

**ALBERTA TRANSPORTATION AND  
ECONOMIC CORRIDORS GRMP  
NORTH CENTRAL (ATHABASCA AND FORT  
MCMURRAY DISTRICTS)  
2025 SITE INSPECTION**



| Site Number              | Location                 | Name                             | Hwy  | km     |
|--------------------------|--------------------------|----------------------------------|------|--------|
| NC006                    | 11 Km East of Slave Lake | Mitsue Recreation Area           | 2:46 | 47.33  |
| <b>Legal Description</b> |                          | <b>UTM Co-ordinates (NAD 83)</b> |      |        |
| NW-7-72-4-W5M            |                          | 11U N 6122200                    | E    | 651552 |

|                             | Date                                                                                                                                 | PF | CF           | Total |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----|--------------|-------|
| <b>Previous Inspection:</b> | June 3, 2024                                                                                                                         | 14 | 5            | 70    |
| <b>Current Inspection:</b>  | May 13, 2025                                                                                                                         | 6  | 5            | 30    |
| <b>Road WAADT:</b>          | 2,730                                                                                                                                |    | <b>Year:</b> | 2024  |
| <b>Inspected By:</b>        | José Pineda, Bruce Nestor, Marven Wiseman (Thurber)<br>Arthur Kavulok, Gordon Wolters, Rishi Adhikari (TEC)                          |    |              |       |
| <b>Report Attachments:</b>  | <input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items |    |              |       |

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Primary Site Issue</b> | Active landslide causing severe deterioration to highway conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Dimensions:</b>        | About 80 m wide (parallel to the highway alignment) and 60 m long (perpendicular to the highway alignment)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Site History:</b>      | <p>In the Spring of 2019 Mr. Gordon Wolters, local MCI of TEC, noticed a sudden severe depression on the highway surface. TEC requested Thurber to conduct a call out.</p> <p>During Thurber's inspection on June 10, 2019, it became clear that the current landslide area is adjacent to a previously repaired landslide in 2007 (previously known as NC06-1).</p> <p>The repairs at the NC06-1 site included the installation of surface and sub-surface drainage improvement measures and the construction of a toe berm to stabilize the landslide movement. The drainage improvement measures consisted of installing sub-drains, constructing a riprap lined swale, flushing, and tying older sub-horizontal drains to a drainage collection manhole at the bottom of the slope. The site NC06-1 was inspected by Thurber as part of the GRMP until 2012 when it was determined that the 2007 remedial measures appeared to have mitigated the slope movement. The instruments installed at the old landslide site are not read under the current GRMP.</p> <p>In 2020, Thurber installed geotechnical instruments, consisting of slope inclinometers and vibrating wire piezometers, within the active landslide area to assess depth of movement and soil and groundwater conditions. These instruments are currently read under the GRMP.</p> <p>In 2024, existing underground fiber optic communication lines on both sides of the highway were relocated to avoid conflict with designed remedial measures at this site.</p> <p>In November 2024, under TEC's Contract No. CON0023908, remedial measures of the 2019 landslide were constructed and included: a 95 m long driven steel pile wall centered 3 m from the north pavement edge; grouting and abandoning the existing 760 mm CSP culvert;</p> |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | installing a new 900 mm diameter SWSP culvert by boring beneath the highway; regrading the highway south ditch to drain to a riprap bowl at the inlet of the new 900 mm diameter culvert; regrading the slide area north area of the highway; constructing a riprap channel from the outlet of the new 900 mm diameter culvert to the treeline and; replacing the existing guardrail with new strong post W-beam guardrail. |
| <b>Maintenance</b> | ACP patch placed in 2021 on the west bound lane covering most of the landslide impacted section of the highway. According to the MCI, an ACP overlay is scheduled for the site in 2025.                                                                                                                                                                                                                                     |

| <b>Observations:</b>                                  | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                   | <b>Worse?</b>            |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <input checked="" type="checkbox"/> Pavement Distress | 25 mm dip noted on the middle portion of the 2021 ACP patch.                                                                                                                                                                                                                                                                                                         | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Slope Movement    | Reflective landslide cracks within the 2021 ACP patch area have widened; diagonal cracks within the landslide area are up to 150 mm wide with up to 30 mm drop across the crack surfaces; tension cracks downslope of the highway and the previously observed toe roll are no longer visible due to regrading work completed as part of 2024 pile wall construction. | <input type="checkbox"/> |
| <input type="checkbox"/> Erosion                      |                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Seepage           | Minor flow in the new culvert.                                                                                                                                                                                                                                                                                                                                       | <input type="checkbox"/> |
| <input type="checkbox"/> Bridge/Culvert Distress      |                                                                                                                                                                                                                                                                                                                                                                      | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Other             | The bench and settlement cracks, used to be downslope of the highway surface, were regraded as part of the 2024 pile wall construction and are no longer visible.                                                                                                                                                                                                    | <input type="checkbox"/> |

#### **Instrumentation Readings (5 SIs and 5 VWs):**

SI20-1, installed in the south ditch of the highway, and SI20-4, installed further downslope of the potential toe of the active landslide, continued to show no discernable movement. SI20-3, installed immediately to the north of the bush line downslope of SI20-2, showed a sharp acceleration in movement between June 2024 and September 2024. Following the construction of the pile wall in November 2024, SI20-3 has not shown significant downslope movement.

SI24-7 and SI24-8 were installed during construction of the 2024 pile wall. SI24-7 was installed downslope of the new pile wall, while SI24-8 was installed between the guardrail and the pile wall. SI24-7 showed a rate of movement of 23.1 mm/yr in the spring of 2025, while SI24-8 showed a rate of movement of 4.1 mm/yr in the spring of 2025.

SI20-2, VW20-2A and VW20-2B were removed during construction of the 2024 pile wall.

The vibrating wire piezometers showed groundwater depths ranging from 1.9 m in VW20-4A to 8.1 m in VW20-1 in the spring of 2024.

#### **Assessment (Refer to attached Figures and Photos):**

The pile wall should be able to mitigate the shallow landslide movement at this site. However, future reflective cracks will continue to appear on the highway surface until the pile wall mobilizes the full force to stabilize the landslide movement. Future maintenance, consisting of crack sealing and ACP patching, should take place in the future, as needed.

It should be noted that there is still a potential for a future deep-seated movement at the pile wall location. The current pile wall is not designed to retain the deep landslide and additional repair measures will have to be designed and constructed to deal with this scenario, if needed. In addition, there is a dormant landslide to the west of the existing culvert, but it is not currently impacting the highway.

**Recommendations:**

It is recommended that the site be visited for a few years to assess the effectiveness of the pile wall at mitigating the shallow landslide movement.

The ACP overlay, scheduled for 2025, should eliminate the existing dip on the highway surface and provide a smooth ride to the highway motorists. If delayed, the local MCI should consider sealing the visible landslide cracks on the highway surface.

**Closure**

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement for Use and Limitations of Report.

José Pineda, M.Eng., P.Eng.  
Associate | Senior Geotechnical Engineer

Bruce Nestor, M.Eng., P.Eng.  
Geotechnical Engineer

## STATEMENT FOR USE AND INTERPRETATION OF REPORT

### 1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

### 2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, 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 Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together 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, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE OF THE REPORT.**

### 3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives, and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

### 4. USE OF THE REPORT

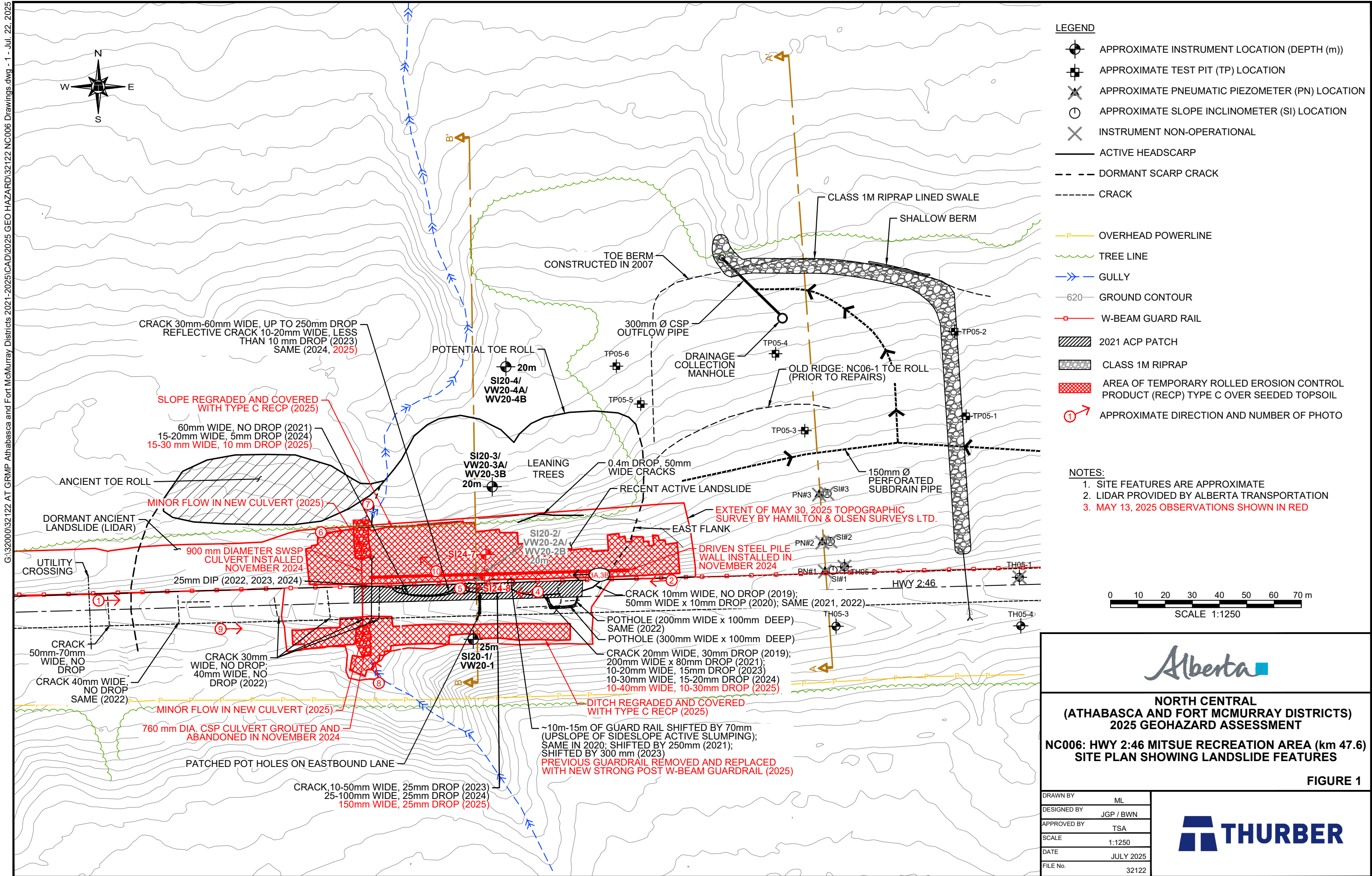
The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT.** Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

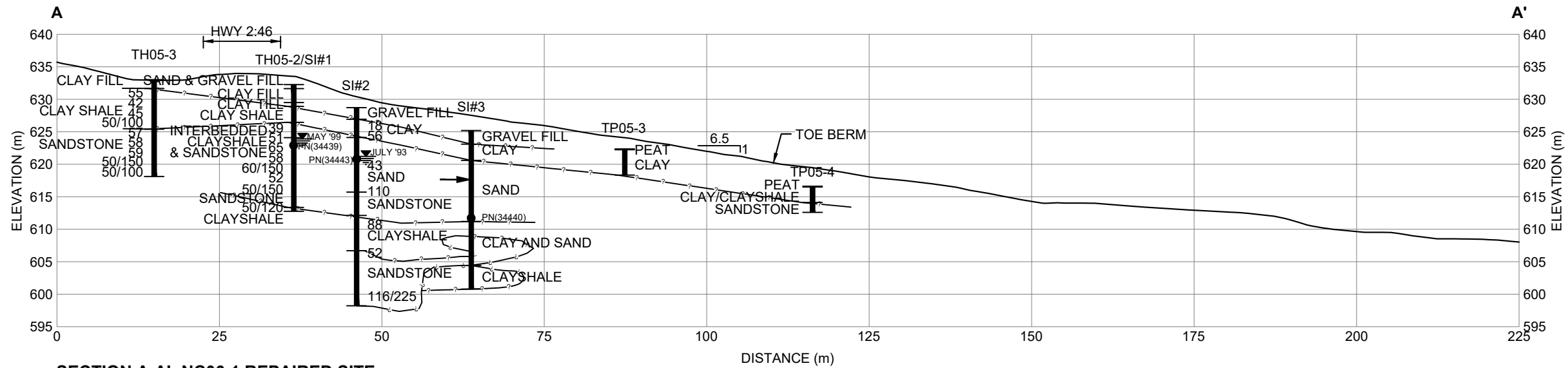
### 5. INTERPRETATION OF THE REPORT

- 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 is inherently judgement-based. 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 the Client and all other parties making use of such documents or records with or without our express written consent need to be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must 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.
- b) **Reliance on Provided Information:** The evaluation and conclusions contained in the Report have been prepared based on conditions in evidence at the time of site inspections and based on information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) **Design Services:** The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber is recommended to be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design need to be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) **Construction Services:** During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions to confirm and document that the site conditions do not materially differ from those conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

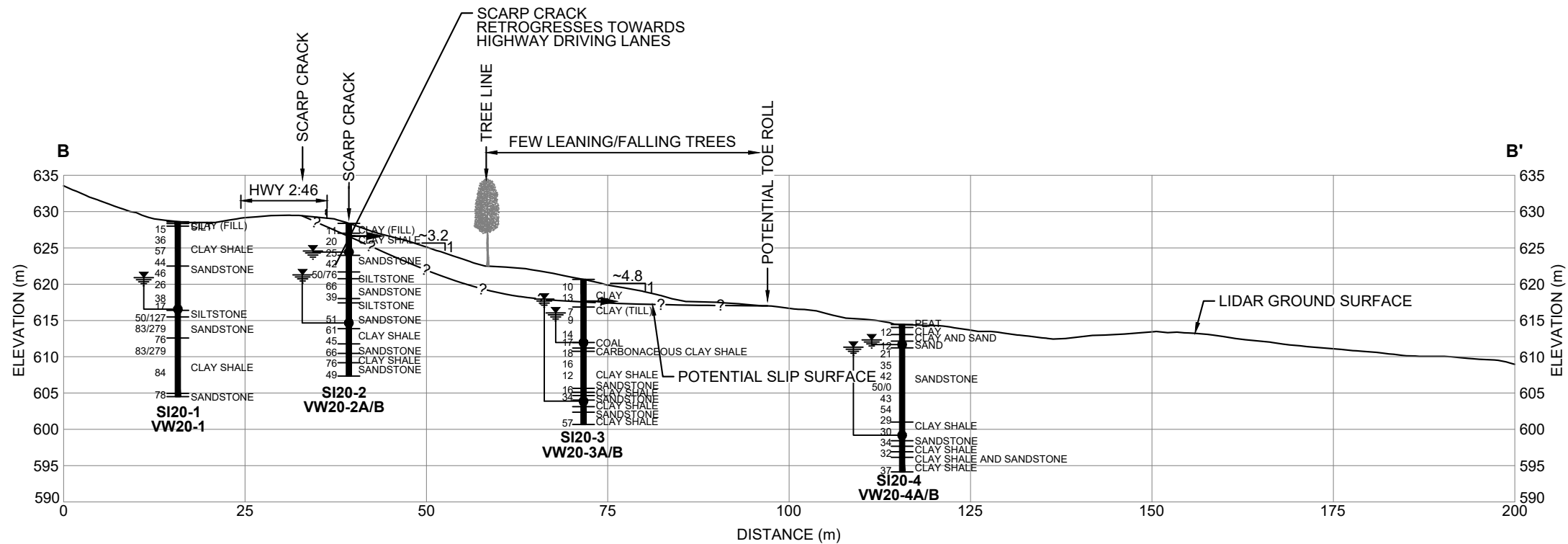
### 6. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or other parties who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes, but is not limited to, decisions made to develop, purchase, or sell land, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.





SECTION A-A': NC06-1 REPAIRED SITE



SECTION B-B': NC06-2 NEW SITE

- LEGEND**
- 15 I SPT N VALUE
  - WATER LEVEL IN PIEZOMETER
  - PNEUMATIC PIEZOMETER TIP LOCATION
  - DEPTH OF MOVEMENT IN SLOPE INCLINOMETER

**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.



**NORTH CENTRAL REGION  
(ATHABASCA AND FORT McMURRAY DISTRICTS)  
2025 GEOHAZARD ASSESSMENT**

**NC006: HWY 2:46 MITSUE RECREATION AREA (km 47.6)  
CROSS-SECTIONS**

**FIGURE 2**

|             |           |
|-------------|-----------|
| DRAWN BY    | ML        |
| DESIGNED BY | JGP / BWN |
| APPROVED BY | TSA       |
| SCALE       | 1:750     |
| DATE        | JULY 2025 |
| FILE No.    | 32122     |





**Photo 1. Looking east toward the highway side slope area regraded as part of the 2024-25 pile wall construction.**



**Photo 2. Looking west at the flank of the landslide area and the west edge of the 2021 ACP patch.**



**Photo 3A (2024 Inspection).** Looking west at the edge of the 2021 ACP patch. Reflective cracks are visible through the ACP patch.



**Photo 3B.** (Same location as Photo 3A viewed during the current inspection). Note that the guardrail was replaced during the 2024-25 pile wall construction.



**Photo 4. Looking west at longitudinal cracks on the highway.**



**Photo 5. Looking east at the most severe area of pavement distress within the slide. The dips and cracks have not shown substantial change since construction of the pile wall in 2024.**



**Photo 6. Looking east at the regraded downslope area. The inlet for the new 900 mm diameter SWSP culvert as well as the associated Class 1M riprap channel are visible in the foreground. Regraded slope area has been covered with Type C erosion control matting.**



**Photo 7. Outlet of new 900 mm diameter SWSP culvert and Class 1M riprap channel.**



**Photo 8. Inlet side of new 900 mm diameter SWSP culvert and riprap bowl.**



**Photo 9. Looking east at the regraded upslope ditch area. Type C erosion control blanket has been placed in the ditch. The inlet to the new 900 mm diameter SWSP culvert is visible near the middle of the photo. |**