



December 19, 2005

File: 15-85-12

Alberta Infrastructure and Transportation
Room 301, Provincial Building
9621 - 96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Ed Szmata

**PEACE REGION (SWAN HILLS AREA) GEOHAZARD ASSESSMENT
EMBANKMENT FAILURE
ON HWY 749:02, Km 16.10, BANANA BELT – SH 19
2005 ANNUAL INSPECTION REPORT**

Dear Sir;

This letter documents the 2005 annual site inspection of a slide area located along Hwy 749:02 on the northwest side of the highway about 11 km south of High Prairie, Alberta. Thurber Engineering Ltd. (Thurber) undertook this inspection in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE047/2004) with Alberta Infrastructure and Transportation (AIT).

Mr. Barry Meays, P.Eng, and Mr. Don Proudfoot, P.Eng., of Thurber undertook the inspection on June 9, 2005 in the presence of Mr. Roger Skirrow, P. Eng., Mr. Ed Szmata, and Ms. Amanda Russell, all of AIT.

1. BACKGROUND

A call-out was made for this site on September 10, 2004 at which time it was considered a new site, with no history of past instability. Cracks in the pavement were first noticed after chip sealing in July 2004, following which a patch was placed to smooth out slight rutting in the pavement. The slide occurred on about September 3, 2004 and had continued to move since then. Slope movements caused a Telus cable that was buried in the sideslope to break. The cable was rerouted over the slide area above ground on about September 5, 2004.

Approval was received from AIT to proceed with design, tender preparation and construction for this project. The design and tender preparation was completed and the contract was awarded to In-Line Contracting on June 20, 2005. A pre-construction meeting was held on June 22, 2005. An issue dealing with active bird's nests on the site delayed the start of construction. Construction had not commenced by the time of our June 2005 visit but was later completed in the fall.

2. SITE OBSERVATIONS

The changes in condition since last year are shown on the attached topographic survey plan and slope cross-sections which was surveyed in October, 2004 by EXH Engineering Services Ltd. as part of the design. Selected photographs taken during the site visit are also attached.

The slide occurred on the west side of the highway. The backscarp of the slide was located about 2 m into the paved road surface and the slip surface extended below the side slope to toe out in a natural drainage run. The slope varies in height from about 3.5 m at the south end of the slide to about 7 m at the north end. The upper part of the slope (embankment sideslope) was inclined at about 4.5H:1V while the lower portion which was covered with natural bush varying from about 5H:1V at the south end to 3.8 H:1V at the north end. The slide has a total length of about 53.5 m. As was previously recommended, gravel had been placed on the top portion of the slide including the highway shoulder to lessen the sharp drop-off.

The backscarp of the slide was well defined with a total height of about 0.6 m. The exposed pavement structure consisted of 250 mm of asphalt concrete over 200 mm of soil cement over high plastic clay. The slope area in the vicinity of the slide was very soft and saturated with water at the time of the visit. Some water was present pooled along the base of the backscarp crack. The location where Telus pulled out the cable from the slope was badly rutted by the equipment. The slide movement had bowed out the barbed wire fence located at the west edge of the highway right-of-way. Tilted trees were present at the toe of the slope where the slide toe roll was present. The trees that were leaning on the fence were cut down by someone prior to this visit.

At the time of the visit, no water was flowing in the drainage run and it is believed to be an intermittent drainage course. However, there were a few locations where running water had scoured out parts of the base of the drainage run, the most prominent of which is shown on the site plan. There was an 800 mm diameter centerline CSP that crossed at a skew under the highway to drain water through another shorter pipe located south of the slide under the farmer's access road and into the natural drainage run.

The ground rose to the west side of the drainage run to a cleared access trail and then dropped again to the west towards the farmer's fields. All of the slopes were covered with mature trees except where they had been cleared for the access trail.

A small depression was observed in the east ditch directly across from the slide, and water may pond in this area during periods of precipitation.

3. ASSESSMENT

The highway embankment failure appears to be mainly due to saturation of the slope as a result of a prolonged period of rainy weather. The low, saturated area in the east ditch directly across from the slide may also be a source of water feeding the slide. The subsurface conditions below the slope appeared to consist mainly of high plastic clay. Over time, the clay may have become desiccated and weakened by freeze thaw and wet dry cycles which resulted in fissures and /or softened soil into which the rain could permeate. There were no signs of significant erosion at the toe of the slope that could have triggered the slope movement.

4. RISK LEVEL

The risk level for this site has been assessed as follows:

$$PF(13) * CF(4) = 52 \text{ (Same as September 10, 2004 Call-out)}$$

This risk level was based on a Probability Factor (PF) of 13 (active with high rate of movement, steady or increasing) and a Consequence Factor (CF) of 4 (site where partial closure of the road is a direct result of the slide movement).

5. RECOMMENDATIONS

5.1 Short Term

See 5.3 Maintenance

5.2 Long Term

The recommended long-term solution which has been tendered is to construct a toe berm to stabilize the slide area. This will require that a culvert pipe be placed in the base of the drainage run under the berm. The berm will extend about half way up the slope. The failed portion of the slope located above the berm level will be subexcavated and reconstructed with well-compacted drier clay, benched into the intact portion of the highway embankment. The bush area in the vicinity of the berm will need to be cleared. The farmer could use the berm as a new access to his cleared trailed which would allow the existing short culvert to be removed.

Some erosion protection will be required in the base of the drainage run at the existing scour hole location, and just downstream of the end of the new dissipation bowl downstream of the culvert which co-oincides with the end of an existing approach at the north end.

The small depression area in the east ditch directly across from the slide should be filled with compacted clay to reduce the probability of water ponding and surcharging the slide with water.

A right-of-way request was prepared as part of the design, and the additional lands were negotiated by AIT.

The cost of the work excluding land and engineering costs was estimated in the order of \$200,000.

5.3 Maintenance

The slide is currently affecting the roadway and could continue to retrogress into the pavement due to the relatively high backscarp. Barricades and warning signs should be maintained around the slide area to warn motorists of the hazard and the slide should be inspected on a daily basis so that signs can be moved, or a detour constructed if the slide worsens.

6. CLOSURE

We trust this assessment and recommendations meet with your needs at this time. Please contact the undersigned should questions arise or if the slide condition worsens.

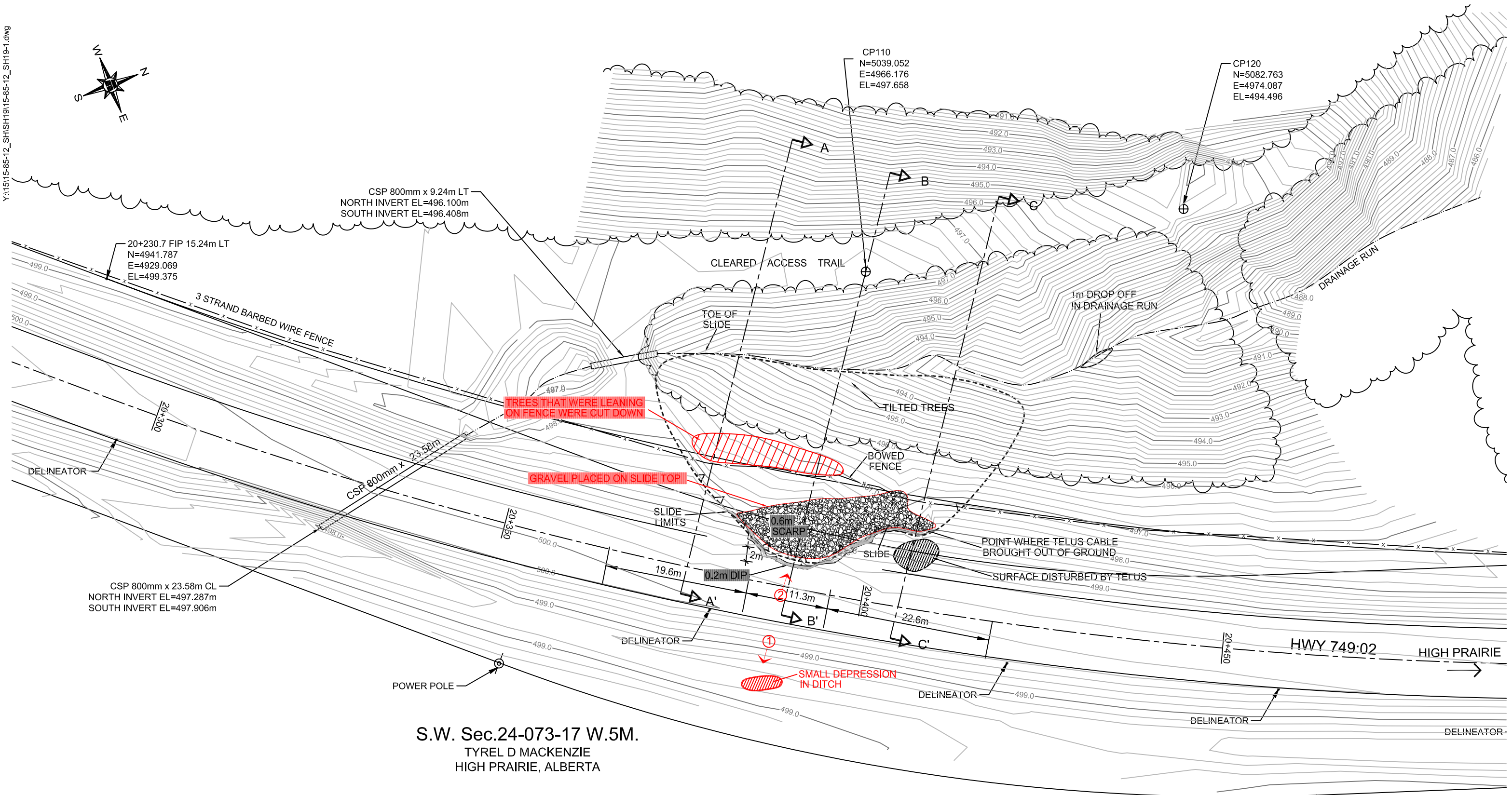
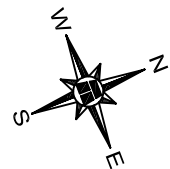
Yours very truly,
Thurber Engineering Ltd.
Don Proudfoot, P.Eng.
Review Principal



Barry Meays, P.Eng.
Project Engineer
/slip

Attachments

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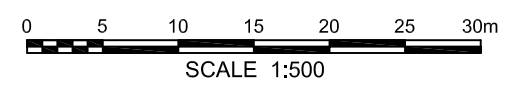
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LEGEND :

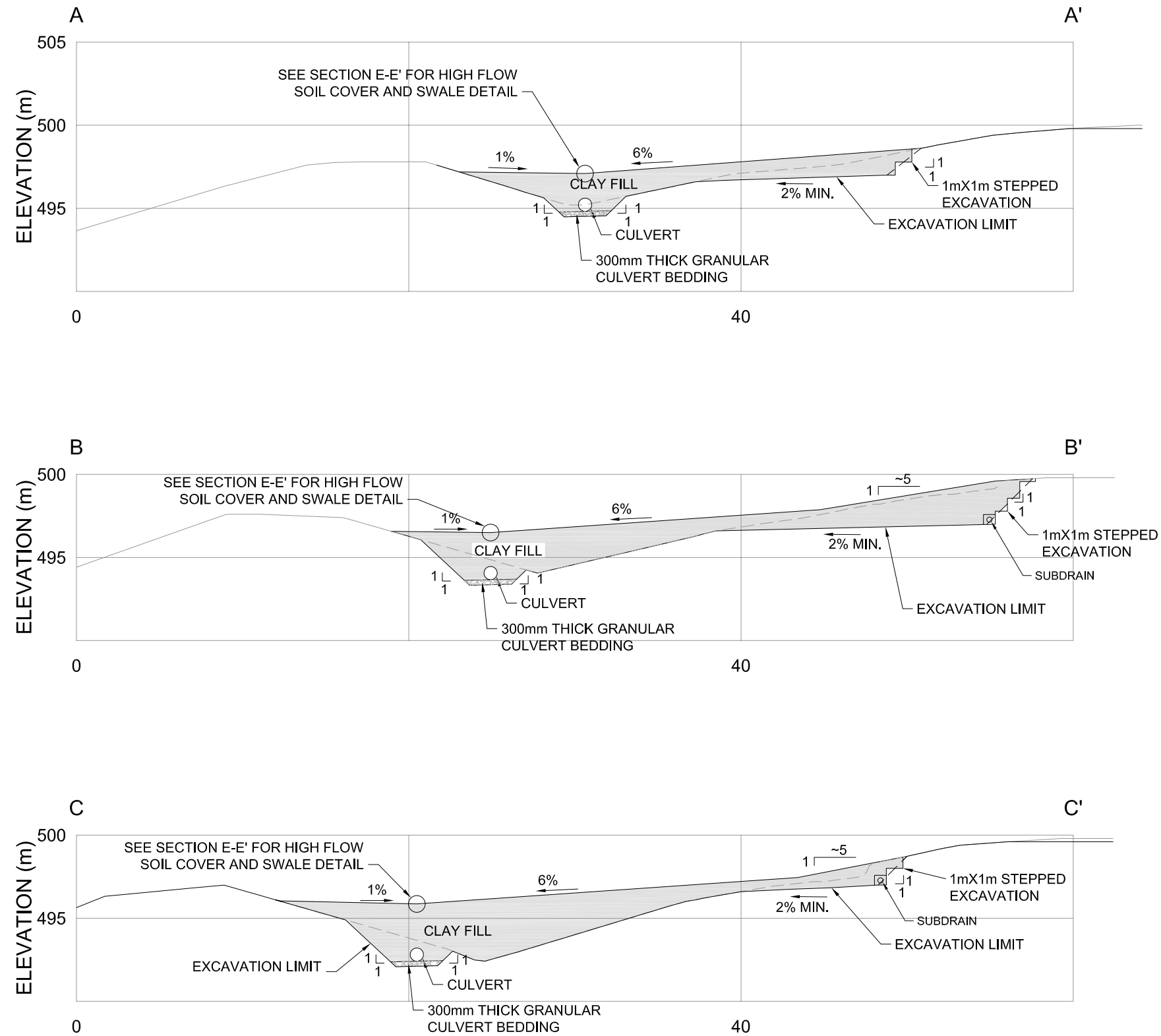
-  PHOTO & DIRECTION
-  LANDSLIDE SCARP

NOTES :

1. BASE PLAN AND CONTOURS PROVIDED BY EXH ENGINEERING SERVICES LTD.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
3. JUNE 9, 2005 OBSERVATIONS SHOWN IN RED



**FIGURE SH19-1, HWY 749:02 km 16.10
SOUTH OF HIGH PRAIRIE, AB
BANANA BELT SLIDE - SH19, SITE PLAN (JUNE 9, 2005)**



**FIGURE SH19-2, HWY 749:02 km 16.10
SOUTH OF HIGH PRAIRIE, AB
BANANA BELT SLIDE - SH19, CROSS-SECTIONS A-A', B-B' , AND C-C'**



Photo 1: Looking southeast at small depression in ditch opposite the slide area.



Photo 2: Looking northwest at slumped area from edge of highway embankment.