

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – GRANDE PRAIRIE  
2020 INSPECTION**



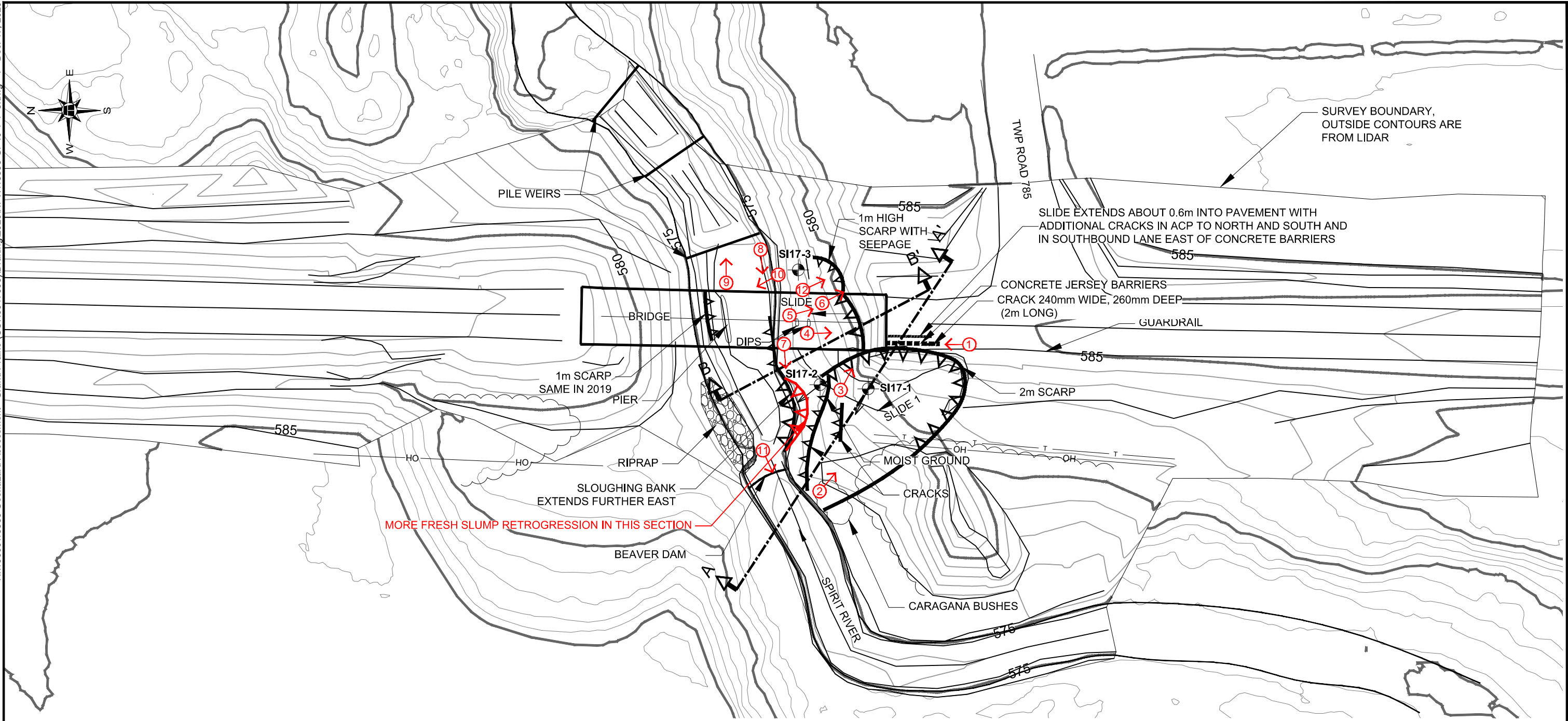
Site Number	Location	Name	Hwy	km
GP040	4.7 km's N. of Rycroft	Spirit River Bridge (BF75106)	2:68	4.7
Legal Description		UTM Co-ordinates		
SE¼ 34-078-5 W6M		11U E 394291	N 6184727	

	Date	PF	CF	Total
<b>Previous Inspection:</b>	30-May-2019	12	6	72
<b>Current Inspection:</b>	28-May-2020	13	6	78
<b>Road AADT:</b>	3,290		<b>Year:</b>	2019
<b>Inspected By:</b>	Ed Szmata, AT Rishi Adhikari, AT Graham Cooper, AT		Nicole Wilder, Thurber Don Proudfoot, Thurber	
<b>Report Prepared By:</b>	Nicole Wilder, Renato Clementino (Review)			
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	<p>In 2013, a landslide began to develop in the west side of the south abutment headslope and sideslope of the Spirit River Bridge (BF75106). It appears there is also a second localized slide below the bridge south abutment which extends towards the east where a previous tension crack existed and has now developed into a 1 m high scarp.</p> <p>Erosion was also observed at the toe of the south abutment headslope beneath the bridge.</p>	
<b>Dimensions:</b>	<p>The upper portion of the landslide located close to the south abutment was about 20 m in width across the backscarp and extended down to the river bank. The lower portion of the landslide located on the river terrace was about 35 m in width across the backscarp. The second slide to the east was approximately 30 m in width.</p>	
<b>Maintenance:</b>	<p>Jersey Barriers were placed around the scarp on the edge of the highway in spring 2017 and have remained in place. Construction has started on remediating the landslide.</p>	
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>
<input checked="" type="checkbox"/> Pavement Distress	Cracks were present along the backscarp of the landslide in the shoulder of the SBL of Hwy 2:68 at the south abutment (Photo 1) and on the east side of jersey barriers, these appeared to be in similar condition in 2020.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	A landslide occurred on the west side of the south abutment headslope (Photos 2 and 3). A 35 m long tension crack has formed on the terrace below the main backscarp and another localized slide failure is present below the south abutment which extends northeast which appeared it has worsened since the last inspection. Two dips were present in the south headslope. Soil loss/settlement were evident at the crest of the south abutment headslope. There was a 1 m high scarp observed on the north	<input checked="" type="checkbox"/>

	abutment which may be exacerbated during highwater.	
<input checked="" type="checkbox"/> Erosion	Erosion was observed at the toe of the south abutment headslope beneath the bridge and has extended further east. It appears that river erosion is contributing to slump retrogression on the south bank just west of the bridge. (See Photo 7).	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	The ground was moist near SI17-2 and water was also observed on the south abutment head slope (Photo 5). Seepage was also noted within the scarp that has formed on the east side of the south abutment.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Bridge/Culvert Distress	The top of the southeast abutment of the bridge appeared to be pushing against and spalling the girders. The south abutment is being undermined and it looks like 3 concrete counterforts were constructed under the centre with 2 H piles at each edge with cables under the bridge widening section.	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
<b>Instrumentation June 22, 2020: Inclinometers SI17-1 = Sheared off at 4.6 m depth; SI17-2 = Sheared off at 4.3 m depth; SI17-3 = movement between 0.2 m to 3.9 m at a rate of 19.4 mm/yr in summer 2020. Piezometers PN17-1A = not functioning; PN17-1B = 3.6 m BGS; PN17-2 = 7.3 m BGS; PN17-3 = not functioning.</b>		
<b>Assessment:</b> <p>In 2013, as a result of heavy rains, the water level in the Spirit River rose and shifted toward the south. The raised river level which caused erosion at the toe of the south bridge abutment headslope and sideslope, resulting in the occurrence of the landslide in the south abutment fill.</p> <p>It is important that the abutment headslope and sideslope be stabilized in order to avoid causing further distress to the bridge structure.</p> <p>A geotechnical investigation consisting of three test holes with slope inclinometers and pneumatic piezometers was performed in summer of 2017. Simplified stratigraphic cross sections are attached on Drawing No. 13353-GP40-1-2 and 3, which show the soil conditions encountered in the boreholes, piezometric conditions and inferred slip surface of the landslides. The slip surface appears to be based in high plastic clay and clay till, toeing out at the river.</p>		
<b>Recommendations:</b>		<b>Cost</b>
Regularly monitor the landslide for activity		Maintenance
<p>A preliminary remediation report was prepared by Thurber for stabilization options along the south bank of the river and repair the abutment headslope dated January 7, 2019.</p> <p>Three options were considered to stabilize the landslide, which were:</p> <ul style="list-style-type: none"> <li>▪ Cast-in place concrete pile wall</li> <li>▪ Driven Steel H-pile wall</li> <li>▪ Hardy Ribs</li> </ul> <p>The preferred option was using a cast-in place concrete pile wall with soils nails for which a tender package was prepared (TND0021103). Subsequently the detailed design and tender package was prepared and construction to remediate the landslide began on July 9, 2020 and will likely be completed in Spring 2021.</p>		

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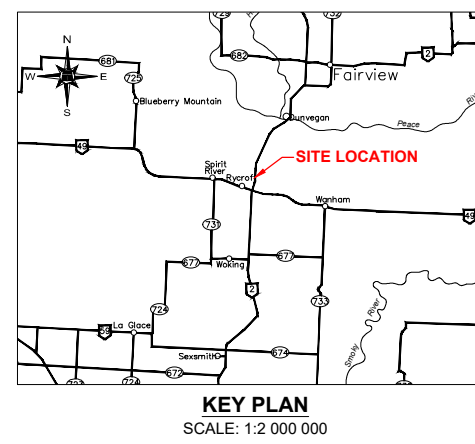
- LEGEND**
- APPROXIMATE INSTRUMENT / TEST HOLE LOCATION
  - SCARP CRACK
  - APPROXIMATE OVERHEAD POWER LINE LOCATION
  - APPROXIMATE TELUS BURIED CABLE LOCATION
  - APPROXIMATE BUSH LINE LOCATION
  - PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION

**NOTES :**

1. FEATURE LOCATIONS ARE APPROXIMATE
2. MAY 26, 2020 FEATURES SHOWN IN RED

0 10 20 30 40 50 60m

SCALE 1:1000



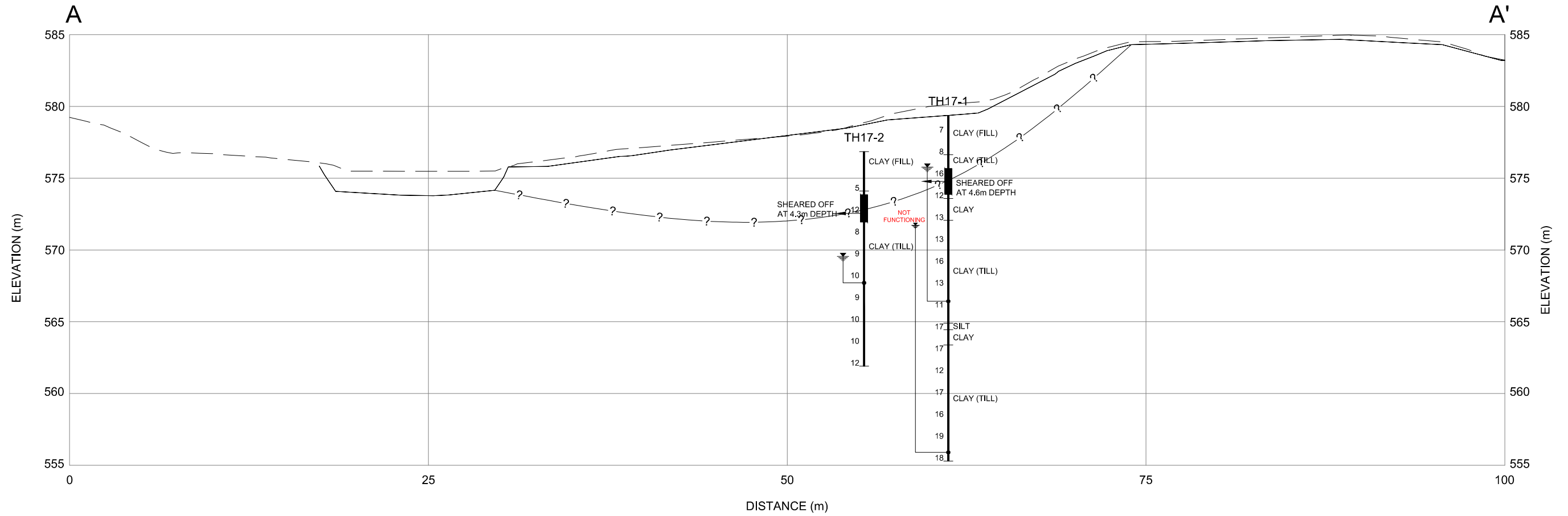
**PEACE REGION (GRANDE PRAIRIE)**

**GP40-1: HWY 2-68 KM 4.7 SPIRIT RIVER BRIDGE  
2020 INSPECTION PLAN**

**DWG No. 13353-GP40-1-1**

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	RVC
SCALE	1:1000
DATE	DECEMBER 2020
FILE No.	13353

**THURBER ENGINEERING LTD.**



**LEGEND**

- SPT N VALUE
- WATER LEVEL IN PIEZOMETER (JUNE 22, 2020)
- PNEUMATIC PIEZOMETER TIP
- PROFILE FROM SURVEY
- PROFILE FROM LIDAR
- ZONE OF MOVEMENT NOTED IN SLOPE INCLINOMETER
- INFERRED SLIP SURFACE OF LANDSLIDE

**NOTE**

DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.



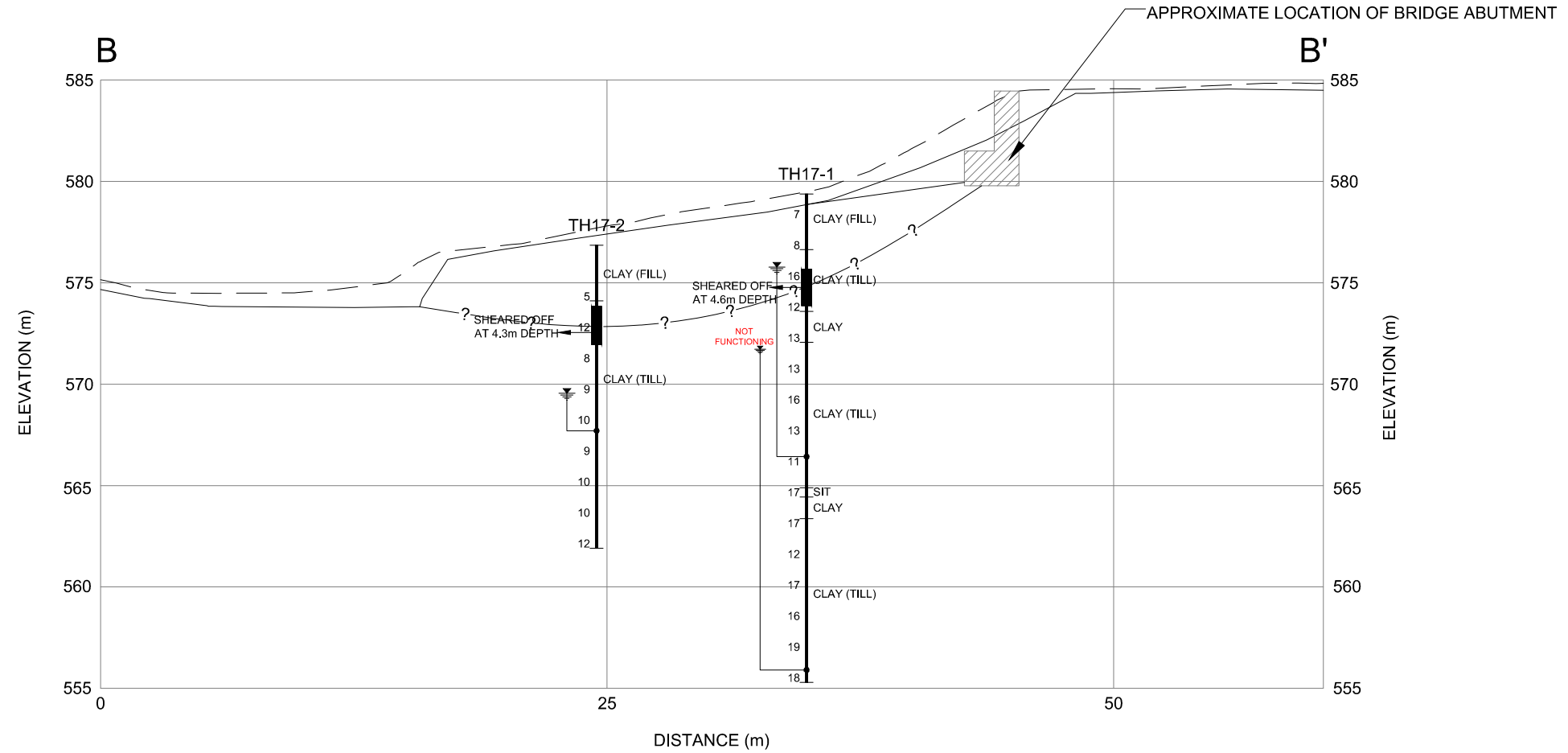
**PEACE REGION (GRANDE PRAIRIE)**

**GP40-1: HWY 2-68 KM 4.7 SPIRIT RIVER BRIDGE  
CROSS - SECTION A - A'**








**DWG No. 13353-GP40-1-2**

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	RVC
SCALE	1:300
DATE	DECEMBER 2020
FILE No.	13353





**LEGEND**

-  SPT N VALUE
-  WATER LEVEL IN PIEZOMETER (JUNE 22, 2020)
-  PNEUMATIC PIEZOMETER TIP
-  PROFILE FROM SURVEY
-  PROFILE FROM LIDAR
-  ZONE OF MOVEMENT NOTED IN SLOPE INCLINOMETER
-  -?- INFERRED SLIP SURFACE OF LANDSLIDE

**NOTE**

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PEACE REGION (GRANDE PRAIRIE)

**GP40-1: HWY 2-68 KM 4.7 SPIRIT RIVER BRIDGE  
CROSS - SECTION B - B'**

DWG No. 13353-GP40-1-3

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	RVC
SCALE	1:300
DATE	DECEMBER 2020
FILE No.	13353





**Photo 1.**  
Looking north at  
the Slide 1 scarp  
cracks along the  
edge of the SBL.



**Photo 2.**  
Looking east at the  
Slide 1 scarp along  
the edge of the  
road.



**Photo 3.**  
Looking east at the flank of Slide 1.



**Photo 4.**  
Looking south at the south abutment. Note the settlement of the soil. It appears that the bridge was widened after the original construction. Concrete counterforts are under the original bridge and steel H piles with cables are under the widened part.



**Photo 5.**  
Looking southeast  
at the scarp and  
flank of Slide 2.



**Photo 6.**  
Looking at the  
south abutment  
and seepage  
coming out of it.





**Photo 7.**  
Looking upstream of the bridge at the river bank erosion/slumping. The toe of Slide 1 is located at the caragana bushes.



**Photo 8.**  
Looking upstream towards the bridge pier and build of debris against the pier.



**Photo 9.**  
Pile weirs located  
in the streambed  
downstream of the  
bridge.



**Photo 10.**  
Looking north at  
1m high scap on  
north abutment.



**Photo 11.**  
Looking west  
towards beaver  
dam.



**Photo 12.**  
Looking southeast  
at the scarp and  
flank of Slide 2.