



December 14, 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
HWY 33:12 EMBANKMENT SLUMP (SH9)
2005 ANNUAL INSPECTION REPORT**

Dear Sir;

This letter documents the 2005 annual site inspection of an area of former slope instability located along Hwy 33:12 about 23 km north of Swan Hills, 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 of Thurber undertook the inspection on June 7, 2005 in the presence of Mr. Roger Skirrow, P. Eng., Mr. Ed Szmata, Ms. Amanda Russell, and Mr. Fred Bicknell, all of AIT.

1. BACKGROUND

Thurber last visited the site in June, 2004 and the site conditions at that time is described in our Part B assessment letter in the site binder. Remedial measures were carried out to correct the side slope failure and scour at the culvert outlet between November 9 and December 3, 2004 and consisted of a 15 m wide by 4 m high toe berm, subexcavation and re-construction of the upper portion of the slide above the berm with locally available compacted sand fill, and extension of the culvert by about 35 m with riprap placed at the outlet. The work was completed under Contract 6971/04. A design cross-section drawing of the repairs is attached.

Slumping that existed around the inlet of the culvert where the end section of the culvert had broken off, and water was flowing under and into the separated joint was also repaired. Repairs consisted of excavation of the inlet area (about 6 m x 6 m x 2 m), removal and replacement of the 6 m long CSP end piece of the culvert, reconstruction of the slope by placement of uniformly compacted clay to prevent flow-by, re-alignment/straightening of the creek channel about 9 m upstream of the culvert end, and armouring the inlet with riprap.

Further background for the site is provided in the Geotechnical File Review Section A of the binder.

2. SITE OBSERVATIONS

The changes in condition since repairs were completed last fall are shown on the attached site sketch plan and cross-section, which shows the updated remediation measures. Selected photographs taken during the visit are also attached.

Grass was just beginning to sprout on the recently rehabilitated west sideslope. Two silt fences were installed across the slope in a north-south fashion above the culvert outlet, and were functioning well but had a couple of loose spots. An additional silt fence located lower down the slope along the south edge of the creek was loose. A 7 m long crack up to 20 mm wide was observed right at the grade change of the flatter upper slope and lower steeper slope nearer the south side of the old slump (see attached drawing).

The creek channel immediately upstream of the rehabilitated culvert inlet on the east side of the highway was approaching the culvert at a severe skew to the culvert alignment. The freshly placed riprap was also slightly higher than the culvert invert elevation. During construction it was not possible to regrade the channel due to the presence of a gas line along the north edge of the highway right-of-way.

3. ASSESSMENT

The fresh crack observed south of the culvert at the break in the west sideslope is likely attributed to settlement of the freshly placed fill, but it could possibly be a reflection of the previous instability.

The slumping that occurred prior to repairs at the culvert inlet was likely caused by erosion, and possibly hampered by debris in the pipe. The recent repairs have remedied this situation, however ongoing erosion is possible due to the sharp bend in the channel immediately in front of the culvert inlet.

Both of the above conditions will be checked again next year.

4. RISK LEVEL

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

$$PF(3) * CF(3) = 9 \text{ (Was } 9 \times 3 = 27 \text{ last year prior to repairs)}$$

A Probability Factor of 3 is considered appropriate since the slide is inactive with a low probability of remobilization. A Consequence Factor of 3 is still considered appropriate since the embankment fill is fairly high and at a culvert crossing.

5. RECOMMENDATIONS

5.1 Short Term

The 2004 remedial measures have improved the overall condition of the existing slump on both sides of the highway. However, the crack observed south of the culvert at the boundary of the slope segments should be regularly monitored, to see if it is a reflection of a portion of the previous slump or simply recent settlement of the fill, and to warn of a potential worsening of the condition.

Yearly monitoring is also still recommended for the remainder of the site to assess the performance of the recent repairs, and to see if erosion will re-emerge in the future at either the inlet or outlet of the culvert. The condition and functionality of the subdrains installed as part of the repairs on the west slope should be monitored. The progress of revegetation on the backslope should also be checked.

5.2 Long Term

No long term measures are required at this time due to the recent repairs.

5.3 Maintenance

It is recommended that the lower silt fence along the south side of the creek, and the few loose spots on the silt fences further up the slope west of the highway be repaired by tightening and rebasing it into the soil. Similarly, the silt fence east of the highway above the culvert inlet should be reinstated until the grass has fully caught.

Some additional riprap should be added to the outside bend of the channel upstream of the culvert inlet, to lower the risk of future erosion.

These above maintenance measures are expected to cost in the order of \$2,000.

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



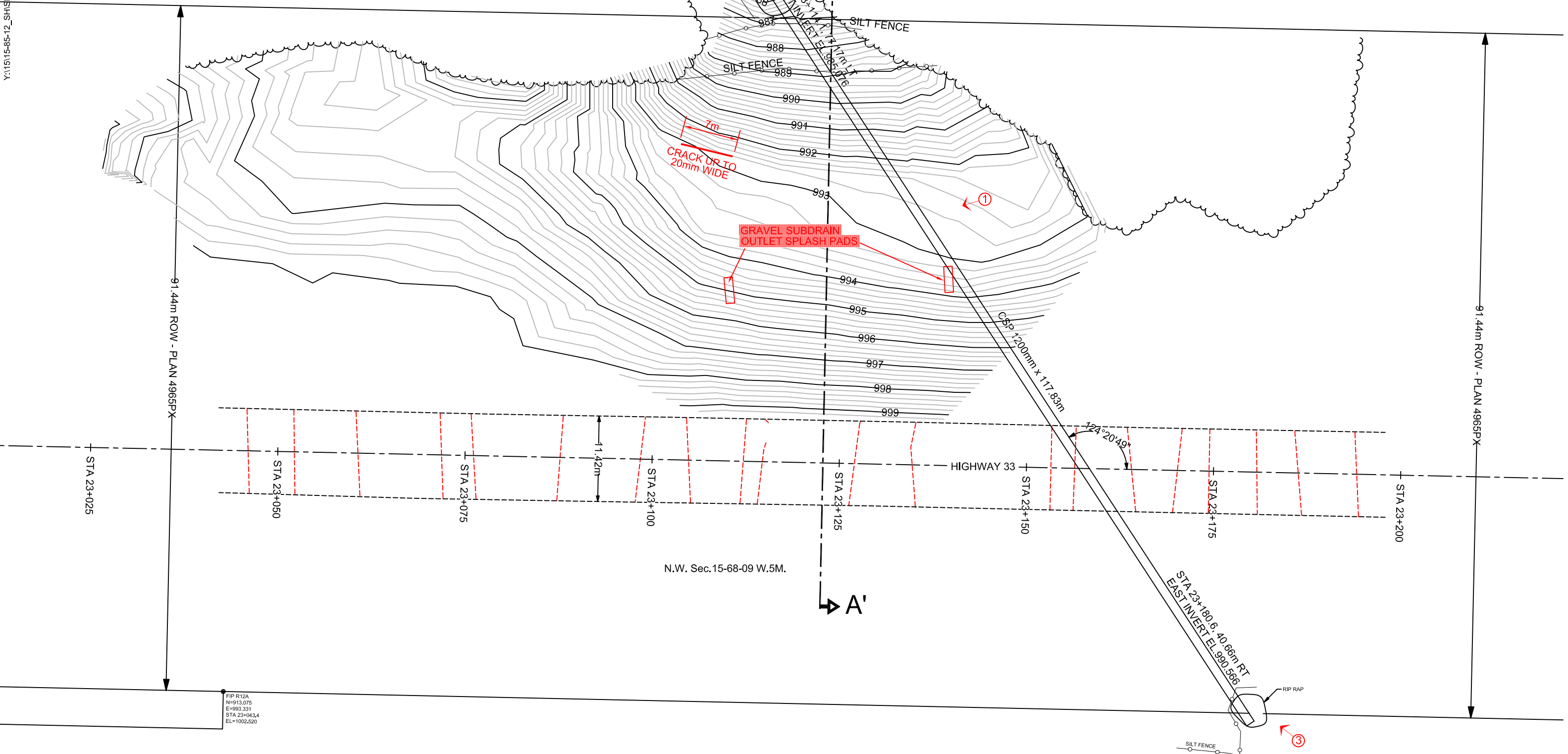
Barry Meays, P.Eng.
Project Engineer

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Attachments

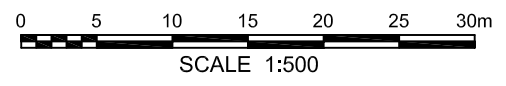
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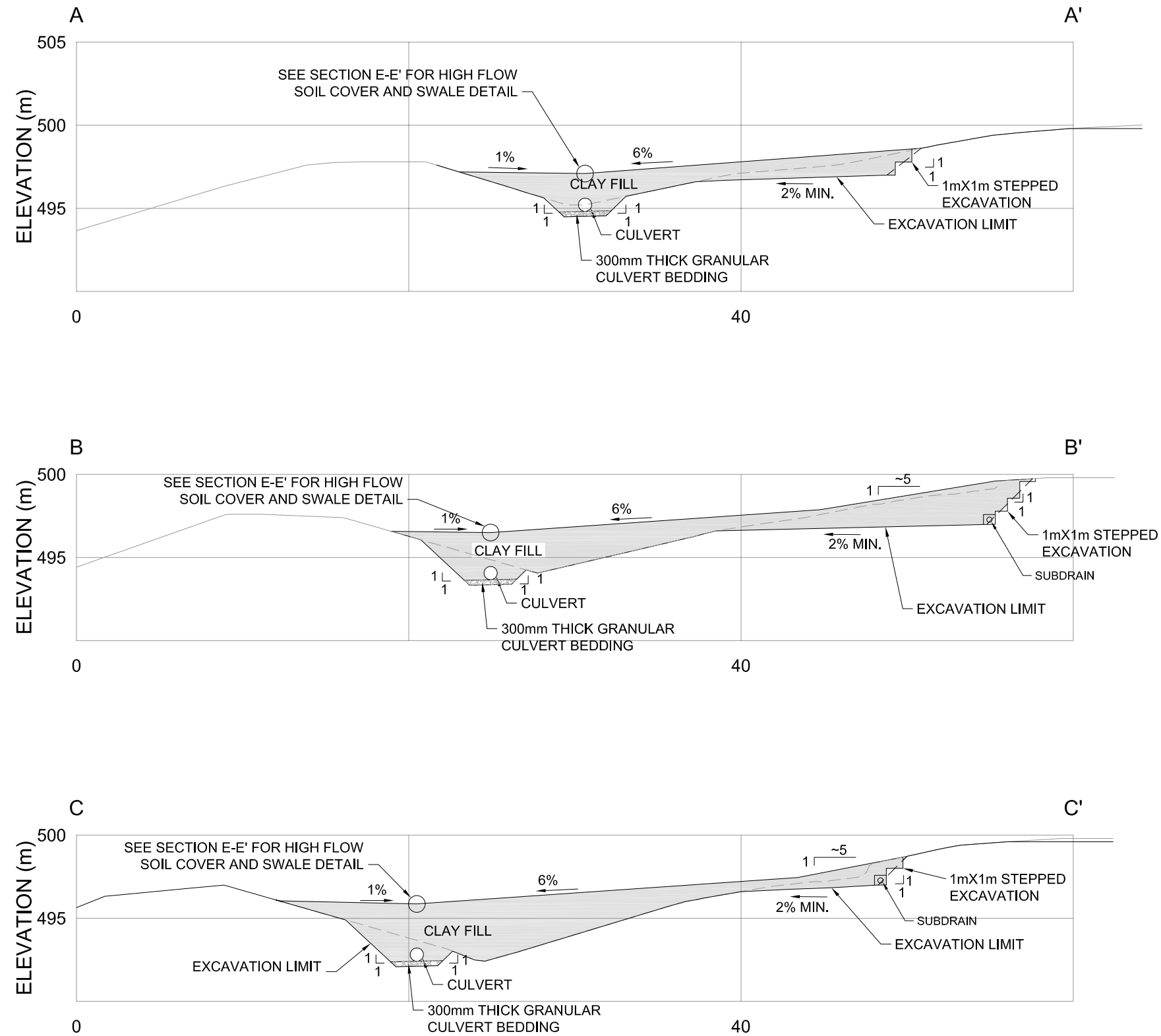


- NOTES :**
1. BASE PLAN & CONTOURS PROVIDED BY EXH ENGINEERING SERVICES LTD.
 2. FEATURE LOCATIONS ARE APPROXIMATE.
 3. PREVIOUS OBSERVATIONS SHOWN IN BLACK
 4. JUNE 7, 2005 OBSERVATIONS SHOWN IN RED

- LEGEND :**
- ③ → PHOTO AND DIRECTION



**HWY 33:12 EMBANKMENT SLUMP
23 km NORTH OF SWAN HILLS (SH9)
UPDATED SITE SKETCH PLAN (JUNE 7, 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 south to southwest along slope at gravel drains and culvert outlet.



Photo 2: Looking northeast at culvert outlet. Note loose silt fence south of creek.



Photo 3: Looking west at culvert inlet. Note sharp channel bend in front of culvert and riprap higher than inlet.