.		✕
U9W-U9E							U9U9 - Stretch marks on backside. Dented 160 x 1500 mm with cracks and 3 rivets broken - total 7 tears up to 25 mm in length. Bowed 45 mm overall. 60mm crack in bottom flange.		✕

WEST U/S TRUSS

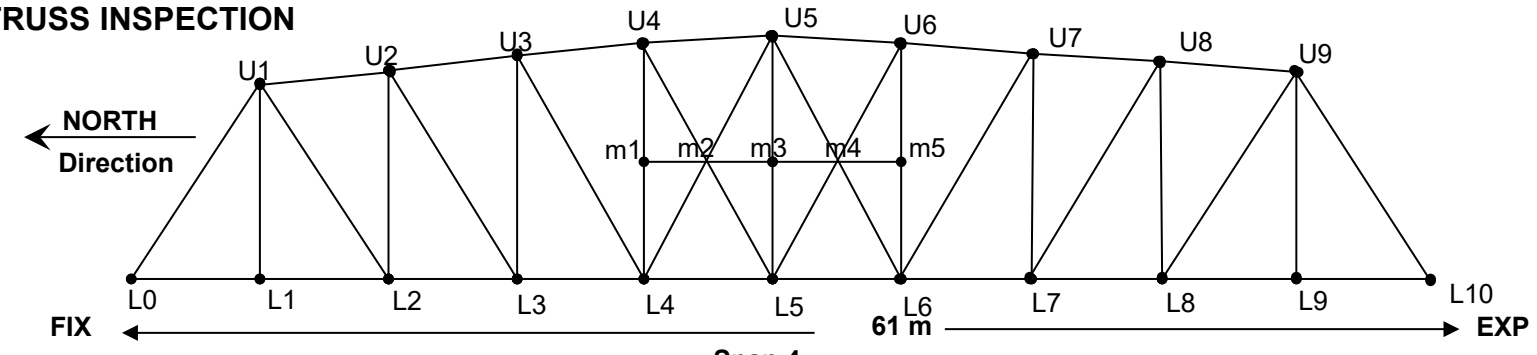
File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-07

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Lower Chord Bracing (Note Truss Direction)									
L0W-L1E								✔	
L0E-L1W								✔	
L1W-L2E								✔	
L1E-L2W								✔	
L2W-L3E								✔	
L2E-L3W								✔	
L3W-L4E								✔	
L3E-L4W								✔	
L4W-L5E								✔	
L4E-L5W								✔	
L5W-L6E								✔	
L5E-L6W								✔	
L6W-L7E								✔	
L6E-L7W								✔	
L7W-L7E								✔	
L7E-L8W								✔	
L8W-L9E								✔	
L8E-L9W								✔	
L9W-L10E								✔	
L9E-L10W							Minor dent at L10.	✔	
Floor Beams									
L0W-L0E								✔	
L1W-L1E								✔	
L2E-L2E								✔	
L3W-L3E								✔	
L4W-L4E								✔	
L5W-L5E								✔	
L6W-L6E								✔	
L7W-L7E								✔	
L8W-L8E								✔	
L9W-L9E								✔	
L10W-L10E								✔	

Bridge Name: Athabasca River, span 4 of 7
Truss Ident: A0150-07, 10-panel truss 61.0 m span
Note: All circles represent members that were tested.

TRUSS INSPECTION



Span 4

EAST D/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-07

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord									
L0-U1E								✔	
U1-U2E								✔	
U2-U3E								✔	
U3-U4E								✔	
U4-U5E								✔	
U5-U6E								✔	
U6-L7E								✔	
U7-U8E								✔	
U8-U9E							Missing bolt left side at U9 inside.	✔	
U9-L10E								✔	
Verticals									
U1-L1E	●			●			Missing rivet at L1E.	✔	
U2-L2E								✔	
U3-L3E								✔	
U4-L4E								✔	
U5-L5E							U5L5E - 40mm crack at cross bracing connection.	✔	
U6-L6E								✔	
U7-L7E								✔	
U8-L8E								✔	
U9-L9E	●			●			Missing 2 bolts at L9 inside flange due to fabrication error. Minor paint scrapes.	✔	

EAST D/S TRUSS

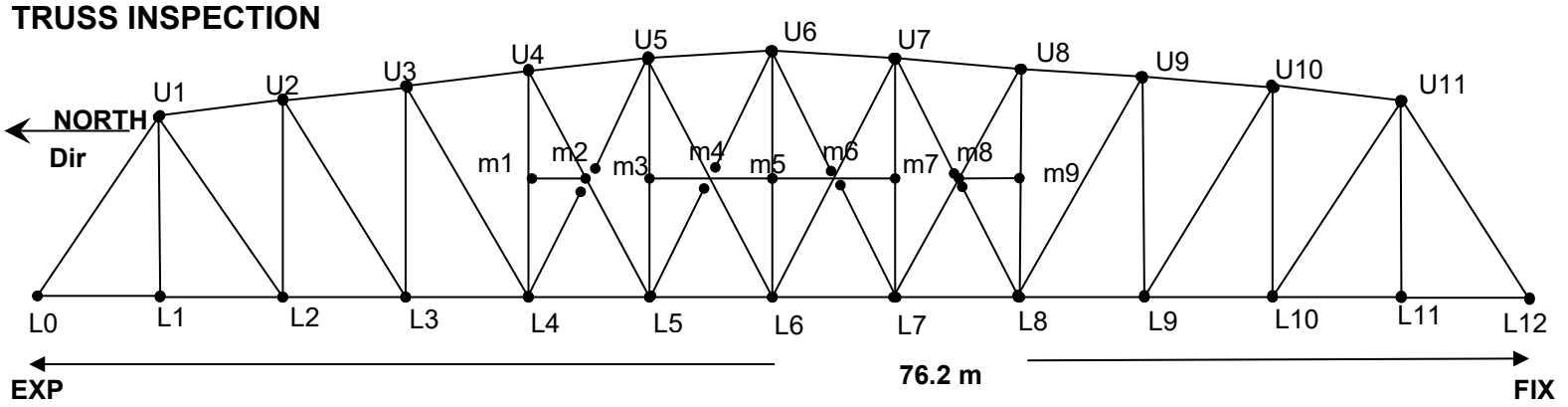
File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-07

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Diagonals									
U1-L2E	●			●				✔	
U2-L3E	●			●			Missing 6 bolts	✔	
U3-L4E	●			●			Missing 4 bolts	✔	
U4-L5E	●			●				✔	
U5-m2E	●			●				✔	
m2-L4E	●			●				✔	
U5-m4E	●			●				✔	
m4-L6E	●			●				✔	
U6-L5E	●			●				✔	
U7-L6E		✕		●			U7-L6E - 3mm crack at U7. Old crack with no change.		✕
U8-L7E	●			●			Missing 6 bolts	✔	
U9-L8E	●			●				✔	
m1-m2E	●			●				✔	
m2-m3E	●			●				✔	
m3-m4E	●			●				✔	
m4-m5E	●			●				✔	
Bottom Chord									
L0-L1E	●							✔	
L1-L2E								✔	
L2-L3E							L2L3E - Lower outside angle bent 30x200mm.	✔	
L3-L4E								✔	
L4-L5E								✔	
L5-L6E								✔	
L6-L7E								✔	
L7-L8E								✔	
L8-L9E								✔	
L9-L10E				●				✔	

Bridge Name: Athabasca River, span 4 of 7
Truss Ident: A0150-07, 10-panel truss 61.0 m span
Note: All circles represent members that were tested.

TRUSS INSPECTION



Span 5

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord									
L0-U1W							Minor bend at top flange.	✔	
U1-U2W								✔	
U2-U3W								✔	
U3-U4W								✔	
U4-U5W							Jacking plates are welded to the top chord at U4.	✔	
U5-U6W								✔	
U6-U7W							Jacking plates are welded to the top chord at U6.	✔	
U7-U8W								✔	
U8-U9W								✔	
U9-U10W								✔	
U10-U11W								✔	
U11-L12W							Two holes are in the gusset and none in the member near U11. Two bolts missing at wheelguard height. Minor dent and notch.	✔	
Verticals									
U1-L1W	●			●				✔	
U2-L2W							Minor dent just above rail.	✔	
U3-L3W								✔	
U4-L4W								✔	
U5-L5W							Rough hole at inner lacing bar bolt.	✔	
U6-L6W							Old weldment left in place for replacing members at L6.	✔	
U7-L7W								✔	
U8-L8W								✔	
U9-L9W							Inside flange dent at old sway brace location. Flanges distorted from high load damage straining the connection.	✔	
U10-L10W							Minor distortions.	✔	
U11-L11W	●			●			Bowed 8 mm at the rail/wheelguard height.	✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Diagonals									
U1-L2W	●			●				✔	
U2-L3W	●			●			Typical 8 open holes at L3.	✔	
U3-L4W	●			●			Typical 6 open holes at L4.	✔	
U4-L5W	●			●				✔	
U5-m2W	●			●				✔	
m2-L4W	●			●				✔	
U5-L6W	●			●				✔	
U6-m4W	●			●				✔	
m4-L5W	●			●				✔	
U6-m6W	●			●				✔	
m6-L7W	●			●				✔	
U7-L6W	●			●				✔	
U7-m8W	●			●				✔	
m8-L8W	●			●				✔	
U8-L7W	●			●				✔	
U9-L8W	●			●			Typical 6 open holes at L8.	✔	
U10-L9W	●			●			Typical 6 open holes.	✔	
U11-L10W	●			●			Typical 6 open holes	✔	
m1-m2W	●			●				✔	
m3-m4W	●			●				✔	
m4-m5W	●			●				✔	
m5-m6W	●			●				✔	
m6-m7W	●			●				✔	
m7-m8W	●			●				✔	
m8-m9W	●			●				✔	
Bottom Chord									
L0-L1W	●							✔	
L1-L2W								✔	
L2-L3W								✔	
L3-L4W								✔	
L4-L5W								✔	
L5-L6W								✔	
L6-L7W								✔	
L7-L8W								✔	
L8-L9W								✔	
L9-L10W								✔	
L10-L11W								✔	
L11-L12W				●				✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord Bracing (Note Truss Direction)									
U2W-U2E								✔	
U3W-U3E								✔	
U4W-U4E								✔	
U5W-U5E								✔	
U6W-U6E								✔	
U7W-U7E								✔	
U8W-U8E								✔	
U9W-U9E								✔	
U10W-U10E								✔	
U1W-U2E								✔	
U1E-U2W								✔	
U2W-U3E								✔	
U2E-U3W								✔	
U3W-U4E								✔	
U3E-U4W								✔	
U4W-U5E								✔	
U4E-U5W								✔	
U5W-U6E								✔	
U5E-U6W								✔	
U6W-U7E								✔	
U6E-U7W								✔	
U7W-U8E								✔	
U7E-U8W								✔	
U8W-U9E								✔	
U8E-U9W								✔	
U9W-U10E								✔	
U9E-U10W								✔	
U10W-U11E								✔	
U10E-U11W								✔	
u1W-u1E								✔	
u2W-u2E								✔	
u3W-u3E								✔	
u4W-u4E								✔	
u5W-u5E								✔	
u6W-u6E								✔	
u7W-u7E								✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
u8W-u8E								✔	
u9W-u9E								✔	
u10W-u10E								✔	
PORTALS									
U1W-U1E							U1U1 - 24 x 800 mm dent and 25 x 150 mm tear to lower flanges at centerline creating a 10 mm overall bow.		X
U11W-U11E							U11U11 - High load damage and bottom flanges dented.	✔	
Lower Chord Bracing (Note Truss Direction)									
L0W-L1E								✔	
L0E-L1W								✔	
L1W-L2E								✔	
L1E-L2W								✔	
L2W-L3E								✔	
L2E-L3W								✔	
L3W-L4E								✔	
L3E-L4W								✔	
L4W-L5E								✔	
L4E-L5W								✔	
L5W-L6E								✔	
L5E-L6W								✔	
L6W-L7E								✔	
L6E-L7W								✔	
L7W-L7E								✔	
L7E-L8W								✔	
L8W-L9E								✔	
L8E-L9W							Rust blisters at L8E.	✔	
L9W-L10E								✔	
L9E-L10W								✔	
L10W-L11E								✔	
L10E-L11W								✔	
L11W-L12E								✔	
L11E-L12W								✔	

WEST U/S TRUSS

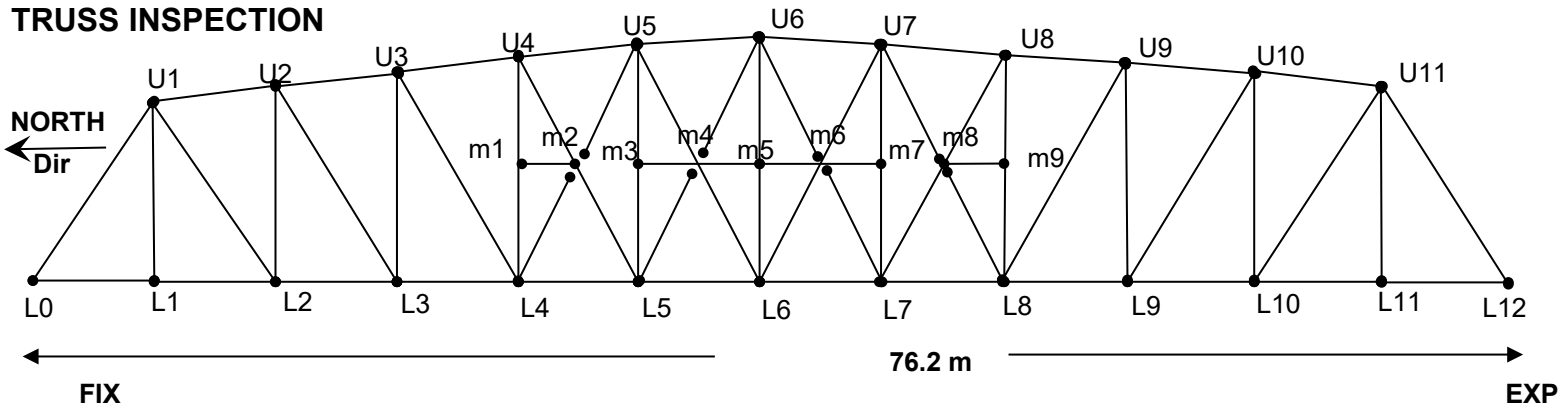
File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Floor Beams									
L0W-L0E								✔	
L1W-L1E								✔	
L2E-L2E								✔	
L3W-L3E								✔	
L4W-L4E								✔	
L5W-L5E								✔	
L6W-L6E								✔	
L7W-L7E								✔	
L8W-L8E								✔	
L9W-L9E								✔	
L10W-L10E								✔	
L11W-L11E								✔	
L12W-L12E								✔	

Bridge Name: Athabasca River, span 5 of 7
Truss Ident: A0139-05, 12-panel truss 76.2 m span
Note: All circles represent members that were tested.

TRUSS INSPECTION



Span 5
EAST D/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord									
L0-U1E							Two holes are in the gusset and none in the member near U1 - Typical at all corners. Two minor dents.	✔	
U1-U2E								✔	
U2-U3E								✔	
U3-U4E								✔	
U4-U5E							Jacking plates are welded to the top chord at U4.	✔	
U5-U6E								✔	
U6-L7E							Jacking plates are welded to the top chord at U6.	✔	
U7-U8E								✔	
U8-U9E								✔	
U9-U10E								✔	
U10-U11E								✔	
U11-L12E							Two holes are in the gusset and none in the member near U11. Two open holes at curb height.	✔	
Verticals									
U1-L1E	●			●				✔	
U2-L2E								✔	
U3-L3E							Minor dent at 3/4 height.	✔	
U4-L4E							15 mm sweep inside flange.	✔	
U5-L5E							Minor dent with notch above mid.	✔	
U6-L6E								✔	
U7-L7E								✔	
U8-L8E							U8L8E - Notched and dented 25x500mm.	✔	
U9-L9E							U9L9E - Inside flange bent 20mm by wheel guard.	✔	
U10-L10E								✔	
U11-L11E	●			●				✔	

EAST D/S TRUSS

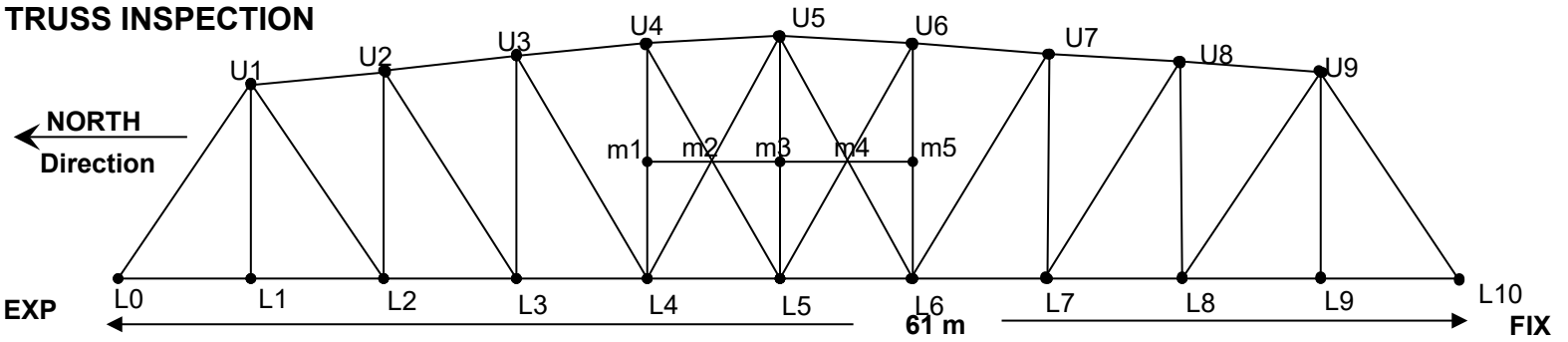
File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0139-05

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Diagonals									
U1-L2E	●			●				✔	
U2-L3E	●			●				✔	
U3-L4E	●			●				✔	
U4-L5E	●			●				✔	
U5-m2E	●			●				✔	
m2-L4E	●			●			Minor notch inside flange at 4/5 height.	✔	
U5-L6E	●			●			Dented 5 mm and overall bend of 25 mm.	✔	
U6-m4E	●			●				✔	
m4-L5E	●			●			Notch and deformed.	✔	
U6-m6E	●			●				✔	
m6-L7E	●			●				✔	
U7-L6E	●			●				✔	
U7-m8E	●			●				✔	
m8-L8E	●			●				✔	
U8-L7E	●			●				✔	
U9-L8E	●			●			Typical 6 open holes at L8	✔	
U10-L9E	●			●			Typical 6 open holes at L9	✔	
U11-L10E	●			●				✔	
m1-m2E	●			●				✔	
m3-m4E	●			●				✔	
m4-m5E	●			●				✔	
m5-m6E	●			●				✔	
m7-m8E	●			●				✔	
m8-m9E	●			●				✔	
Bottom Chord									
L0-L1E	●							✔	
L1-L2E								✔	
L2-L3E								✔	
L3-L4E								✔	
L4-L5E								✔	
L5-L6E								✔	
L6-L7E								✔	
L7-L8E								✔	
L8-L9E								✔	
L9-L10E								✔	
L10-L11E								✔	
L11-L12E				●				✔	

Bridge Name: Athabasca River, span 5 of 7
Truss Ident: A0139-05, 12-panel truss 76.2 m span
Note: All circles represent members that were tested.

TRUSS INSPECTION



Span 6

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-08

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord									
L0-U1W							Missing 2 bolts at U1 joint on outside (Typ) and 3 bolts on inside.	✔	
U1-U2W							Missing 2 bolts on inside lower flange.	✔	
U2-U3W								✔	
U3-U4W								✔	
U4-U5W								✔	
U5-U6W								✔	
U6-U7W								✔	
U7-U8W								✔	
U8-U9W								✔	
U9-L10W							U9L10W - Cracked wedge washer.	✔	
Verticals									
U1-L1W	●			●				✔	
U2-L2W								✔	
U3-L3W							U3L3W - Minor bends at sway bracing connection.	✔	
U4-L4W							Bent 10 mm near old bracing.	✔	
U5-L5W							Weld of top bracing to vertical has gouged the member. 10 mm notch at chest height. Missing 2 bolts.	✔	
U6-L6W								✔	
U7-L7W								✔	
U8-L8W								✔	
U9-L9W	●			●			Minor dent and notches at 2m above flexbeam.	✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-08

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Diagonals									
U1-L2W	●			●			Minor dent at 4/5 height. 1 missing bolt with hole in angle.	✔	
U2-L3W	●			●			6 open holes within connection and none on top.	✔	
U3-L4W	●			●			4 open holes within connection and none on top. Misaligned holes throughout.	✔	
U4-L5W	●			●				✔	
U5-L4W	●			●			"S" dent inside angle up to 15 mm distortion.	✔	
m2-L4W	●			●			Minor dent at rail.	✔	
U5-m4W	●			●				✔	
m4-L6W	●			●				✔	
U6-L5W	●			●				✔	
U7-L6W	●			●			Typical 4 missing bolts.	✔	
U8-L7W	●			●			Typical 6 misisng bolts.	✔	
U9-L8W	●			●				✔	
m1-m2W	●			●				✔	
m2-m3w	●			●				✔	
m3-m4W	●			●				✔	
m4-m5W	●			●				✔	
Bottom Chord									
L0-L1W	●						Both outside flanges are bent 15 mm at L0.	✔	
L1-L2W								✔	
L2-L3W								✔	
L3-L4W								✔	
L4-L5W								✔	
L5-L6W								✔	
L6-L7W								✔	
L7-L8W								✔	
L8-L9W								✔	
L9-L10W				●			Full of gravel - typical of bottom chords throughout.	✔	

WEST U/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-08

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord Bracing (Note Truss Direction)									
U2W-U2E							High load damage with bracing bent.	✔	
U3W-U3E							High load damage with bracing bent.	✔	
U4W-U4E								✔	
U5W-U5E								✔	
U6W-U6E							Crack in the weld holding the bottom clip angle.	✔	
U7W-U7E							Member bowed.High load damage bracing distorted.	✔	
U8W-U8E							High load damage bracing distorted.	✔	
U1W-U2E								✔	
U1E-U2W								✔	
U2W-U3E								✔	
U2E-U3W								✔	
U3W-U4E								✔	
U3E-U4W								✔	
U4W-U5E								✔	
U4E-U5W								✔	
U5W-U6E								✔	
U5E-U6W								✔	
U6W-U7E								✔	
U6E-U7W								✔	
U7W-U8E								✔	
U7E-U8W								✔	
U8W-U9E								✔	
U8E-U9W								✔	
u1W-u1E								✔	
u2W-u2E								✔	
u3W-u3E								✔	
u4W-u4E								✔	
u5W-u5E								✔	
u6W-u6E								✔	
u7W-u7E								✔	
u8W-u8E								✔	
PORTALS									
U1W-U1E							U1U1 - High load damage with multiple dents and bends at bottom flange. 60mm crack in bottom flange.		✘
U9W-U9E							U9U9 - High load damage with dent on bottom side.	✔	

WEST U/S TRUSS

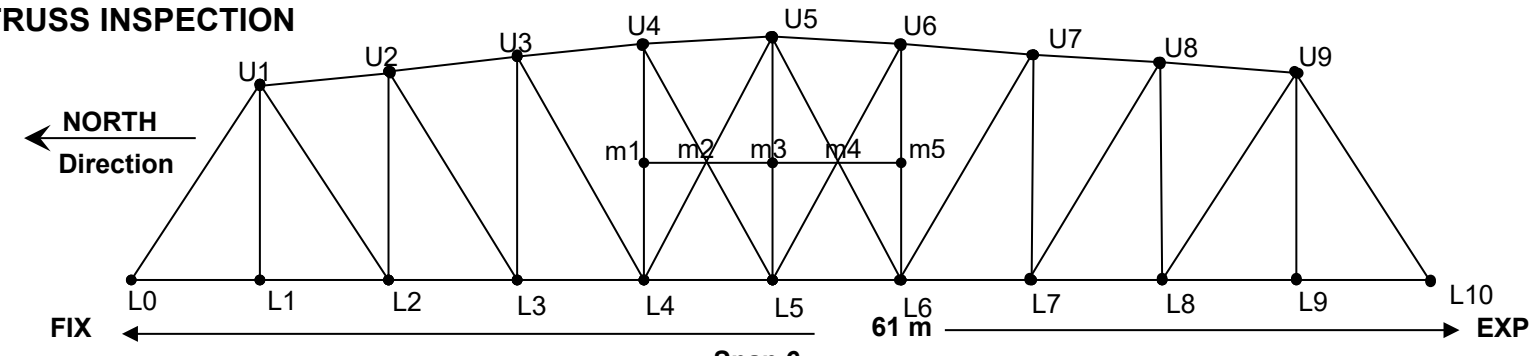
File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-08

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Lower Chord Bracing (Note Truss Direction)									
L0W-L1E								✔	
L0E-L1W								✔	
L1W-L2E								✔	
L1E-L2W								✔	
L2W-L3E								✔	
L2E-L3W								✔	
L3W-L4E								✔	
L3E-L4W								✔	
L4W-L5E								✔	
L4E-L5W								✔	
L5W-L6E								✔	
L5E-L6W								✔	
L6W-L7E								✔	
L6E-L7W								✔	
L7W-L7E								✔	
L7E-L8W							Slightly bent gusset at L7.	✔	
L8W-L9E								✔	
L8E-L9W							Sway brace bent under bridge 30 mm. Isolated minor 6 - 12 mm bends at diagonals.	✔	
L9W-L10E								✔	
L9E-L10W								✔	
Floor Beams									
L0W-L0E								✔	
L1W-L1E							Typical floor beam with strengthening plates at top and bottom. Open holes at west side of floor beam.	✔	
L2E-L2E							Open holes at west side of floor beam.	✔	
L3W-L3E							Open holes at west side of floor beam.	✔	
L4W-L4E							Open holes at west side of floor beam.	✔	
L5W-L5E								✔	
L6W-L6E								✔	
L7W-L7E								✔	
L8W-L8E								✔	
L9W-L9E								✔	
L10W-L10E								✔	

Bridge Name: Athabasca River, span 6 of 7
Truss Ident: A0150-08, 10-panel truss 61.0 m span
Note: All circles represent members that were tested.

TRUSS INSPECTION



Span 6

EAST D/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-08

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Top Chord									
L0-U1E							Missing 3 lower bolts at U1, but no holes in member. Missing 2 bolts at top connection.	✔	
U1-U2E								✔	
U2-U3E								✔	
U3-U4E								✔	
U4-U5E								✔	
U5-U6E								✔	
U6-L7E								✔	
U7-U8E								✔	
U8-U9E								✔	
U9-L10E							U9L10E - Cracked wedge washer.	✔	
Verticals									
U1-L1E	●			●				✔	
U2-L2E							2 open holes at 0.5m above flexbeam and 1 missing bolt at U2.	✔	
U3-L3E								✔	
U4-L4E								✔	
U5-L5E								✔	
U6-L6E								✔	
U7-L7E								✔	
U8-L8E							30 mm gentle bend of inside flange top half.	✔	
U9-L9E	●			●				✔	

EAST D/S TRUSS

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River
Truss ID: A0150-08

Inspection Date: 6-Jul-2020
Inspected by: Randy Bredo
Colin Roy

MEMBER	ULTRASONIC INS.							MEMBER	
	A-END			B-END					
A- END B-END	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	No Crack	Crack Under Rivet Head	Crack Beyond Rivet Head	OTHER ITEMS	Acceptable Member	Rejected Member
Diagonals									
U1-L2E	●			●			Fabrication error, 2 missing bolts.	✔	
U2-L3E	●			●				✔	
U3-L4E	●			●			Additional welded plate to the existing gusset plate at U3. Missing 4 bolts.	✔	
U4-L5E	●			●				✔	
U5-m2E	●			●				✔	
m2-L4E	●			●				✔	
U5-m4E	●			●				✔	
m4-L6E	●			●				✔	
U6-L5E	●			●				✔	
U7-L6E	●			●			Typical missing 4 bolts.	✔	
U8-L7E	●			●			Typical missing 6 bolts.	✔	
U9-L8E	●			●				✔	
m1-m2E	●			●				✔	
m2-m3E	●			●				✔	
m3-m4E	●			●				✔	
m4-m5E	●			●				✔	
Bottom Chord									
L0-L1E	●						Bow in the gusset plate due to mishandling. Dent in bottom angle at L0, 15 by 150mm.	✔	
L1-L2E								✔	
L2-L3E								✔	
L3-L4E								✔	
L4-L5E								✔	
L5-L6E								✔	
L6-L7E								✔	
L7-L8E								✔	
L8-L9E								✔	
L9-L10E				●				✔	

Bridge Name: Athabasca River, span 6 of 7
Truss Ident: A0150-08, 10-panel truss 61.0 m span
Note: All circles represent members that were tested.

Bearing Measurements

File: 71600-1
Bridge Name: Local Road near Smith
Stream: Athabasca River

Inspection Date: 6-Jul-20
Inspected by: Randy Bredo
Colin Roy

Span	1	2	3	4	5	6	7
Truss Type	TT	TT	TT	TH	TH	TH	RB
Span Lengths	8.5	8.5	8.5	61	76.2	61	4.9

Bearing Measurements

Span	Location	Truss	End	Fixed or Exp	Type	Temp (°C)	Measured	Design Setting	Difference	Slot Size	Dirty	Corroded Interface	Comments/Missing Components
4	P3	L10W	South	Exp	SP	20	31	17	14	75	Y	N	Missing bolt top cover plate. Expanded 10 mm. Anchor Bolt nut is too tight. Anchor bolt bent.
		L10E				20	31	17	14	75	Y	N	Anchor bolt bent
	P4	L0W	North	Fix	PF						Y	N	
		L0E									Y	N	2 mm gap between trusses.
5	P4	L12W	South	Exp	SP	20	27	21	6	75	Y	N	Sliding plate bearing with stainless steel and teflon.
		L12E				20	23	21	2	75	Y	N	2 mm gap between trusses.
	P5	L0W	North	Fix	PF						Y	N	3 mm gap between trusses.
		L0E									Y	N	
6	P5	L10W	South	Fix	PF						Y	N	3 mm gap between trusses.
		L10E									Y	N	
	P6	L0W	North	Exp	SP	20	41	2	39	75	Y	N	Expansion device to accommodate sliding hill still has room to move. Modified expansion bearing. No anchor bolt at exterior.
		L0E				20	55	2	53	75	Y	N	Expansion device to accommodate sliding hill still has room to move but one of the anchor bolts has been removed. Bow in the gusset plate at L0E due to mishandling. Anchor bolt maxed out and bent.

RN=Roller Nest, **NR=**Reinforced Neoprene Pads, **NT=**NR+Teflon and Stainless Steel, **RK=**Rocker, **RL=**Roller,
DD=Disc and Dome, **SP=**Sliding Plates, **PF=**Pinned is used for all fixed bearings.
Some fixed bearings will have a DD above it and should be noted.
Design Setting = .011 x (temp + 5C) x (bridge length-meters)
Measurements are in mm unless noted otherwise.

Gusset Plate Thickness Measurements for Corrosion Monitoring

File: 71600-1
Bridge Name: Athabasca River Bridge
Stream: Local Road near Smith
Truss ID: A0150-07 A0139-05 A0150-08

Inspection Date: 6-Jul-20
Inspected by: Randy Bredo, Colin Roy

		Rating Range			Rating Range
Salted:	**No**	Yes / No	**Paint Rating:**	**5**	1-9
Corrosion Rate:	**Low**	Slow / Medium / Fast	**Recoatability Rating:**	**5**	1-9
Corrosion Damage:	**Low**	Low / Medium / High	**Paint Priority:**	**Low**	Low / Medium / High

Field Measurements of Gusset Plate Thickness:

Component - A0150-07
Span 4

WEST U/S TRUSS			EAST D/S TRUSS		
	L0	L10		L0	L10
Sample	Gusset (mm)	Gusset (mm)	Sample	Gusset (mm)	Gusset (mm)
1	9.3	9.3	1	9.5	9.6
2	9.6	9.4	2	9.6	9.7
3	9.4	9.3	3	9.6	9.6
4	9.3	9.5	4	9.8	9.5
Minimum Value	9.3	9.3	Minimum Value	9.5	9.5
Design Uncoated = 9.54 mm					
Field Coated					

Component - A0139-05
Span 5

WEST U/S TRUSS			EAST D/S TRUSS		
	L0	L10		L0	L10
Sample	Gusset (mm)	Gusset (mm)	Sample	Gusset (mm)	Gusset (mm)
1	12.8	12.9	1	13.0	12.7
2	12.7	12.9	2	12.9	12.8
3	12.8	12.9	3	12.9	12.9
4	12.8	13.0	4	12.9	12.7
Minimum Value	12.7	12.9	Minimum Value	12.9	12.7
Design Uncoated = 12.5 mm					
Field Coated					

Component - A0150-08
Span 6

WEST U/S TRUSS			EAST D/S TRUSS		
	L0	L10		L0	L10
Sample	Gusset (mm)	Gusset (mm)	Sample	Gusset (mm)	Gusset (mm)
1	9.2	11.0	1	9.3	9.5
2	9.4	10.2	2	9.3	9.3
3	9.2	10.5	3	9.3	9.4
4	9.3	10.3	4	9.5	9.4
Minimum Value	9.2	10.2	Minimum Value	9.3	9.3
Design Uncoated = 9.54 mm					
Field Coated					

Other Measurements

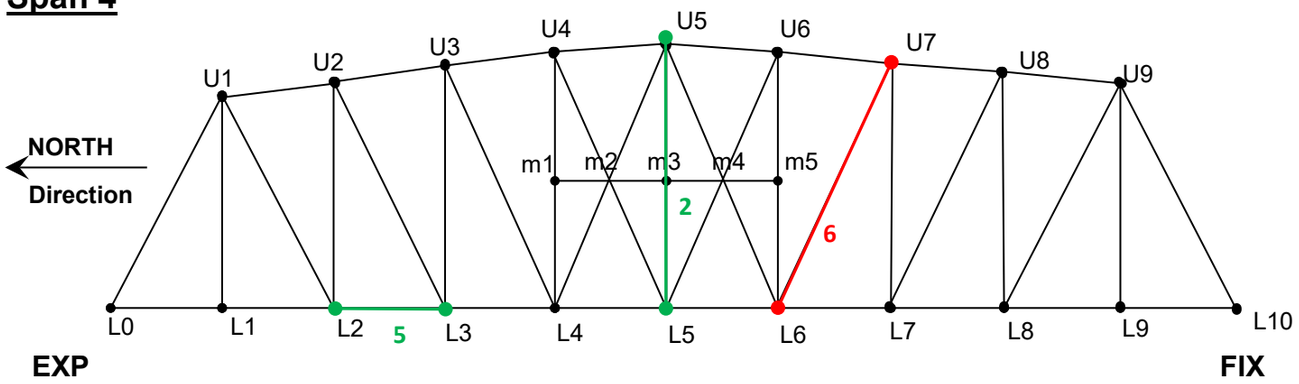
location	Uncorroded	Corroded
S5L0E	13.56	12.01
S6L0E	10.05	6.81

Comments:
Corrosion is not an issue at this bridge and unlikely to become one for the next decade.

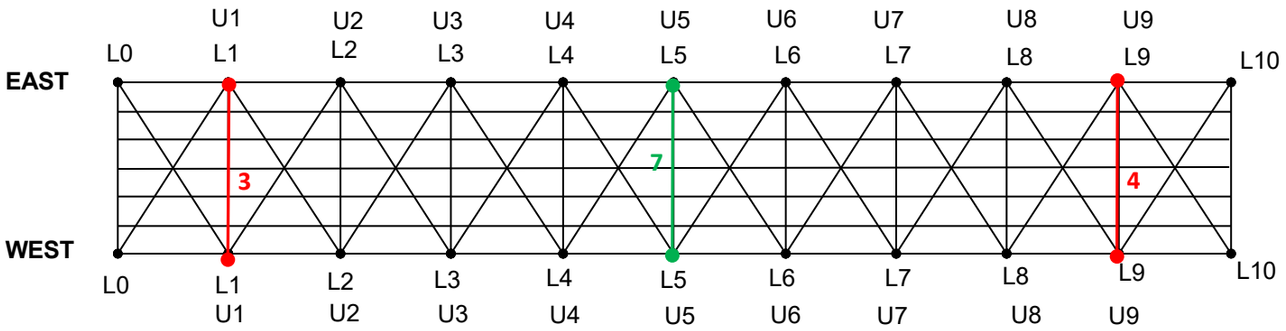
Notes:

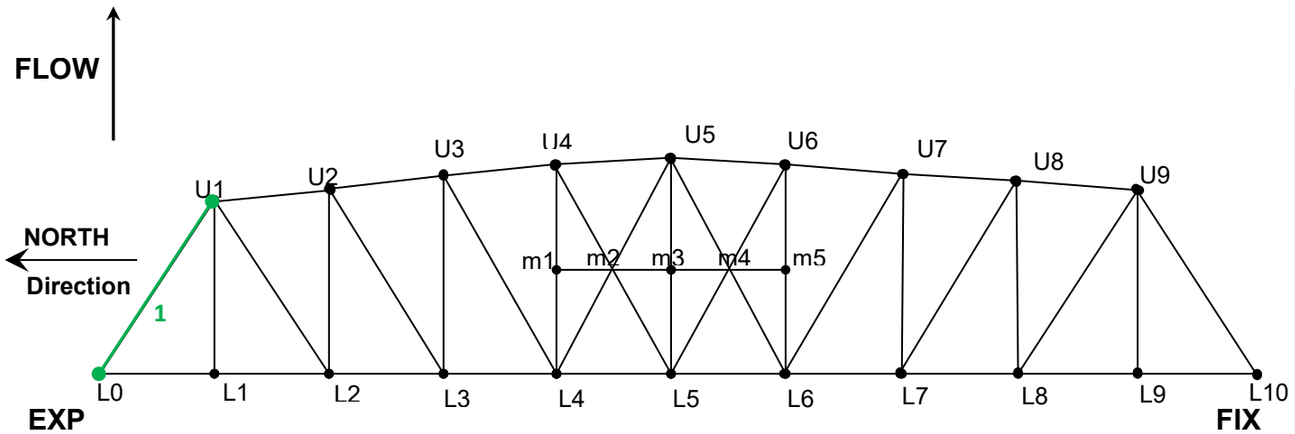
1. Thickness readings include the paint thickness on one side, so the actual plate thickness will be a number greater than the original plate thickness if no corrosion is present.
2. Steel plates fluctuate in thickness during the manufacturing process so readings will vary slightly even if no corrosion is present.
3. Multiple thickness measurements were taken to give a representation of the worst, average and best examples of the plate.

Span 4



EAST D/S TRUSS





WEST U/S TRUSS

Remarks

1 L0U1W - Two 20 mm notches.

2 U5L5E - 40mm crack at cross bracing connection.

3 U1U1 - Bottom flange dented with sheared rivets.

4 U9U9 - Stretch marks on backside. Dented 160 x 1500 mm with cracks and 3 rivets broken - total 7 tears up to 25 mm in length. Bowed 45 mm overall. 60mm crack in bottom flange.

5 L2L3E - Lower outside angle bent 30x200mm.

6 U7-L6E - 3mm crack at U7. Old crack with no change.

7 U5U5 - High load damage with bracing bent.

Recommendations

Grind out notches: 1

Repair/reweld crack: 2

Replace members: 3 and 4

Heat straighten member: 5 and 7

Assess or replace cracked member: 6

LEGEND

REPLACE

REPAIR/ STRAIGHTEN

BOLTS

Alberta Transportation

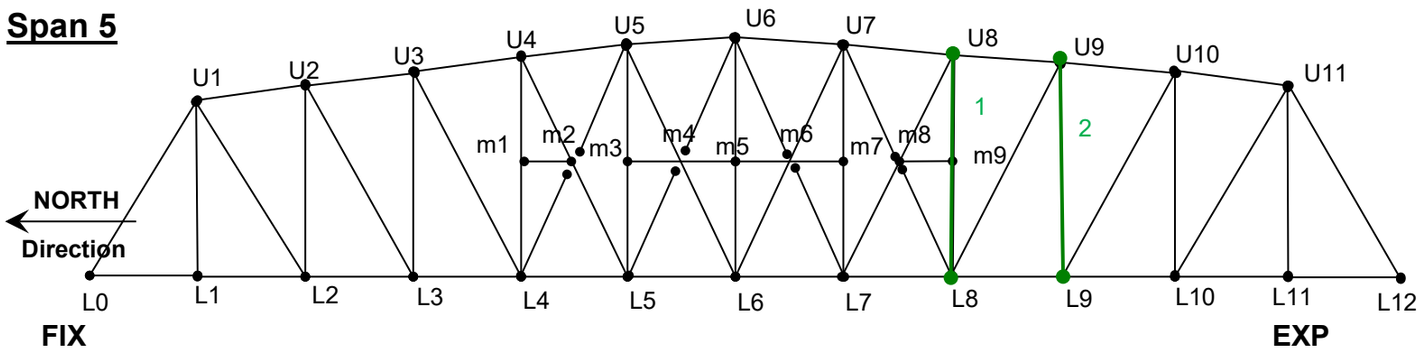
AECOM

ULTRASONIC BRIDGE INSPECTION SUMMARY
10-PANEL TRUSS DIAGRAM
Athabasca River
Local Road near Smith

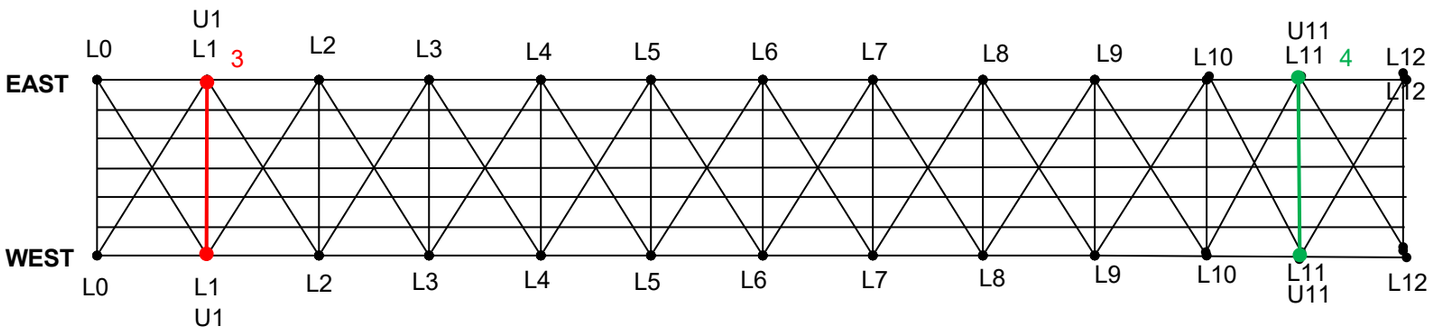
BF71600-1

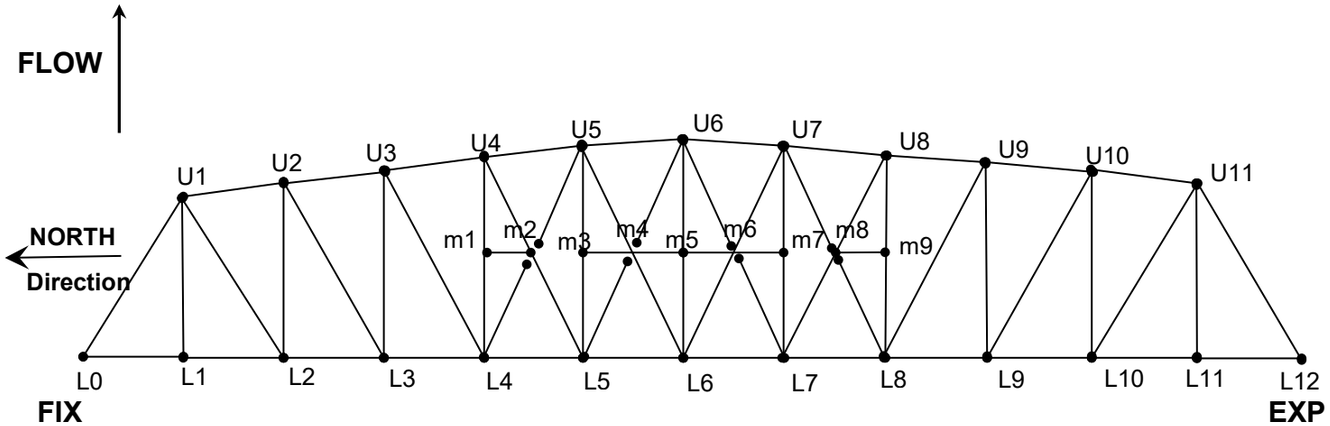
Truss ID:	**A0150-07**
Span:	**4 of 7**
Length:	**61.0 m**
Inspection Date:	**6-Jul-20**

Span 5



EAST D/S TRUSS





WEST U/S TRUSS

Remarks

1 U8L8E - Notched and dented 25x500mm.

2 U9L9E - Inside flange bent 20mm by wheel guard.

3 U1U1 - 24 x 800 mm dent and 25 x 150 mm tear to lower flanges at centerline creating a 10 mm overall bow.

4 U11U11 - High load damage and bottom flanges dented.

Recommendations

Heat straighten members: 1, 2, and 4

Replace member: 3

LEGEND

REPLACE

REPAIR/ STRAIGHTEN

BOLTS

Alberta Transportation

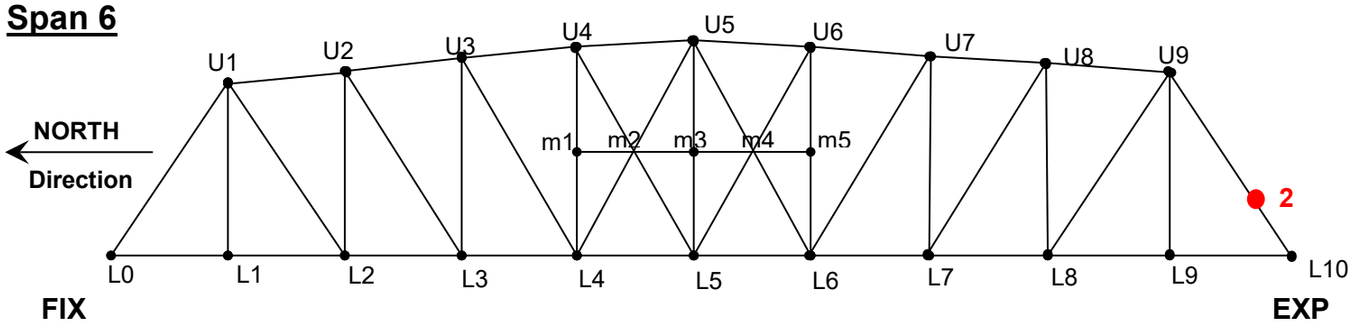
AECOM

ULTRASONIC BRIDGE INSPECTION SUMMARY
12-PANEL TRUSS DIAGRAM
Athabasca River
Local Road near Smith

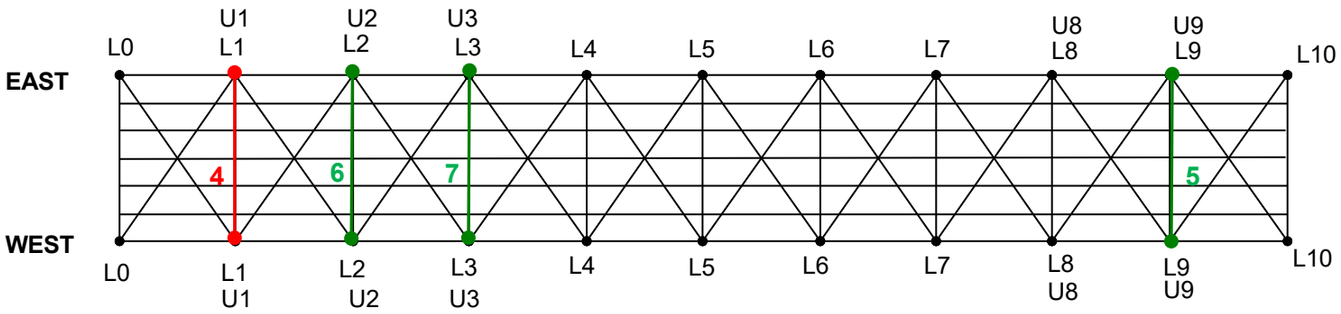
BF71600-1

Truss ID:	**A0139-05**
Span:	**5 of 7**
Length:	**76.2 m**
Inspection Date:	**6-Jul-20**

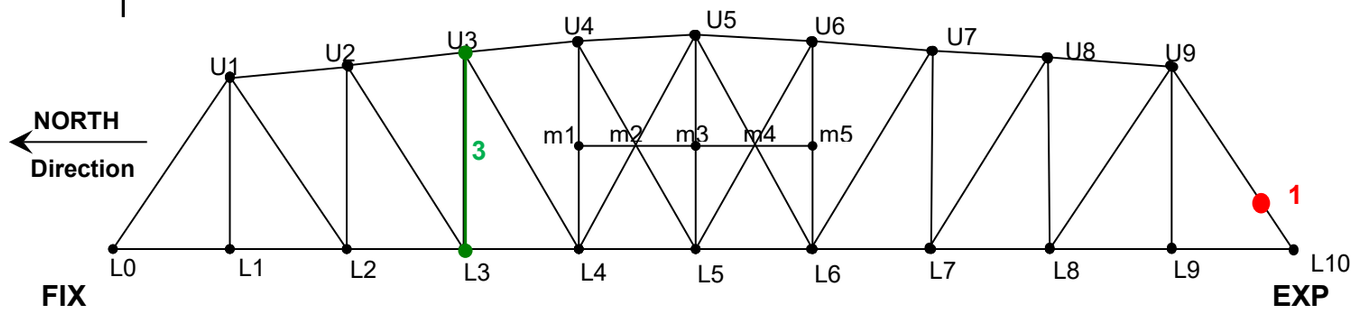
Span 6



EAST D/S TRUSS



FLOW



WEST U/S TRUSS

Remarks

1 U9L10W - Cracked wedge washer.
2 U9L10E - Cracked wedge washer.
3 U3L3W - Minor bends at sway bracing connection.
4 U1U1 - High load damage with multiple dents and bends at bottom flange. 60mm crack in bottom flange.
5 U9U9 - High load damage with dent on bottom side.
6 U2U2 - High load damage with bracing bent.
7 U3U3 - High load damage with bracing bent.

Recommendations

Replace cracked washers: 1 and 2
Heat straighten member: 3, 5, 6, and 7
Replace member: 4

LEGEND

REPLACE
REPAIR/ STRAIGHTEN
BOLTS / WASHERS

Alberta Transportation

AECOM

ULTRASONIC BRIDGE INSPECTION SUMMARY
10-PANEL TRUSS DIAGRAM
Athabasca River
Local Road near Smith

BF71600-1

Truss ID:	**A0150-08**
Span:	**6 of 7**
Length:	**61.0 m**
Inspection Date:	**6-Jul-20**

Bridge Inspection

Bridge File Number	71600 -1 Bridge	Form Type	1H TT
Year Built/Year Superr	1945/1944	Lic No.	
Bridge or Town Name	SMITH	Inspector Name	Colin Roy
Located Over	ATHABASCA RIVER, 8.11, WATERCRS-ST	Inspector Class	A
Located On	LOCAL ROAD	Assistant Name	R Gadu
Water Body Cl./Year		Assistant Class	A
Navigabil. Cl./Year		Inspection Date	July 6/2020
Legal Land Location	NW SEC 23 TWP 71 RGE 1 W5M	Arrive Time	9:00 AM
Longitude, Latitude	-114:02:38, 55:10:12	Depart Time	5:00 PM
Road Authority	M.D. OF LESSER SLAVE RIVER NO. 124	Data Entry By	
Contract Main Area	UNDEFINED CMA	Data Entry Date	
Clear Roadway/Skew	5.5 /	Reviewer Name	
AADT/Year	280 / ~~2617~~(E) 2020	Review Date	
Road Classification	RLU-210G-90	Dept. Reviewer Name	
Detour Length (km)	60	Dept. Review Date	
		Follow-Up By	

Allowable Load (t):	Single	H 32 FLOOR BEAM	Sem	HS 45 FLOOR BEAM	Train	CS3 64 U2U3	—> On Critical Spans —>Critical Member
Design Loading:		HS20					—> Primary Spar

Posting Information

Required Verl. Clearance Posting (m)											
Posted Vertical Clearance (Y/N)			Yes								
Posted:	Lane	NB	On Bridge (m)	4.4	In Advance (Y/N)	Yes	Lane	SB	On Bridge (m)	4.4	In Advance (Y/N)	Yes
Remarks	Measured 4.702 and 4.592m - ~~April 3, 2014~~; Confirmed - measurements										

Required Load Posting (t)			Single		Semi		Truck Train	
Posted Loading (t)			Single	32.0	Semi	45.0	Truck Train	64.0
Posted:	Lane	NB	At Junction (Y/N)	Yes	In Advance (Y/N)	No	At Bridge (Y/N)	No
Posted:	Lane	SB	At Junction (Y/N)	Yes	In Advance (Y/N)	No	At Bridge (Y/N)	Yes
Remarks	Required where missing. NOT TO STANDARD. NB junction is close to bridge							

Hazard Marker At Bridge (Y/N)	Yes
Remarks	
Other Sign Types	Narrow bridge, Slup l oncoming traffic on bridge, Max 30, Curve.

Utilities (Located at)

Utility Attachments			
Telephone	2 wires 20m East and 1 wire 10m E	Gas	
Power	3 wires 20m West.	Municipal	
Others		Problem (Y/N)	No
Remarks			

Approach Road

		Last	Now	Explanation of Condition
Horizontal Alignment:		4	4	Sharp curve South side.
Vertical Alignment		4	4	Steep hill North side. Limited sight distance.
Roadway Width (m)	10.000			Settlement/Jump on South approach
Approach Bump		4	4	
Guardrail (Y/N)	Yes			~~Str is damage, 2 sections at NE, 2 sections at SE TDE.~~ ~~Bent steel spacer at NE.~~ ~~TDE at SE is disconnected from post~~ Damaged TB at NW
Guardrail		3	5	
Length (m)	8.000			
Current Standard (Y/N)	No			Minor damage at ends.
Termination Type	Turned Down			
Drainage		4	4	Headslope gully on South and North related to approach drainage. Approach windrows force drainage onto headslopes.
Approach Road General Rating		4	4	

Superstructure			
Bridge Component	**Last**	**Now**	**Explanation of Condition**
(Primary Span : TH, 7 Spans, Lengths(m): 8.5-8,5-8.5-61-76.2-61-4.9, A-Ident Number: A0150-07;A0139-05;A0150-08)			
Special Features			
Special Feature		7	Dywidag Strengthening: Spans 4-6. Bottom chord, covered by gravel deposit.
(Type :)			
Special Feature		X	
(Type :)			
Wearing Surface/Deck Top Detail Ratings			
N (%) 1 (%) 2 (%) 3 (%)			Isolated: ~~not~~
Last 0 0 0 2			Wearing surface up to 20mm
Now 0 0 0 20			Planks have worked loose. Holes
Wearing Surface/Deck Top	3	3	Ends are fracturing due to
(Material Type : **UNTREATED TIMBER**)			movement and rot with potholes
(Plank Thickness(mm) : **75**)			developing.
(Plank Width(mm) : **300**)			
Deck Rideability	5	3	Potholes
Deck Joints	X	5	Steel cover plate over pier 6 joint.
Temperature (deg. C)			
(Expansion Type :)			
(Fixed Type :)			
Gap Size (mm) / Gap Location			
Curbs/Wheel Guards	4	4	1 damaged sections on span 5 with missing connections
(Curb Type : **Standard**)			150 x 300 x 6100 mm
(Type : **TREATED TIMBER**)			wheel guard blocks twisted
(Thickness(mm) : **150**)			
(Width(mm) : **300**)			
Bridge Rail	4	4	Triple layer. Incorrect splices. Missing 4 bolts per splice ~~plate~~ Timber blocking. Numerous missing ~~or damaged posts.~~ blocks, many, most omitted.
(Type : **GALVANIZED STEEL FLEX BEAM**)			
Bridge Rail Posts/Blocking	3	3	Flexbeam only, blocks are treated timber.
(Type : **GALVANIZED POST STEEL;GALVANIZED POST STEEL**)			sp 4 cof post rotated at bottom
Bridge Rail/Posts Coating	6	6	
(Type : **GALVANIZED**)			
Sidewalk	X	X	

Superstructure

Bridge Component		Last	Now	Explanation of Condition
(Primary Span : TH, 7 Spans, Lengths(m): 8.5-8.5-8.5-61-76.2-61-4.9, Aident Numbers: A0150-07;A0139-05;A0150-08)				
Wide Load Damage (Y/N)	Yes			Minor nicks.
High Load Damage (Y/N)	Yes			High load damage to bottom wing brace elements and portals
Top Chord		7	7	
Batter Posts		4	4	Damage to North & South portals span 4, North of span 5-6 South of span 6. HLD hrad, worst is at South end. Miss in rivets.
Sway Bracings		4	4	Span 4 - U7-L6 E - 3mm long crack Sep 08 U3l 4E, SP6 Dented
Diagonals		3	4	Damage to x portals and wind bracing. Minor damages - North end of Span 5 U6U7, S6U7U8, S6U3U4
Verticals		4	4	9 bolts @ N portal-1 bolt at N Engnr bottom chord.
Portals		3	3	All portals damaged. Require replacement.
Connections		4	4	17 stringers/bay.
Floor Beams		7	7	Bottom chord twisted at NE phalt.
Bottom Chord		4	4	2020
(No. of Stringers : 170;204;170)				See 2015 UT Inspection report for full details.
Stringer Detail Ratings				Surface corrosion
	N (count) / 1 (count) / 2 (count) / 3 (count)			Cracked members
Last				U4545E-S4 - 40mm ck in weld F
Now				U7L6E-S4 - 3mm ck
Stringers		6	6	U4L4-S6 - 60mm ck in bottom flange
(Type : STEEL)				U4L4-S4 - 60mm ck in bottom flange
(Width(mm) : 125)				
(Depth(mm) : 305)				
(Spacing(mm) : 350)				
Paint Condition		5	5	15% superficial rusting on lower members.
(Colour Description : YELLOW)				
(Colour Code : 13538)				
Touchup Required (Y/N)	No			
Bearings		5	5	5 of 6 exp brgs are ineffective and sledding instead of rolling - new alignment plates are broken.
Temperature (deg. C)	20			
(Expansion Type : SLIDING PLATE)				Span 4 exp anchor bolt bent
(Fixed Type : PINNED BEARING)				Span 6 E07 anchor bolt bent
Functioning (Y/N)	No			
Sub Deck/Deck Underside		5	5	
(Material Type : TREATED TIMBER)				
(Plank Thickness(mm) : 100)				
(Plank Width(mm) : 300)				
Defects (Percent Area)	2			
Span Alignment Problems				
Vertical (Y/N)	No			North hi is pushing bridge. Looking from North to South. Steel structures sweeps at: 160 mm to the West.
Horizontal (Y/N)	Yes			
Superstructure General Rating		3	3	

Superstructure

Bridge Component		Last	Now	Explanation of Condition
(Secondary Span : TT)				
Special Features				
Special Feature			X	
(Type :)				
Special Feature			X	
(Type :)				

Superstructure			
Bridge Component	**Last**	**Now**	**Explanation of Condition**
(Secondary Span : TT)			
Wearing Surface/Deck Top Detail Ratings			
	N (%) 1 (%) 2 (%) 3 (%)		
Last	0 0 0 5		
Now	0 0 0 20		
Wearing Surface/Deck Top	5	3	Defects ~~up to 5% of surface wear up to 25mm deep. Severe with exposed S~~ Forming potholes at plank ends due to rot.
(Material Type : **UNTREATED TIMBER**)			
(Plank Thickness(mm) : **75**)			
(Plank Width(mm) : **300**)			
Deck Rideability	5	3	
Wheel Guards	4	3	Grader damage West wheelguard. North span & bolt on South span.
(Curb Type : **Standard**)			3 damaged sections on SP1-3
(Type : **TREATED TIMBER**)			
(Thickness(mm) : **150**)			
(Width(mm) : **300**)			
Bridge Rail	4	3	Single layer foxboard on 3 TT spans.
(Type : **GALVANIZED STEEL FLEX BEAM**)			Missing bolts at several connections.
Bridge Rail Posts	4	3	Posts not bolted securely to timbers on SP2.
(Type : **TREATED TIMBER;GALVANIZED POST STEEL**)			Posts splayed outwards from plow pressure
Bridge Rail/Posts Coating	5	5	
(Type : **GALVANIZED**)			
(No. of Stringers : **11;11;11;14**)			
Stringer Detail Ratings			
	N (count) 1 (count) 2 (count) 3 (count)		
Last	0 0 0 0		North span 150 x 300 at 440 OC-steel stringers
Now	0 0 0 0		Minor twist/rotation.
Stringers	6	6	S1 stringer 6 split along bottom
(Type : **TREATED TIMBER**)			
(Width(mm) : **500**)			
(Depth(mm) : **200**)			
(Spacing(mm) : **630**)			
Sub Deck/Deck Underside	6	5	rotten and broken planks between S6 & S7
(Material Type : **TREATED TIMBER**)			
(Plank Thickness(mm) : **100**)			
(Plank Width(mm) : **300**)			
Defects (Percent Area) : 0			
Span Alignment Problems			
Vertical (Y/N) : No			North approach is pushing slightly West.
Horizontal (Y/N) : Yes			
Superstructure General Rating	**6**	6	

Substructure

Bridge Component		Last	Now	Explanation of Condition
Abutments				
(Extended Backwall Piles (Y/N) : **N**)				Abutments covered in f
(Extended Backwall Piles Spacing(mm) :)				
(Total Number of Caps/Corbels : **1;1**)				AB1 buried in fill
Bearing Seats/Caps/Corbels Detail Ratings				AB2 concrete, limited access/view.
	N (count)	1 (count)	2 (count)	3 (count)
Last	2	0	0	0
Now	2	0	0	0
Bearing Seats/Caps/Corbels		N	N	
(Type : **CONCRETE**)				
(Depth(mm) :)				
(Width(mm) :)				
Backwalls/Breastwalls		5	5	Timber breast wall at North
Greatest Height (m)	0.30			
Wingwalls		6	6	
(Total Number of Bearing Piles : **0;0**)				
Piles Detail Ratings				
	N (count)	1 (count)	2 (count)	3 (count)
Last	999	0	0	0
Now	100	0	0	0
Piles		N	N	
Paint/Coating		X	X	
Abutment Stability		5	3	North abutment has been pushed, appears to be stabilized.
Scour/Erosion		4	4	Erosion gullies, both abutments.
Piers/Bents				
(Type : **PIER-SOLID**)				Heavy scaling on piers 4 & 5 on top
(Total Number of Caps/Corbels : **2;2;2;1;1;1**)				P1-1 steel H pile double cap.
Bearing Seals/Caps/Corbels Detail Ratings				P2-2 timber caps.
	N (count)	1 (count)	2 (count)	3 (count)
Last	0	0	0	0
Now	0	0	0	0
Bearing Seals/Caps/Corbels		4	4	P3,4,5- conc
(Type : **CONCRETE**)				P6 concrete

Substructure

Bridge Component		Last	Now	Explanation of Condition
(Total Number of Bearing Piles : 6:10:2:1:1:2)				P1-Steel H pile. P2 - TT, P3-P5 concrete.
Piles Detail Ratings				
	N (count) 1 (count) 2 (count) 3 (count)			Wide checks in timber piles
Last	0 0 0 0			
Now	0 0 0 0			
Pier Shaft/Piles		4	4	
Greatest Height (m)	16.50			
Bracing/Struts/Sheathing		4	4	Timber bracing is rotten at w ends
Nose Plate		6	6	
Paint/Coating		7	7	
(Colour Description :)				
(Colour Code :)				
Pier Stability		5	5	Erosion of slope around Pier 3
Scour		N	N	
Debris (Y/N)	Yes			Large drift caught on P5
Substructure General Rating		4	4	

Structure Usage

		Last	Now	Explanation of Condition
Channel				
(U/S Direction : W)				
(D/S Direction : E)				
Alignment		8	8	
Bank Stability		4	4	The North hill continues to move towards river. Sloughing embankment ~50m2
HWM (m below Top of Curb)				HWM not visible
Drift (Y/N)	No Yes			Large trees during flood
Slope Protection		4	4	Erosion gullys both hideslopes
(Type : NONE; NONE)				
Guidebank/Spurs		X	X	
Adequacy of Opening		8	8	
(Fish Compensation Measure 1 : NONE)				
(Fish Compensation Measure 2 : NONE)				
Channel General Rating		4	4	

Maintenance Recommendations

Completed Work

Planned Work

	Work Type	Status	Rec. Year	Target Year	Inspector Comments	Department Comments
	REPAIR/REPLACE BRIDGE RAIL	PRIORITY REQUIRED	2017 21		Install missing splice bolts -200, rail bolts -20, truss blocking -10	
	PATCH DECK	PRIORITY REQUIRED	2017 21		Replace ~~approx. 3ft planks~~ at ~~at~~ deck	
	STRAIGHTEN/REPLACE MEMBERS	PRIORITY REQUIRED	2017 21		Repairs as per 2015 UT report. (Replace 2 portals, assess or replace cracked diagonal	
	WASHING	PRIORITY REQUIRED	2017 21		wash deck & bottom chord	
	PLACE ADDITIONAL RIP RAP	PRIORITY REQUIRED	2017 21		~20m3 class 1M ~~or~~ Geotextile	
	REMOVE DRIFT ACCUMULATION	PRIORITY REQUIRED	2017 20		At pier 5	
	OTHER ACTION	PRIORITY REQUIRED	2017 20		Erect proper weight restriction signs at advance and N/B at Bridge	
	OTHER ACTION	PRIORITY REQUIRED	~~2017~~		~~Repair approach rail: New railing (2) TD ends 24"x5" c/d to post~~	
	OTHER ACTION	PRIORITY REQUIRED	2017 21		Replace damaged wire guard #50m	
	OTHER ACTION	PRIORITY REQUIRED	~~2017~~		~~Rugrade approaches~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2017~~		~~Bend abutment piles~~	
	OTHER ACTION	PRIORITY REQUIRED	2017		~~Install missing bolts in connections (8)~~	
	OTHER ACTION	PRIORITY REQUIRED	2017 ~~21~~		~~CLOAK 3 repairs in portals, sway brace =10~~	
	OTHER ACTION	PRIORITY REQUIRED	2017 21		Seal piers PD repairs in P4/P5 ~4m2	
	OTHER ACTION	PRIORITY REQUIRED	~~2017~~		~~Replace 2 sway bracing~~	
	ULTRASONIC TRUSS INSPECTION					
	~~SEAL CURBS~~ Bridge rail		2021		Replace cracked bridge rail post	
	SEAL DECK					
	OVERLAY DECK					
	~~REPAIR/REPLACE DECK JOINTS~~ other				See 2020 UT summary for recommended work	
	REPLACE STRIP DECK					
	REPLACE SUB DECK					
	RESET/ PAINT BEARINGS					
	CORE TIMBER CAPS/CORBELS					
	REPAIR/REPLACE TIMBER CAPS					
	REPAIR ABUTMENT SCOUR/EROSION					

	Work Type	Status	Rec. Year	Target Year	Inspector Comments	Department Comments
	INSTALL STRUTS					

Structural Condition Rating (Last/Now) (%)	38.9/	**Sufficiency Rating (Last/Now)** (%)	30.4/	Est. Repl. Yr	~~2025~~ 2035	Maint. Reqd. (Y/N)	Y

Special Comments for Next Inspection	A-55855 cracks in member S4 07C6E or replace	Department Comments	TUCC BOUNDARY: TAWATINAW RIVER; RISK ZONE YELLOW

Previous Inspector's Name	Wade Nanninga	Previous Assistant's Name	
Next Inspection Date	16-Nov-2020	Previous Inspection Date	16-Aug-2017
Inspection Cycle (Default) (months)	39		
Comment			

Level 2 Inspection - Ultrasonic Truss

Bridge File Number	71600 -1 Bridge	Form Type	UTS
Year Built/Year Supstr	1945/1944	Lot No.	
Bridge or Town Name	SMITH	Inspector Name	Colin Foy
Located Over	ATHABASCA RIVER, 8.11, WATERCRS-ST	Inspector Class	A.
Located On	LOCAL ROAD	Assistant Name	Brady Brede
Water Body Cl./Year		Assistant Class	A1
Navigabil. Cl./Year		Inspection Date	July 6, 2020.
Legal Land Location	NW SEC 23 TWP 71 RGE 1 W5M	Arrive Time	8:00
Longitude, Latitude	-114:02:38, 55:10:12	Depart Time	17:00.
Road Authority	M.D. OF LESSER SLAVE RIVER NO. 124	Data Entry By	
Contract Main. Area	UNDEFINED CMA	Data Entry Date	
Clear Roadway/Skew	5.6 /	Reviewer Name	
AADT/Year	280 / 2020 (E)	Review Date	
Road Classification	RLU-210G-80	Dept. Reviewer Name	
Detour Length (km)	80	Dept. Review Date	
		Follow-Up By	

Allowable Load (1):	Single	H 32 FLOOR BEAM	Semi	HS 45 FLOOR BEAM	Train	CS3 64 U2U3	—> On Critical Spans —>Critical Member
Design Loading:	HS20						—> Primary Span

(Primary Span : TH, Spans: 4,5,6, Lengths(m): 61-76.2-61)

(Secondary Span : TT, Spans: 1,2,3,7, Lengths(m): 8.6-8.5-8.6-4.9)

(Total Length : 8.5-8.5-8.5-61-76.2-61-4.9 = 228.8)

Ultrasonic Truss Inspection Results

	Last	Now	Explanation of Condition
Cracked Truss Members? (Y/N)	Y		See level 2 report for additional details. - July 6, 2020.
Crack Indication? (Y/N)	Y		
Distortion Existing? (Y/N)	Y		
Monitor/Repair Distortion? (Y/N)	Y		
Severe Corrosion? (Y/N)	N		
Truss Member Repairs? (Y/N)	Y		
Bearing Repairs? (Y/N)	N		
Other Bridge Repairs? (Y/N)	Y		

① Cracked Members

S4 U7U6E 3mm
S4 U5L5E 40mm
S4 U9U7 60mm.
S6 U1U1 60 mm.

② Distorted Members

S4 U1L0W kicks
S5 U1L0W minor bend
S4 U5U5 bent.
S6 U2U2 bent
S6 U3U3 bent.
S5 U8L8E kick & dent 25x500mm.
S5 U9L9E bent 20mm.
S6 U3L3W bent
S4 U1U1 dent.
S4 U9U9 dent. HLD
S5 U1U1 dent
S5 U11U11 dent
S6 U1U1 dent.
S6 U9U9 dent.
S4 L2L3E bent 30x200mm
S6 L0L1E buckling

Maintenance Recommendations

Completed Work

Planned Work

	Work Type	Status	Rec. Year	Target Year	Inspector Comments	Department Comments
	REPAIR/REPLACE BRIDGE RAIL	PRIORITY REQUIRED	~~2020~~ 2021		Install missing splice bolts ~200, rail bolts ~20, truss blocking ~10	
	PATCH DECK	PRIORITY REQUIRED	~~2020~~ 2021		Replace approx. 36 planks Strip deck	
	RESET/ PAINT BEARINGS	PRIORITY REQUIRED	~~2020~~		~~Reinstall 2 AWS a. pier 6;~~	
	STRAIGHTEN/REPLACE MEMBERS	PRIORITY REQUIRED	~~2020~~ 2021		Repairs as per 2015 UT report 2020 Replace 4 portals, assess or replace 1 cracked diagonal	
	WASHING	PRIORITY REQUIRED	~~2020~~ 2021		Deck and bottom chord.	
	PLACE ADDITIONAL RIP RAP	PRIORITY REQUIRED	2020 2021		~~50m3 class 1 at A2~~, 20m3 class 1 at ~~P3~~ Place headslopes	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~ 2021		Erect proper weight restriction signs at advance and N/B at Bridge	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~Repair approach rail. New radius (2), TB ends (2) reconnect to post. Replace 5 posts.~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~ 2021		Replace damaged wheel guard ~30m	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~Regrade approaches.~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~Band P2 piles.~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~Install missing bolts in connections (6)~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~HLDWLD repairs to portals, sway brace ~10~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~ 2021		Seal piers PD repairs to P4/P5 ~4m2	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~Replace 2 sway bracing~~	
	OTHER ACTION	PRIORITY REQUIRED	~~2020~~		~~Repair or replace 2 vertical clearance signs.~~	
	~~ULTRASONIC TRUSS INSPECTION~~ Remove dirt		2021		Remove dirt	
	~~SEAL CURBS~~ Bridge wall		2021		Replace cracked bridge wall post	
	~~SEAL DECK~~		2023		Rewrk connection at S4U5L2E	
	~~OVERLAY DECK~~ STRAIGHTEN/		2025		Grind notch S4U1L6W	
	~~REPAIR/REPLACE DECK JOINTS~~ REPLACE MEMBERS		2025		Replace cracked washers S6 09L10W, S609L10E	
	~~REPLACE STRIP DECK~~		2023		Heat straighten sway bracing S4U5U5, S6U1U1, S6U3U3	
	~~REPLACE SUB DECK~~		2021		Assess cracks or replace S4U7L6E	
	~~CORE TIMBER CAPS/CORBEES~~		2022		Replace 4 portals S4U1U1, S4U9U9, S5U1U1, S6U1U1	
	~~REPAIR/REPLACE TIMBER CAPS~~		2022		Heat straighten 2 portals S5U1U1, S6U9U9	
	~~REPAIR ABUTMENT SCOUR/EROSION~~		2023		Heat straighten S6U3L3W S4L2L3E, S5U8L8E, S5U9L9E	

	Work Type	Status	Rec. Year	Target Year	Inspector Comments	Department Comments
	REMOVE DRIFT ACCUMULATION					
	INSTALL STRUTS					

Structural Condition Rating (%)	38.9	**Sufficiency Rating (%)**	30.4	Est Repl Year	2023
Level 1 Insp Date	07-May-2020	Next Level 1 Insp Date	07-Aug-2023	Current Level 1 Insp Cycle (Default) (Months)	39
Special Comments for Next Insp	Monitor N hill and P6 movement				
Snooper? (Y/N)	N	Lift? (Y/N)	Y	Traffic Control? (Y/N)	Y
Boat? (Y/N)	N	Ladder? (Y/N)	N		
Other Special Requirements Comments					
Previous Level 2 Inspector's Name		Previous Level 2 Insp Date			
Next Level 2 Insp Date	01-Jan-1951	Discontinue Level 2 Insp? (Y/N)	N		
Level 2 Insp Previously Completed	0	Level 2 Insp Cycle (Default) (Months)	72		
Detailed Report/Diagram? (Y/N)	Y				
Level 2 Insp Comments					
Department Reviewer Comments					

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

1.

Span 5 overall view of exterior.

2.

Abutment 1 approach east guardrail bent.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

3.

Abutment 1 approach west guardrail end with minor damage.

4.

Approach strip deck worn up to 25 mm.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

5.

Span 4 and 5 strip deck with potholes and spots rotten – looking south.

6.

Span 5 and 6 strip deck with potholes and spots rotten – looking north.

Note damage to east wheel guard at span 5.

AECOM		
	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

7.

Span 5 west side with wheel guard blocks twisted.

8.

Span 4 L0E bridge rail post cracked at bottom rivets.

9.

Typical batter post holes with missing rivets from abandoned rail attachment.

10.

Typical batter post with open holes near connection from abandoned old portal attachment.

AECOM		
	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

11.

Span 4 U1L0W batter post with nicks.

12.

Span 5 U1L0W batter post with minor bend.

13.

Span 6 U9L10W batter post with cracked wedge washer.

14.

Span 6 U9L10E batter post with cracked wedge washer.

15.

Span 4 U5U5 sway bracing with bend.

16.

Span 6 U2U2 sway bracing with bend.

17.

Span 6 U3U3 sway bracing with bend.

18.

Span 4 U7L6E diagonal member with 3 mm crack at top.

19.

Span 4 U5L5E vertical member with 40 mm crack at cross bracing connection.

20.

Span 5 U8L8E vertical member with nick and dent 25x500 mm.

21.

Span 5 U9L9E vertical member bent 20 mm.

22.

Span 6 U3L3W vertical member with bends at sway bracing connection.

23.

Span 4 U1U1 north portal with dent and sheared rivets.

24.

Span 4 U9U9 south portal, U9L10W batter post, and U9L10E batter post – looking north.

Note strip deck is worn.

25.

Span 4 U9U9 south portal with highload damage – rivets broken, and holes torn, 60 mm crack in bottom flange.

26.

Span 4 U9U9 south portal with highload damage – rivets broken, and holes torn, 60 mm crack in bottom flange – view from north.

27.

Span 4 U9U9 south portal with highload damage – rivets broken, and holes torn, 60 mm crack in bottom flange – close view.

28.

Span 4 U9U9 south portal with highload damage.

29.

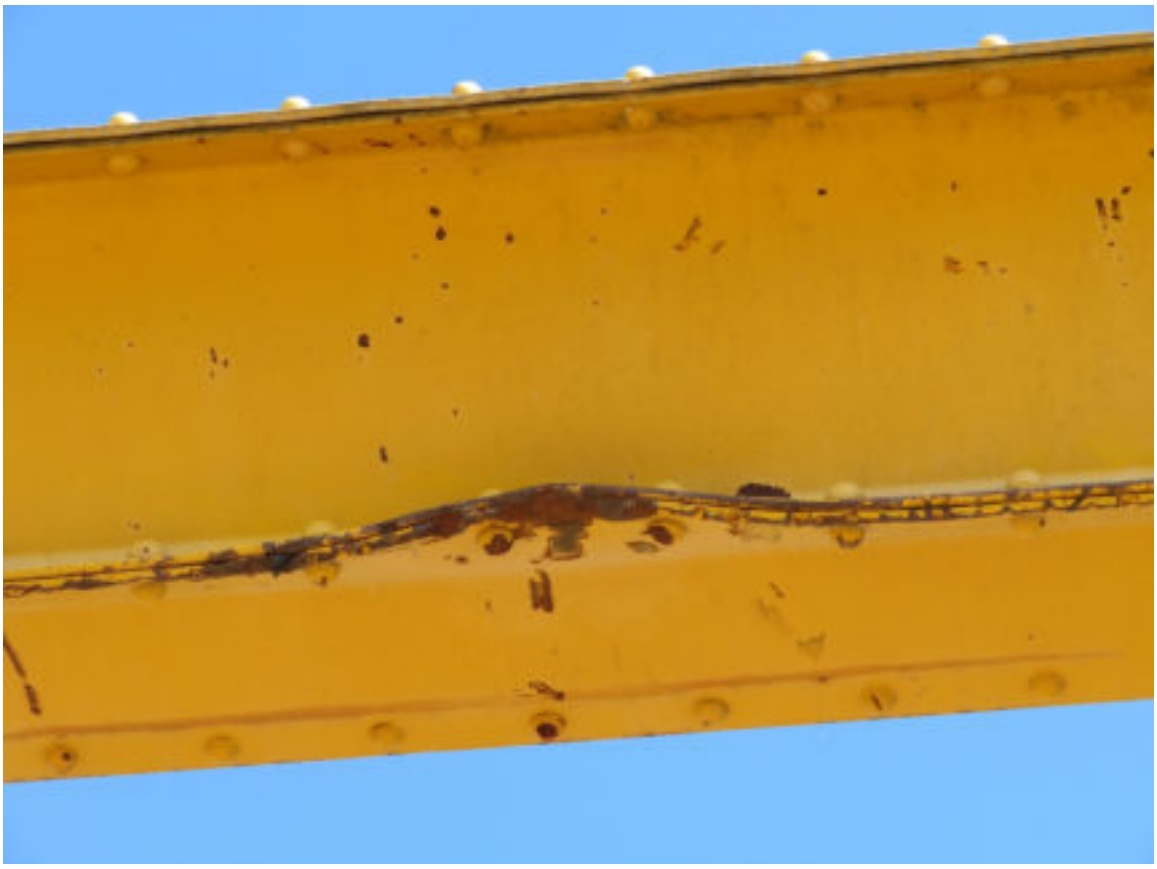
Span 5 U1U1 north portal bent at bottom side – looking west.

30.

Span 5 U1U1 north portal bent at bottom side – looking east.

31.

Span 5 U1U1 north portal bent at bottom side – view from south.



32.

Span 5 U11U11 south portal bent at bottom two plates.

33.

Span 6 U1U1 north portal with dents to bottom plate and view of overall damage, 60 mm crack in bottom flange.

34.

Span 6 U1U1 north portal with dents to bottom plate and view of overall damage, 60 mm crack in bottom flange.

35.

Span 6 U1U1 north portal with dents to bottom plate and view of overall damage, 60 mm crack in bottom flange.

36.

Span 6 U1U1 north portal with dents to bottom plate and view of overall damage, 60 mm crack in bottom flange – view from south.

37.

Span 6 U1U1 north portal with dents to bottom plate, 60 mm crack in bottom flange – close view.

38.

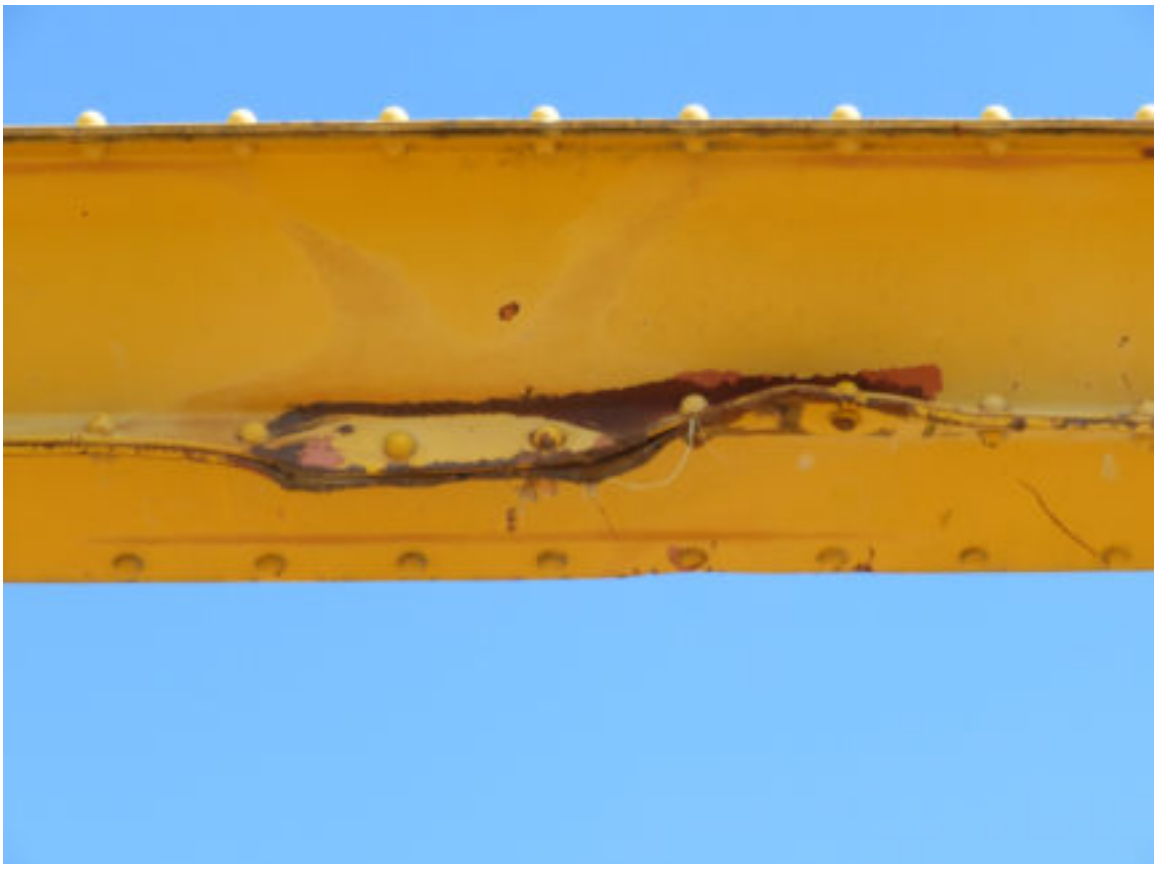
Span 6 U1U1 north portal with dents and 60 mm crack in bottom flange.

39.

Span 6 U9U9 south portal with dent on bottom side – looking east.

40.

Span 6 U9U9 south portal with dent on bottom side – looking west.



41.

Span 6 U9U9 south portal with dent on bottom side – close view.

42.

Span 4 L2L3E bottom chord bent 30x200 mm.

43.

Span 6 bottom chord filled with gravel, typical.

44.

Span 6 L0L1E bottom chord and L0E gusset buckling from improper jacking of truss.

45.

Span 6 L0L1E bottom chord and L0E gusset buckling from improper jacking of truss.

46.

Span 5 L0E gusset plate.

Gusset plate thickness measurements: 13.56 mm uncorroded and 12.01 mm as lowest value.

47.

Span 6 L0E gusset plate.

Gusset plate thickness measurements: 10.05 mm uncorroded and 6.81 mm as lowest value.

48.

Span 4 L0W fixed bearing at pier 4.

49.

Span 4 L0E fixed bearing at pier 4

50.

Span 4 L10W expansion bearing at pier 3.

Note anchor bolt bent.

51.

Span 4 L10E expansion bearing at pier 3.

Note anchor bolt bent.

52.

Span 5 L0W fixed bearing at pier 5.

53.

Span 5 L0E fixed bearing at pier 5.

54.

Span 5 L12W expansion bearing at pier 4.

55.

Span 5 L12E expansion bearing at pier 4.

56.

Span 6 L0W expansion bearing at pier 6 with no anchor bolt at exterior.

57.

Span 6 L0W expansion bearing at pier 6 with no anchor bolt at exterior.

58.

Span 6 L0E expansion bearing at pier 6.

59.

Span 6 L0E expansion bearing with anchor bolt maxed out and bent.

60.

Span 6 L10W fixed bearing at pier 5.

61.

Span 6 L10E fixed bearing at pier 5.

62.

Southeast bridge rail post leaning.

63.

Southeast bridge rail post leaning with gap at top of post – close view.

64.

Span 1 with stringer 6 split along bottom.

Note erosion at abutment 1 headslope.

65.

Span 1 deck underside looking south.

66.

Span 1 subdeck with rotten and broken planks between stringer 6 and 7 – looking south.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

67.

Span 2 deck underside looking south.

68.

Span 3 deck underside looking north.

69.

Span 4 deck underside looking north.

70.

Pier 1.

71.

Pier 2 looking north.

72.

Pier 2 looking north.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

73.

Pier 3 and 4 looking north.

74.

Pier 3 looking south.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

75.

Pier 4 looking north.

76.

Pier 4 looking north.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

77.

Pier 4 looking south.

78.

Pier 4 west with severe scaling at top – looking north.

79.

Pier 4 east with severe scaling at top – looking north.

80.

Pier 4 east with severe scaling at top – looking south.

81.

Pier 4 east with severe scaling at top – looking south.

82.

Pier 5 looking north.

Note drift on westside of pier.

AECOM	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

83.

Pier 5 looking south.

Note drift on westside of pier.

84.

Drift buildup at westside of pier 5.

AECOM		
	Bridge File:	71600-1
	Date:	July 6, 2020
	Photos by:	Colin Roy and Randy Bredo
	Stream Name / Highway Location:	Athabasca River bridge on local road, 1 KM N of Smith

85.

Abutment 1 with erosion of headslope.

86.

Abutment 2 looking north.

87.

North embankment at pier 6 sloughing.

APPENDIX E – SCOUR SURVEY REPORT

BACKGROUND	
Spans	7 spans – 8.5/8.5/8.5/61/76.2/61/4.9
Year Built	1945
AADT (2020)*	280
Detour Length / Dead End	60 km / N
Clear Roadway	5.5 m
Load Rating	32, 45, 64 Design load HS 20
Vert. Clearance	--
Structural Condition Rating*	38.9 %
Sufficiency Rating*	29.4 %
New Scour Priority	4
Overall Scour Risk Rating	Moderate
Foundation Type	Spread Footing
Minimum cover in last scour survey	1.1 m @ Pier 3
Pier Width	4.5 m
Geotech.	--
Last Scour Survey	2018
New RPW Priority	1
Overall RPW Risk Rating	Low

* BIM Level 2 report – updated July 6, 2020

HYDROTECHNICAL	
B	200 m
H	8 m
T	280 m
S	0.00035
Y	9.5 m
V	2.4 m/s
Q	5700 cms
HW Elev.	554.18 m (M-71600-99-A)
Deck Height	Approx. 14 m
Flood Years	1944, 1954, 1986
Freeboard	Approx. 2.4 m
B (@ Bridge)	Approx. 200 m
Constriction?	No

Scour Survey Results				
Pier	**Cover – 2021**	**Cover – 2018**	**Cover – 2013**	**Cover – 1999**
1	6.3 m	N/A	N/A	6.8 m
2	2.6 m	3.1 m	3.2 m	3.8 m
3	0.8 m	1.1 m	1.1 m	0.5 m
4	N/A	N/A	N/A	4.0 m

Notes

The bridge structure was digitized and footing elevations were based on as-built drawings 434-2-P-F01, 434-2-P-F02 and 434-8-P in 1944, and the scour survey report and drawing M-71600-99-A in 1999. Based on the 1999 scour survey report, it was concluded that there was a substantial discrepancy in the geodetic elevation for this site. The pre-1999 survey data and drawings were found too low. The datum has been corrected since 1999. All the survey data and results in this report are consistent with the 1999 datum.

Comments

1. Pier 1 – located near the channel bank and mostly dry. The risk of scour at the pier is low.

2. Pier 2 – no progression of scour was noted when comparing to the last survey in 2018. The risk of scour at the pier is low. The available cover above the footing bottom is approx. 2.6 m.

3. Pier 3 – drifts were found at the pier nose during survey. The condition was not ideal for data collection around the pier, but the surveyor was able to angle the sonar sensor trying to get as close as possible around the pier nose to collect the data. Comparing the survey data and results in 2018, the scour around the pier has been worsened significantly in the last few years and it is comparable to the conditions in 1999. Assuming the natural streambed elevation at 544.6 m, the general scour depth at the pier nose is approx. 2.6 m, which is close to the blue clay layer as indicated on the as-built drawings. The scour area of approx. 20 m x 12 m is located just upstream of the pier nose and along the right side of the pier. The remaining cover at the pier nose is approx. 0.8 m above the footing bottom elevation.

4. Pier 4 – located near the channel bank and mostly dry. The risk of scour at the pier is low.

5. RPW – N/A.

Recommendations

The scour identified at Pier 3 has been progressing significantly since 2018. The scour depth is getting close to the 1999 results. While the channel could potentially infill over time during low flow conditions; however, it appears that drifts are also found to be an ongoing issue at Pier 3 as there were records and photos in which drifts were identified in 2008, 2013, 2017 and 2021. The accumulation of drifts could likely accelerate the scour development at the pier nose; therefore, timely removal is recommended. It is also recommended to increase the inspection frequency to every 3 years for now and the next survey should be scheduled in 2024 to closely monitor pier scour for this site. It is imperative that drift removal be completed prior to the next survey. An additional survey and inspection is also recommended should a major flood event occurred before the next schedule to ensure that the piers are not severely damaged or extensive scour does not occur after the flood.

Figure 1 – Aerial image from Google Earth, image date August 30, 2019.

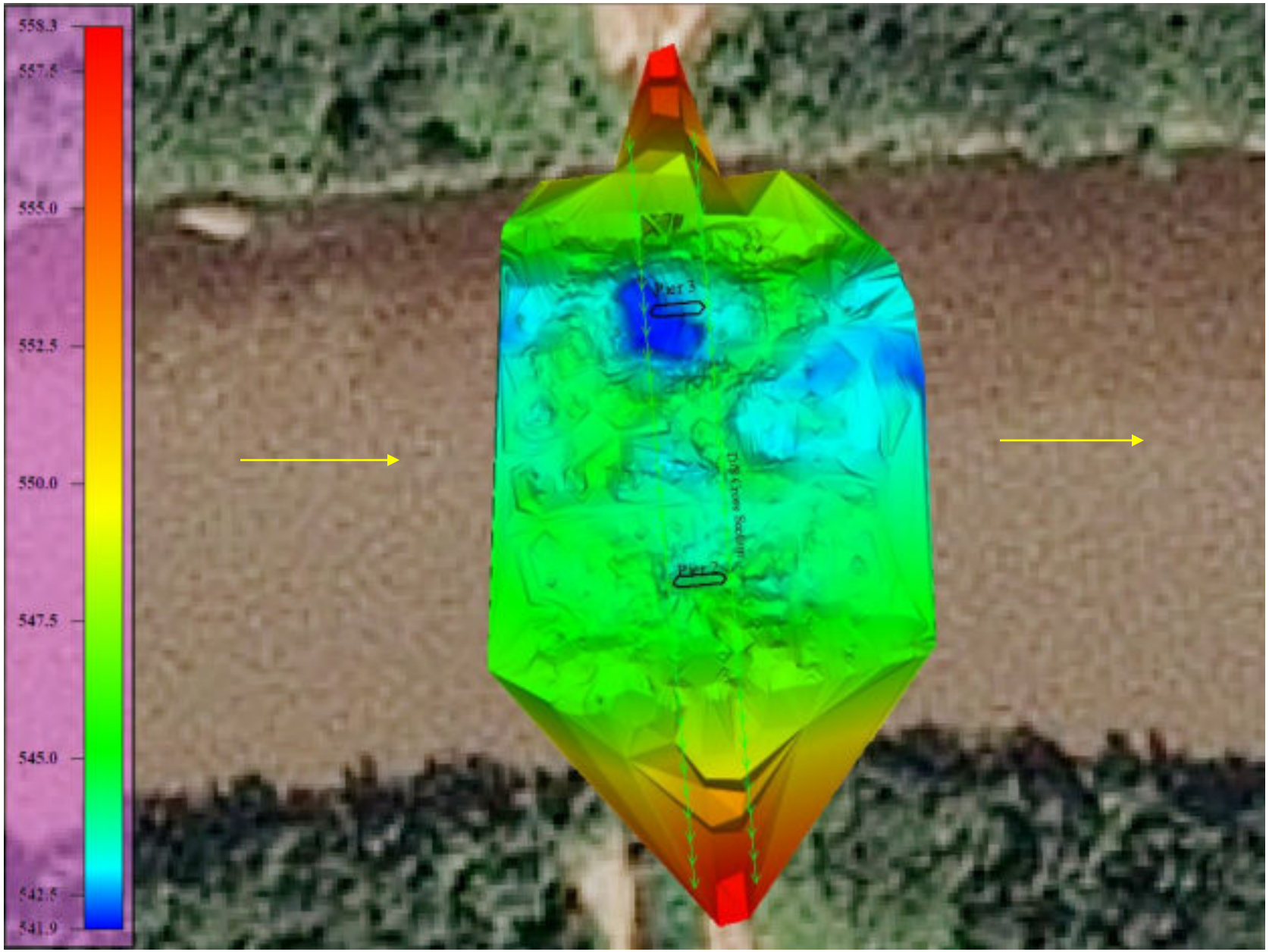


Figure 2 – Triangulated Elevations in 2021

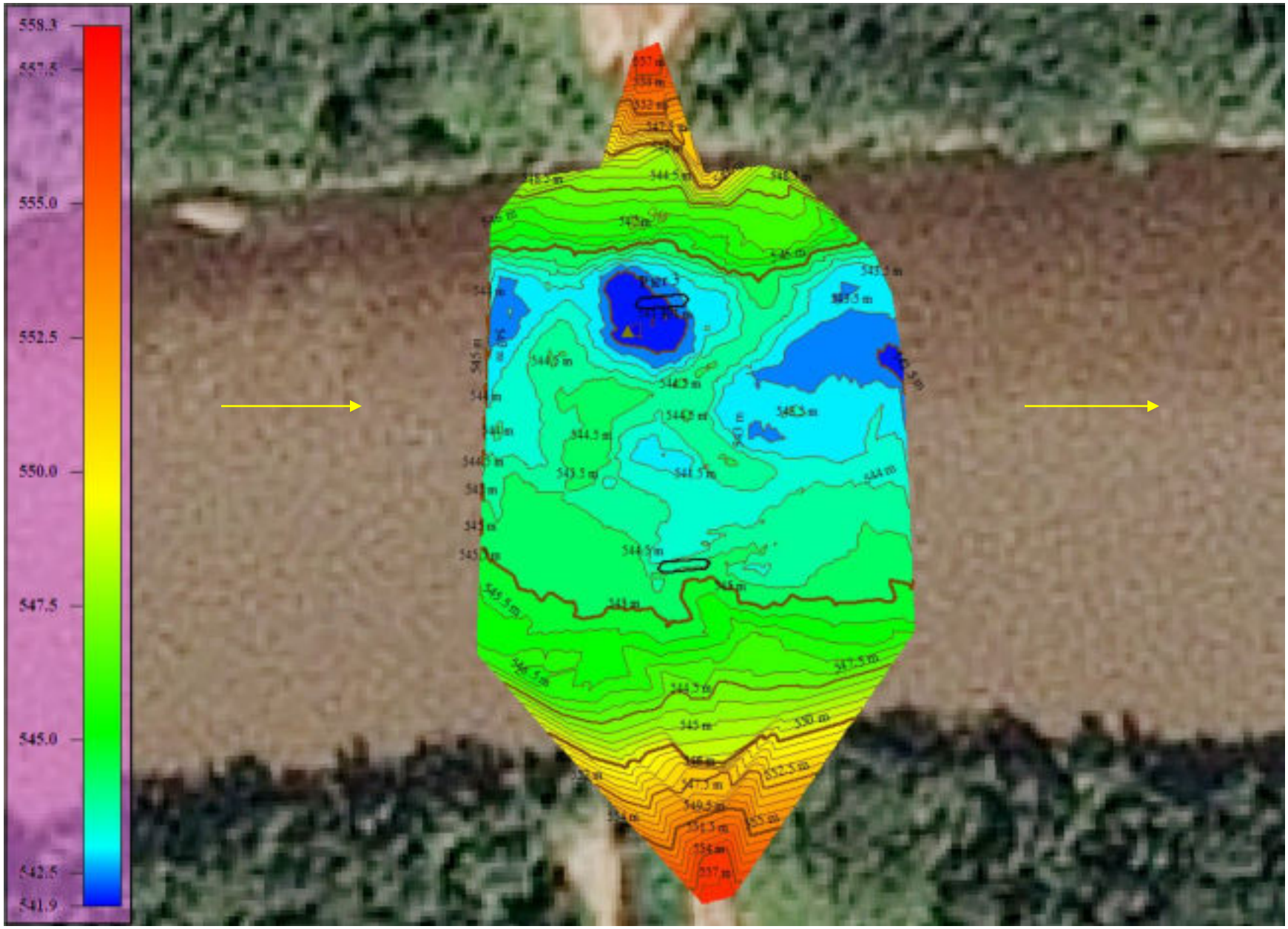


Figure 3 – Contours in 2021

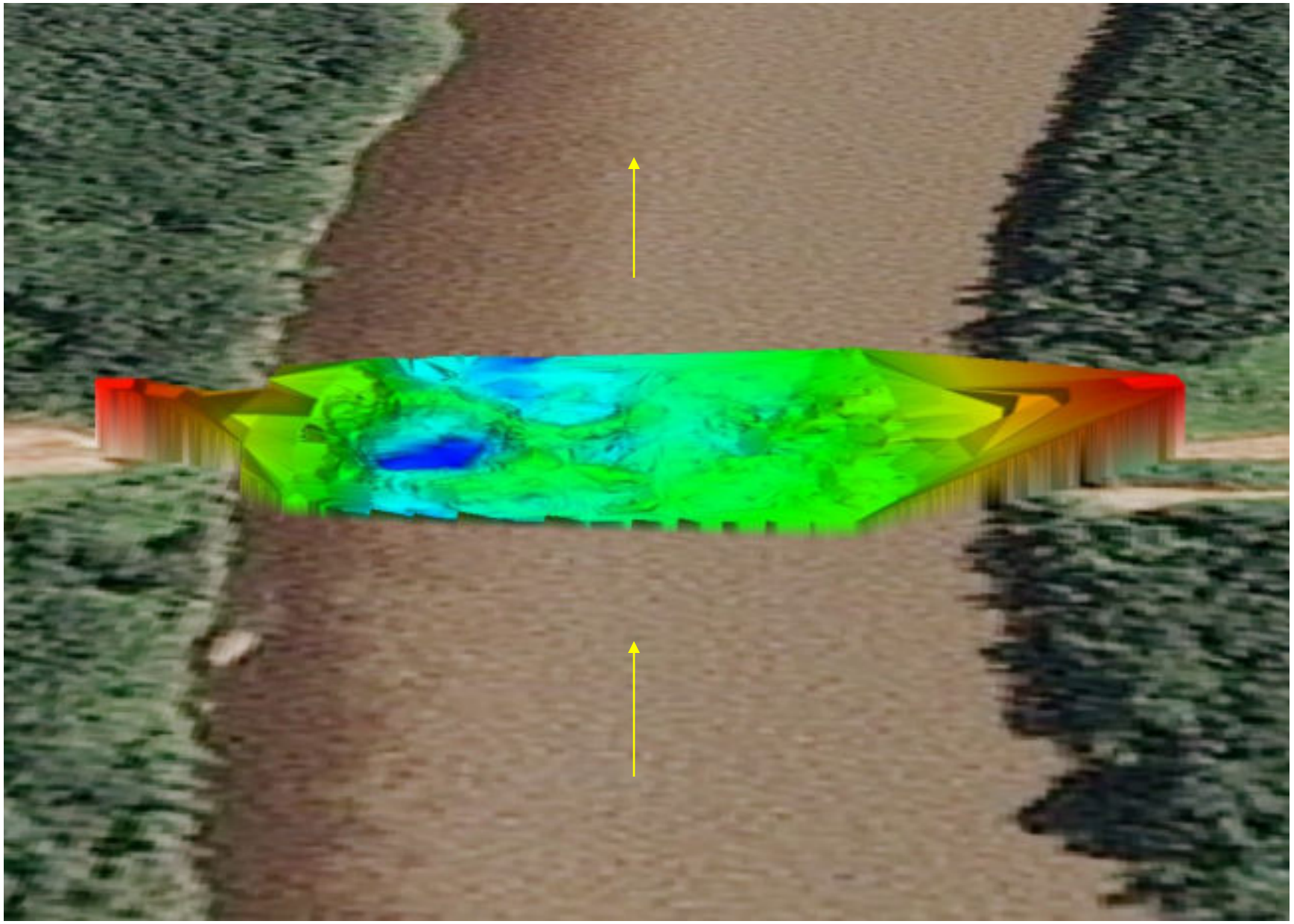


Figure 4 – 2021 Survey 3D view

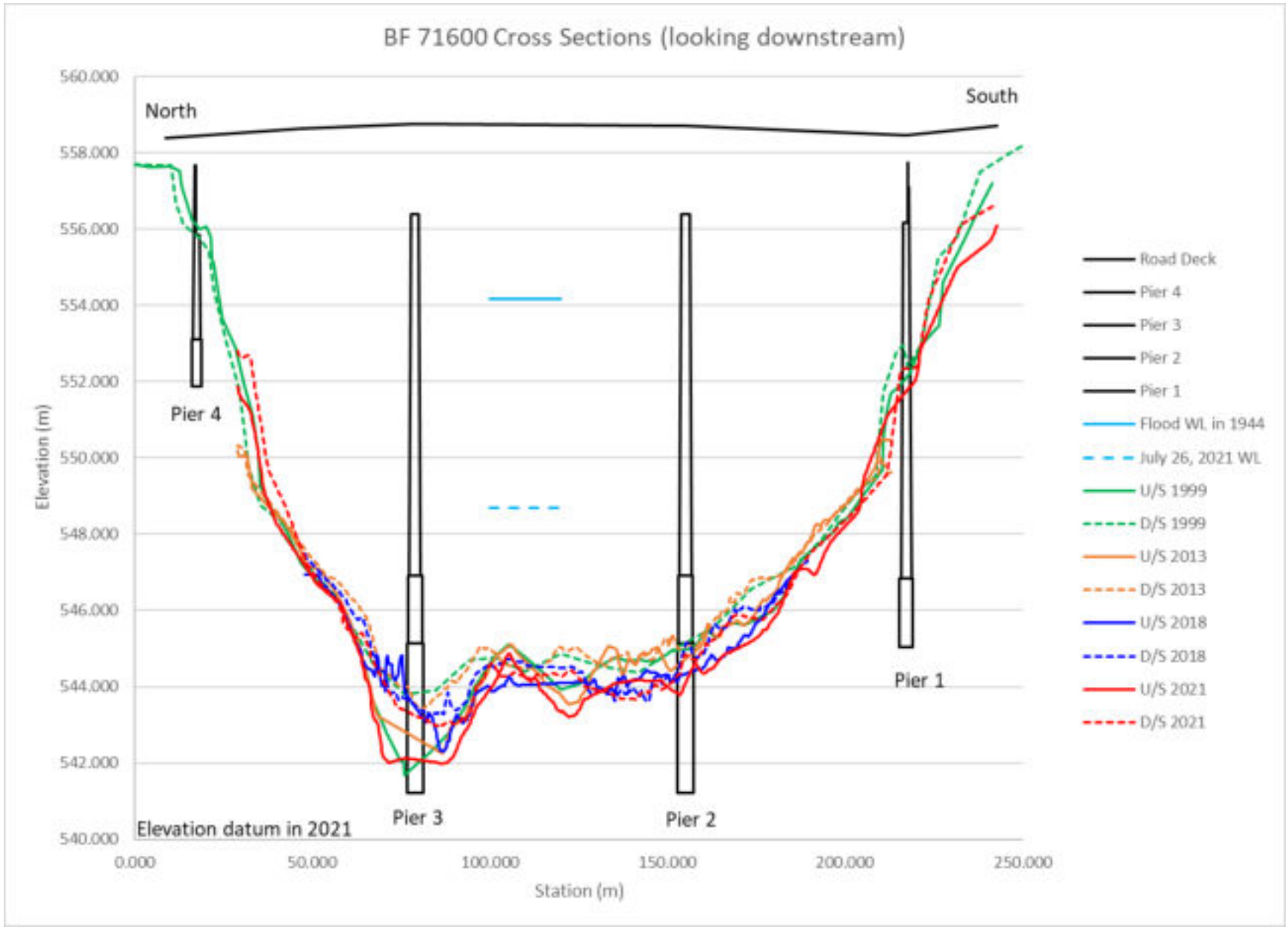


Figure 5 – Cross Sections

Site Photo 1 – upstream face of the bridge

Site Photo 2 – downstream face of the bridge

Site Photo 3

Site Photo 4

Site Photo 5

Site Photo 6

Site Photo 7 – Drifts at Pier 3

Site Photo 8 – looking south

Site Photo 9 – looking north

APPENDIX F – SLOPE STABILITY ASSESSMENT

R E P O R T

M.D. OF LESSER SLAVE RIVER NO. 124

BF71600 - ATHABASCA RIVER
(INW23-071-01-W5)
Bridge Assessment

ASSOCIATED ENGINEERING

JANUARY 2003

SLOPE STABILITY ASSESSMENT (THURBER ENGINEERING)

APPENDIX E

THURBER ENGINEERING LTD.
Suite 200, 9636 - 51st Avenue
EDMONTON, Alberta T6E 6A5
Phone (780) 438-1460
Fax (780) 437-7125

THURBER

March 13, 2001 File: 17-123-219

Associated Engineering Alberta Ltd.
Suite 200, 708 - 11th Avenue, S.W.
Calgary, Alberta
T2R 0E4

Attention: Mr. Bob Scarth, P.Eng.

SLOPE STABILITY ASSESSMENT OF NORTH SLOPE
ATHABASCA RIVER BRIDGE (BF 71600)
NEAR HAMLET OF SMITH, ALBERTA
PROJECT NO.: 983551-006-100

Dear Sir:

This letter report presents a preliminary geotechnical assessment of the slope instability at the north abutment of Alberta Infrastructure's bridge over the Athabasca River (BF 71600) near the Hamlet of Smith, Alberta.

The assessment was carried out in accordance with our proposal to Associated Engineering Alberta Ltd. dated November 6, 2000. Authorization to proceed was received from Mr. Bob Scarth, P. Eng. of AEAL by letter dated January 23, 2001.

The purpose of the work was to provide a preliminary geotechnical assessment of the slope stability of the north abutment as part of a bridge assessment being conducted by AEAL.

Use of this report is subject to the Statement of General Conditions which is included at the end of the text of this report. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for the proper use and interpretation of this report.

Continued....

1. SCOPE OF WORK

The scope of work was as follows:

- Review AI bridge file to obtain information about the subject site;
- Site inspection and reconnaissance to observe the present slope stability conditions of the north abutment and slide area to the north of the bridge;
- Provide a summary report of our findings and recommend potential slope remediation measures;
- Provide a Class A estimate of potential remedial measures; and,
- Identify scope of geotechnical work needed to complete Preliminary Engineering.

A survey of the north abutment area was to be completed by AEAL through PALS Survey Ltd. Field drilling or instrumentation was beyond the scope of this work.

2. PROJECT HISTORY

2.1 Bridge File Review

The bridge consists of a single lane 3 span steel through truss with 3 timber approach spans for a total length of 212 m. The bridge was completed in 1945 and has had slope instability problems at the north abutment throughout its service life starting during construction. To date it is estimated that there has been about 8 m of lateral movement toward the river and about 2 m of settlement at the north abutment. There is also record of upward movement of about 1 m at the north end of the bridge in 1996.

In the immediate vicinity of the bridge the Athabasca River flows from west to east and the north abutment is on the outside of a right hand bend.

Review of the AI bridge files indicates that the first concern of the north slope instability was mentioned in a memo on July 20, 1944. It was recorded on June 9, 1949 that the slope movements had impacted the bridge and the rollers were almost out of the roller nests. Movements of the north end of the bridge have been recorded several times since construction.

The recorded slope movements throughout the bridge history and calculated movement rates are summarized in Table 1, following:

TABLE 1
HISTORICAL NORTH ABUTMENT MOVEMENTS

PERIOD	REPORTED HORIZONTAL MOVEMENT (mm)	AVERAGE MOVEMENT RATE (mm/yr)
Up to August 1952	127* (estimated)	
From June 1957 to July 1958	40	37
From July 1965 to August 1966	500	460
Up to September 1969	3454*	144
Up to November, 1986	5940*	150
To present date	approx. 8000*	150

* Total horizontal movement values (based on the field reports)

Based on these values the average resultant movement vector including vertical movements of the north abutment over its 55 year history is approximately 8 m, corresponding to an average annual movement rate of 150 mm/year. It is noted that the movement rate has remained relatively constant based on the readings from 1969, 1986 and present.

Due to the ongoing large movements it has been necessary to perform regular maintenance at the north abutments, including constructing two extensions to the bridge, re-driving of piles and also frequent resetting of bridge bearings.

2.2 Review of Aerial Photographs of North Slope

A review of the stereo aerial photographs from 1950, 1970, 1973, 1977, 1986 and 1997 was carried out. The Aerial Photographs review indicated that the north slope has been affected by a very large landslide that extends from the north end of the bridge to prairie level and covers an area of approximately 140 hectares.

The slide appears to consist of a series of blocks moving translationally likely along a common lower shear zone. The upper scarp of the landslide is at prairie level and is about 1000 m north of the river bank. The landslide is about 1500 m wide in the middle of the slope. Based on the air photographs, it is estimated that the landslide extends approximately 500 m upstream and 1200m downstream of the bridge along the slope toe (see Figure 1). The north bridge abutment is situated within the lowest slide block adjacent to the river.

No geotechnical investigation or monitoring has been undertaken of the slide. However the above failure mechanism has been inferred based on the surficial topography and air photograph information. It is noted that the slide and failure mechanism is similar to the Al Bridge over the Little Smoky River near Guy Hwy 49:12, which has been documented by Thompson and Hayley (1975) and is shown schematically on Figure 2 attached.

The landslide is described as a retrogressive failure of slide blocks that encompass the entire valley slope from bottom to top. Sliding may be initiated by river erosion of the lower block adjacent to the river or possibly due to fluctuations in the groundwater level. Due to resulting loss of support to the upslope blocks, the upslope blocks move in succession toward the river over a very long time period. This is a complex and ongoing process.

2.3 Site Reconnaissance

A site reconnaissance was carried out by Mr. Ljubo Bijeljanin, P. Eng of Thurber Engineering, on January 24, 2001 and the following was recorded:

The north end of the bridge is situated on a gentle outside bend of the Athabasca River. The depth of the valley measured from prairie level to the river is estimated to be about 60 to70 m. The back scarp of the overall slide at the prairie level is about 1 km (horizontal distance) north from the river.

The average slope from prairie level to river surface is in order of 6 to 7°. The slope is heavily wooded and the trees, are largely second growth aspen. Three to four scarps were noted within the overall slide which form the boundaries of the various block movements depicted schematically in Figure 2. Scarps up to a few metre high were present especially at the lower part of the slide (Photo 6 on Figure 5). Several small areas of ponded water were noted within the slide area and these are typically formed in poorly drained features that result from back tilted slide blocks caused by previous sliding (Figure 1 attached).

Toe erosion was noted at several locations along the rivers edge, below the bridge and also at several locations upstream and downstream.

The road is about 8 m. wide, unpaved with ditches on both sides of the road. A flat fill area is located near to the bridge, which appears to have resulted from past remedial work at the north bridge abutment.

The vertical alignment of the road is longitudinally waved following the landslide surface contours. It was estimated during the site reconnaissance that the first 40 m of the road north of the bridge is almost level; the following 150 m is sloped at about 8 % , the middle section of about 400 m is sloped at about 2 %, and the upper road section of about 300 is sloped at about 6 to 7 %.

No visible signs of cracks or other road damage were noted during the site reconnaissance.

3. ABUTMENT SOIL CONDITIONS

Available soils information for the bridge site and slopes is relatively limited. In particular, no soils information was found for the original bridge design or construction.

Two test holes were drilled to a depth of about 10 m along the road at 7.5 and 55.0 m north of the bridge in 1956 (data from Research Council of Alberta). High plastic grey, stiff clay, with occasion soft to very soft layers, was encountered to the end of the test holes at a depth of about 10 m. Water bearing layers were encountered at a depth of 5.7 and 6.1 m below the ground surface.

Two test holes were drilled to depths 21 and 24 m in 1965 (Department of Highways and Transportation, Plan No. 401, File No 71600). The soil description from laboratory testing of samples collected from these test holes indicates that the soil profile consisted of sandy and silty clay. The log of one of these test holes is shown on a cross-section through the north abutment slope on Figure 3 attached.

4. DISCUSSION AND RECOMMENDATIONS

4.1 North Slope Stability

The bridge site is situated within a very large slide that extends from prairie level to river level and from about 500 m upstream to 1200 m downstream of the bridge.

It is estimated that the bridge north abutment has been moving at an average rate of about 150 mm per year over the last 55 years, which indicates that the level of slide activity is high. The toe of the slope is subjected to river toe erosion which likely triggers much of the ongoing movement. The lower slide block where the bridge abutment is located appears to extend about 200 m upstream and downstream of the bridge.

Judging from the surface topography and comparing the air photographs from 1950 and 1997 it appears that the landslide has retrogressed to the north since the bridge construction. The overall slide back scarp in 1997 appears to be about

60 to 70 m north compared to the back scarp noted on the air photos from 1950. During this period, the landslide area has also extended about 70 m further to the east.

The ground topography suggests a series of slide blocks whose lower surfaces merge to form a single continuos shear zone. The concept of a series of retrogressively failing blocks is confirmed by the presence of several small back scarps down the slope and also the location of several ponded water areas.

It may be that the individual blocks move at differential rates with the lower blocks along the river bank being more active. It is also expected that the movement rates are not uniform, but likely respond to seasonal changes in pore pressure due to infiltration of precipitation or due to periods of river erosion. Hence movement rates would be expected to be greatest through the summer months.

It is expected that the north abutment slope area will continue to move at a similar rate to the historical value measured over the past 55 years (i.e. 150 mm per year) in the absence of other triggering mechanisms or stabilizing measures.

4.2 Slope Stabilizing Remedial Measures

It is not considered practical to stabilize the entire slide area due to the very large areal extent. In other similar bridge sites with slides of similar magnitude and activity, one approach has been to design the bridge structure and foundations to accommodate ongoing movements. For example, at the recently completed rehabilitation of the Little Smoky Bridge on Hwy 49:12 near Guy, the new pier foundations have been designed to accommodate the expected magnitude of ongoing movement over the design life of the bridge. It is noted that the magnitude of movement at the Athabasca River Bridge is quite large and this may not be possible in one upgrade, but may require continual foundation replacements as currently being carried out.

It may be possible to improve the local stability at the bridge north abutment and hence reduce the rate of ongoing movements and settlements of the bridge north abutment by river armouring, toe loading and/or drainage. However it is not possible to quantify the potential improvement in stability with the existing level of information and without undertaking further analysis.

The toe of the river bank is susceptible to erosion along this reach, which continues to remove toe support to the slope. Hence placement of rip rap armouring along the river bank would be beneficial to reduce the effects of erosion. Armour protection of

the entire slide would not be economically feasible. However, based on review of air photos, armouring of the most immediate slide block may involve a slope length of about 400 m (200 m upstream and downstream) and may improve the local stability.

The required length of armour protection should be reviewed with respect to river engineering. Armouring of the immediate abutment area only is not expected to have significant impact on the bridge stability.

The rip rap armouring would be laid at the river's edge and extended up slope to design flood level as shown on Figure 1 attached. The rip rap blanket would be underlain by a pit ran gravel filter as a transition zone between the native soil and the rip rap.

Drainage measures such as drainage trenches or horizontal drains may also improve the local stability depending on the water table conditions. However there is no information on the piezometric conditions at this site to assess the need or effectiveness of such drainage measures.

Improvement of the drainage within the slide area may also be beneficial to reduce the ponding of water which likely contributes to the water level conditions within the slope. This would have to be further assessed using topographic plans to determine the feasibility of improving the drainage.

Further study including field investigation, instrumentation and slope stability analysis, is recommended to determine the present soil and groundwater conditions at the north abutment area, and the elevation and rate of movement before proceeding to preliminary and detailed design of any slope stabilization measures at this site.

5. CLASS A ESTIMATE

5.1 Slope Armouring

A preliminary cost estimate (Class A) for river bank armouring is provided in Table 2 below:

TABLE 2
CLASS A COST ESTIMATE

Material	Quantity(m^3)	Unit Price/ m^3	Cost ($)
Backfill	6500	$10	65,000
Granular Filter	2000	$24	48,000
Rip Rap	4500	$74	333,000
Mob./Demob.			20,000
		Total:	**$ 466,000**

Continued....

The estimate is based on the following assumptions:

- length of bank protection of 400 m, assuming rip rap blanket 0.75 m thick and granular filter 0.30 m thick;
- only minor earthworks associated with vegetation removal, and minor slope toe grading; and,
- Unit prices for rip rap and granular filter materials based on 2000 Construction Contracts with AI in Peace River Region.

5.2 Geotechnical Investigation

It is recommended that geotechnical investigation be undertaken before proceeding to preliminary or detailed design for any slope remedial measures.

The following is recommended:

- drilling sampling and testing about 3 test holes near the north abutment to depths of up to 30 m;
- installation of slope inclinometers and piezometers at each test hole to determine water levels and slope movements;
- instrumentation monitoring over a period of about one year; and,
- analysis and recommendations of slope remedial measures based on results of the investigation.

The results of the investigation would be used to provide input for preliminary and detailed design of slope remedial measures.

The estimated cost for geotechnical investigation, monitoring and analysis is about $45,000.

6. CLOSURE

We trust that this report provide the information you require at present. We would be pleased to answer any questions that you may have regarding this report.

Yours very truly,
Thurber Engineering Ltd.
Robin Tweedie , P.Eng.
Review Principal

Project Engineer
Ljubo Bijeljanin, P. Eng.

PROFESSIONAL ENGINEER ALBERTA
LJUBOMIR BIJELJANIN

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
Signature
Date March 13, 01
PERMIT NUMBER: P 5186
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REFERENCE LIST

Thomson, S. and Hayley, D.W., 1975. The Little Smoky landslide. Canadian Geotechnical Journal, Volume 12, p. 379.

Enclosures:

Figure 1. The site Air Photograph showing the Landslide Area and the Bridge

Figure 2. A Landslide Model (After S. Thomson and D.W. Hayley)

Figure 3. North abutment cross section showing a test hole log

Figure 4. The site Photographs 1 through 6

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

5. INTERPRETATION OF THE REPORT

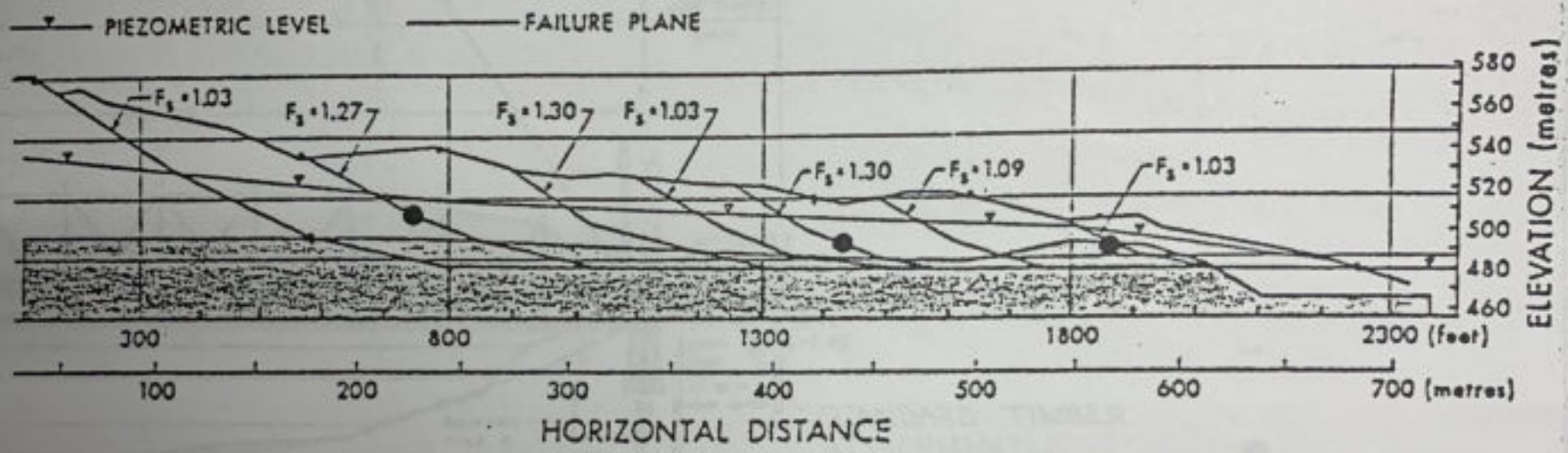
a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgemental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

(see over...)

FIGURES 1 TO 4

THURBER PROJECT #17-123-219

ENGINEER LNB	ASSOCIATED ENGINEERING	
DRAWN MNG	AIR PHOTO SHOWING THE BRIDGE AND THE LANDSLIDE NORTH OF THE BRIDGE	THURBER
DATE MAR 2001		
APPROVED		
SCALE 1:12000 (APPROX.)	SLOPE INSTABILITY AT ATHABASCA BRIDGE SMITH, AB	DRAWING No. FIGURE 1

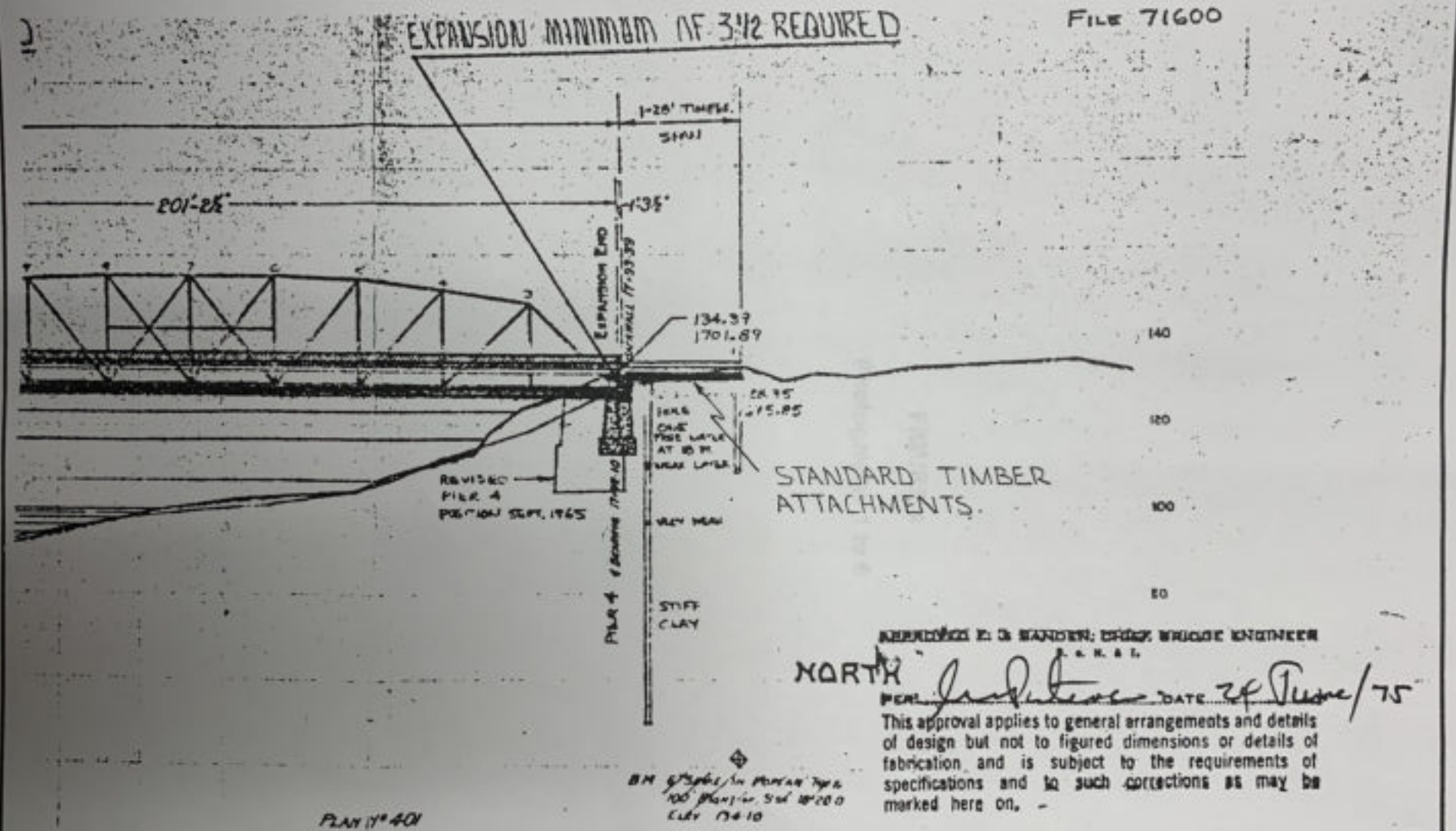


LEGEND

- PLEISTOCENE (MAINLY TILL)
- UPPER CRETACEOUS (CLAY SHALE)
- ● UPPER SHEAR PLANE IDENTIFIED IN BOREHOLES

ENGINEER	LNB	ASSOCIATED ENGINEERING	THURBER
DRAWN	MNG	THE LITTLE SMOKY LANDSLIDE MODE (AFTER S. THOMSON AND D.W. HAYLEY, 1975)	
DATE	MAR 2001		
APPROVED			
SCALE	AS SHOWN	SLOPE INSTABILITY AT ATHABASCA BRIDGE	SMITH, AB

DRAWING No. FIGURE 2



APPROVED E. D. SANDEN, CHIEF BRIDGE ENGINEER
P.E.N.S.E.

PER: _____ DATE 24 June/75

This approval applies to general arrangements and details of design but not to figured dimensions or details of fabrication and is subject to the requirements of specifications and to such corrections as may be marked here on.

ENGINEER	LNB
DRAWN	MNG
DATE	MAR 2001
APPROVED	
SCALE	AS SHOWN

ASSOCIATED ENGINEERING

CROSS SECTION THROUGH THE BRIDGE NORTH ABUTMENT SHOWING A TEST HOLE STRATIGRAPHY

SLOPE INSTABILITY AT ATHABASCA BRIDGE

SMITH, AB

THURBER

DRAWING No. FIGURE 3

APPENDIX G – CLASS A COST ESTIMATES

Option 1A - Bridge Rehabilitation: Load Restriction, Minor Superstructure & Superstructure Repairs

Class 'A' Cost Estimate

Project: BF 71600 Bridge Assessment
Client: Alberta Transportation
Project No.: 2021-3190
Date: 26-Aug-22

ITEM No.	ITEM	TOTAL QUANTITY	UNIT	UNIT PRICE	EXTENSION
1.0	Mobilization	1	LS	$71,000.00	$71,000.00
2.0	Replaced Damaged Guardrails	8	m	$150.00	$1,200.00
3.0	Replace Damaged Wheel Guards	275	m	$200.00	$54,960.00
4.0	Bridge Signage	1	LS	$2,000.00	$2,000.00
5.0	Replace Vertical Clearance Signs	1	LS	$800.00	$800.00
6.0	Install Missing Bolts and Blocking	1	LS	$10,000.00	$10,000.00
7.0	Reset Bearings	1	LS	$100,000.00	$100,000.00
8.0	Repair Scour Hole	1	LS	$500,000.00	$500,000.00
9.0	Complete Truss Repairs (Minimum)	1	LS	$35,000.00	$35,000.00

TOTALS	
SUBTOTAL ESTIMATED CONSTRUCTION COSTS	**$774,960.00**
CONTINGENCY 30%	$232,488.00
ENGINEERING	$154,992.00
TOTAL (Rounded)	**$1,163,000.00**

Option 1B - Bridge Rehabilitation: Minor Superstructure & Substructure Repairs

Class 'A' Cost Estimate

Project: BF 71600 Bridge Assessment
Client: Alberta Transportation
Project No.: 2021-3190
Date: 26-Aug-22

ITEM No.	ITEM	TOTAL QUANTITY	UNIT	UNIT PRICE	EXTENSION
1.0	Mobilization	1	LS	$89,000.00	$89,000.00
2.0	Replaced Damaged Guardrails	8	m	$150.00	$1,200.00
3.0	Replace Damaged Wheel Guards	275	m	$200.00	$54,960.00
4.0	Place Weight Restrictions	1	LS	$2,000.00	$2,000.00
5.0	Replace Vertical Clearance Signs	1	LS	$800.00	$800.00
6.0	Replace Damaged Strip Deck	315	m²	$700.00	$220,500.00
7.0	Installed Missing Bolts and Blocking	1	LS	$10,000.00	$10,000.00
8.0	Reset Bearings	1	LS	$100,000.00	$100,000.00
9.0	Repair Scour Hole	1	LS	$500,000.00	$500,000.00
10.0	Complete Truss Repairs as Per UT Report	1	LS	$210,000.00	$210,000.00

TOTALS	
SUBTOTAL ESTIMATED CONSTRUCTION COSTS	**$1,188,460.00**
CONTINGENCY 30%	$356,538.00
ENGINEERING	$237,692.00
TOTAL (Rounded)	**$1,783,000.00**

Option 2 - Bridge Replacement

Class 'A' Cost Estimate

Project: BF 71600 Bridge Assessment
Client: Alberta Transportation
Project No.: 2021-3190
Date: 26-Aug-22

ITEM No.	ITEM	TOTAL QUANTITY	UNIT	UNIT PRICE	EXTENSION
1.0	Removal and Disposal of Existing Bridge	1	LS	$3,000,000.00	$3,000,000.00
2.0	Slope Stability Improvement Contingencies	1	LS	$5,000,000.00	$5,000,000.00
3.0	Supply and Installation of Bridge	1	LS	$21,287,500.00	$21,287,500.00

TOTALS	
SUBTOTAL ESTIMATED CONSTRUCTION COSTS	**$29,287,500.00**
CONTINGENCY 30%	$8,786,250.00
ENGINEERING	$5,857,500.00
SUBTOTAL	**$43,931,250.00**
TOTAL (Rounded)	**$43,932,000.00**

Option 2 - Bridge Replacement

Class 'A' Cost Estimate

Project: BF 71600 Bridge Assessment
Client: Alberta Transportation
Project No.: 2021-3190
Date: 26-Aug-22

ITEM No.	ITEM	TOTAL QUANTITY	UNIT	UNIT PRICE	EXTENSION
3.0	Removal and Disposal of Existing Bridge	1	LS	$3,000,000.00	$3,000,000.00
4.0	Slope Stability Improvement Contingencies	1	LS	$5,000,000.00	$5,000,000.00
5.0	Supply and Installation of Bridge	1	LS	$28,099,500.00	$28,099,500.00
6.0	Roadwork	1	LS	$4,290,000.00	$4,290,000.00

TOTALS	
SUBTOTAL ESTIMATED CONSTRUCTION COSTS	**$40,389,500.00**
CONTINGENCY 30%	$12,116,850.00
ENGINEERING	$8,077,900.00
SUBTOTAL	**$60,584,250.00**
TOTAL (Rounded)	**$60,585,000.00**

Option 2 - Bridge Replacement

Class 'A' Cost Estimate

Project: BF 71600 Bridge Assessment
Client: Alberta Transportation
Project No.: 2021-3190
Date: 26-Aug-22

ITEM No.	ITEM	TOTAL QUANTITY	UNIT	UNIT PRICE	EXTENSION
3.0	Removal and Disposal of Existing Bridge	1	LS	$3,000,000.00	$3,000,000.00
4.0	Slope Stability Improvement Contingencies	1	LS	$5,000,000.00	$5,000,000.00
5.0	Supply and Installation of Bridge	1	LS	$29,250,000.00	$29,250,000.00

TOTALS	
SUBTOTAL ESTIMATED CONSTRUCTION COSTS	**$37,250,000.00**
CONTINGENCY 30%	$11,175,000.00
ENGINEERING	$7,450,000.00
SUBTOTAL	**$55,875,000.00**
TOTAL (Rounded)	**$55,875,000.00**

Option 2A - Full Replacement at Existing Alignment

Class 'A' Cost Estimate

Project: BF 71600 Bridge Assessment
Client: Alberta Transportation
Project No.: 2021-3190
Date: 26-Aug-22

ITEM No.	ITEM	TOTAL QUANTITY	UNIT	UNIT PRICE	EXTENSION
3.0	Removal and Disposal of Existing Bridge	1	LS	$3,000,000.00	$3,000,000.00
4.0	Slope Stability Improvement Contingencies	1	LS	$5,000,000.00	$5,000,000.00
5.0	Supply and Installation of Steel Girder Bridge	1	LS	$38,610,000.00	$38,610,000.00
6.0	Roadwork	1	LS	$7,800,000.00	$7,800,000.00

TOTALS	
SUBTOTAL ESTIMATED CONSTRUCTION COSTS	**$54,410,000.00**
CONTINGENCY 30%	$16,323,000.00
ENGINEERING	$10,882,000.00
SUBTOTAL	**$81,615,000.00**
TOTAL (Rounded)	**$81,615,000.00**

APPENDIX H – LIFE CYCLE COST ANALYSIS

Alberta Transportation

Life-Cycle Analysis

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Discount Rate :	4%
Analysis Period (years) :	50
Starting Year :	2022

REVISION DATE: **2022-09-30**

Note: Cost estimates are ***Class 'A' accuracy [+/- 50%].***

Year from baseline	*0*	*5*	*6*	*10*	*15*	*20*	*25*	*30*	*40*	*45*	*50*	*EXPENDITURE (current dollars)*	*NET PRESENT VALUE*	*RESIDUAL VALUE*	*ADJUSTED NET PRESENT VALUE*
Year	*2022*	*2027*	*2028*	*2032*	*2037*	*2042*	*2047*	*2052*	*2062*	*2067*	*2072*				
BF 71600 Bridge															
Option 1A															
Bridge Rehabilitation															
Rehabilitation	$1,163,000											$1,163,000.00	$1,163,000.00	$0.00	$1,163,000.00
Inspection		$5,000		$2,500	$2,500	$2,500	$2,500	$2,500	$5,000	$2,500	$2,500	$27,500.00	$11,857.49	$0.00	$11,857.49
Annual Truss Repairs		$150,000										$150,000.00	$123,289.07	$1.00	$123,288.07
Remove Drift/Debris		$50,000										$50,000.00	$41,096.36	$2.00	$41,094.36
Bridge Replacement			$43,932,000									$43,932,000.00	$34,720,097.74	$0.00	$34,720,097.74
												$45,322,500.00	**$36,059,340.65**	**$3.00**	**$36,060,000.00**
Option 1B															
Bridge Rehabilitation															
Rehabilitation	$1,783,000											$1,783,000.00	$1,783,000.00	$0.00	$1,783,000.00
Inspection		$5,000		$5,000	$2,500	$2,500	$2,500	$2,500	$5,000	$2,500	$2,500	$30,000.00	$13,546.40	$0.00	$13,546.40
Remove Drift/Debris		$50,000		$50,000								$100,000.00	$74,874.56	$0.00	$74,874.56
Bridge Replacement				$43,932,000								$43,932,000.00	$29,678,885.06	$0.00	$29,678,885.06
												$45,845,000.00	**$31,550,306.03**	**$0.00**	**$31,551,000.00**
Option 2A															
Structure Replacement															
Structure Replacement	$43,932,000											$43,932,000.00	$43,932,000.00	$0.00	$43,932,000.00
Inspection		$2,500		$2,500	$2,500	$2,500	$2,500	$2,500	$5,000	$2,500	$2,500	$25,000.00	$12,261.72	$0.00	$12,261.72
												$43,957,000.00	**$43,944,261.72**	**$0.00**	**$43,945,000.00**
Option 2B															
Structure Replacement															
Structure Replacement	$60,585,000											$60,585,000.00	$60,585,000.00	$0.00	$60,585,000.00
Inspection		$2,500		$2,500	$2,500	$2,500	$2,500	$2,500	$5,000	$2,500	$2,500	$25,000.00	$12,261.72	$0.00	$12,261.72
												$60,610,000.00	**$60,597,261.72**	**$0.00**	**$60,598,000.00**
Option 2C															
Structure Replacement															
Structure Replacement	$55,875,000											$55,875,000.00	$55,875,000.00	$0.00	$55,875,000.00
Inspection		$2,500		$2,500	$2,500	$2,500	$2,500	$2,500	$5,000	$2,500	$2,500	$25,000.00	$12,261.72	$0.00	$12,261.72
												$55,900,000.00	**$55,887,261.72**	**$0.00**	**$55,888,000.00**
Option 2D															
Structure Replacement															
Structure Replacement	$81,615,000											$81,615,000.00	$81,615,000.00	$0.00	$81,615,000.00
Inspection		$2,500		$2,500	$2,500	$2,500	$2,500	$2,500	$5,000	$2,500	$2,500	$25,000.00	$12,261.72	$0.00	$12,261.72
												$81,640,000.00	**$81,627,261.72**	**$0.00**	**$81,628,000.00**