

# **ALBERTA TRANSPORTATION GEOHAZARD ASSESSMENT PROGRAM PART A: FILE REVIEW**

## **PEACE REGION – PEACE-HIGH LEVEL**

### **PH12 JUDAH HILL – HEART RIVER SLIDES**

|   |   |
|---|---|
| Legal Location:                             | SE¼20-083-21 W5M                        |
| Nearest Landmark:                           | 2 km south along road from CNR crossing |
| Highway Control Section:                    | Hwy 744:04                              |
| Date of Initial Observation:                | 1984                                    |
| Date of Last Inspection:                    | 2008                                    |
| Last Inspected By:                          | Thurber Engineering Ltd.                |
| Instrumentation Installed:                  | None                                    |
| Instrumentation Operational:                | None                                    |
| Risk Assessment:<br>(as of last inspection) | PF = 9<br>CF = 2<br>Risk = 18           |

## 1. INTRODUCTION

The site is located 2 km south of the CN Rail level crossing (km 59.6) on Hwy 744 near the town of Peace River. The site runs along the east side of Hwy 744 at a turnout at the top of Judah Hill, extending from km 57.4 to km 57.1.

Highway 744 runs south from Peace River through Marie-Reine to Highway 683 and on to Highway 49 near Girouxville. For the first 2 km south of the Town of Peace River, it climbs roughly 200 m up the valley wall of the Peace River to prairie level at elevation 545 m.

This site consists of four 15 m to 40 m wide slide bowls on the east side of Hwy 744, originating at the crest of the slope, at prairie level. The upper portion of the slope is at around 38°, then flattens towards a sag pond type feature roughly 150 m east (horizontal distance). The slides are retrogressing westwards towards the turnout and highway, due to intermittent shallow slide activity.

The location of the site is shown on Figure 1, while site details are shown on Figure 2, based on the last inspection.

This section is a review of files made available by Alberta Transportation regarding this site, and has been conducted to update the previous Part A review, which covered all the Judah Hill sites.

## 2. BACKGROUND

### 2.1 Bedrock Geology

Based on the AGS 1:1,000,000 bedrock geology map of Alberta, the following bedrock units occur in the valley slope down to the Peace River:

- Dunvegan Formation – fine sandstone with hard calcareous beds, laminated siltstone, silty shale.
- Shaftsbury Formation – silty shale and shale, ironstone beds, bentonite partings, thin silty and sandy intervals.
- Peace River Formation – silty shale, fine sandstone, silty interbeds.

No rock is exposed at the immediate site – cross-sections presented on the published hydrogeological maps suggest a considerable thickness of surficial materials overlie the rock.

## **2.2 Surficial Geology**

AGS Map 291 (Surficial geology of the Grimshaw area) indicates a local veneer of eolian sand and silt overlying glaciolacustrine fine sand, silt and clay on the upland, with mixed colluvial materials on the slopes. Coarser sand and gravel deposits have been noted in road cuts locally along Hwy 744.

## **2.3 Hydrogeology**

The ARC 1:250,000 Hydrogeological map of Peace River does not show springs or flowing wells (mainly completed within glacial deposits) in this area. Perched aquifers are expected locally, associated with local pockets of sand and gravel. Such pockets can become confined where covered by colluvium or fill on slopes.

## **2.4 Geomorphology**

The site is at the crest of the east valley slope of the Peace River, on a ridge formed between the Peace River and the Heart River. Highway 744 runs down the west side of the ridge as it decreases in height and narrows northwards, towards the town of Peace River. The sides of the Peace River and Heart River valleys are both characterised by extensive landslide activity. Common landslide mechanisms in this region include:

- Earthflows caused by sudden saturation of surficial material.
- Landslides with a base in the weak Shaftsbury Formation shales.
- Landslides within weak glaciolacustrine silts and clays.

At this site, other factors that might influence landslide occurrence include saturation of downslope colluvium, and drainage off the impermeable road surface. The general valley slope at this location (on the upper portion of the slope) is 38 degrees. Below the initially steep valley walls, the slopes flatten out into a series of ‘terraces’ (possible slump blocks) with ponds (possible sag ponds)

towards the river. Overall, the terrain in this portion of the Heart River Valley appears to resemble a very large, old landslide.

Slides 1 to 4 (corresponding to Debris Slides 1 to 4 in previous AMEC reports) are 15 m (Slide 4) to 40 m (Slide 1) wide bowl-shaped features occurring in the fine-grained soils at the crest of the slope (glaciolacustrine clay). The slides are all currently between 6 m and 15 m away from the active lanes of Hwy 744, though because of past retrogression, the Armco barriers have been shifted towards the paved turnout.

These features appear to be related to surface runoff or near-surface seepage, with retrogression of the backscarp apparently related to higher rainfall years.

### **3. HISTORIC INFORMATION.**

#### **3.1 Summary**

Highway 744 was first paved in 1984, and shortly after this Alberta Transportation began noting stability problems. The main focus of work on Judah Hill has been the landslide at the CN Rail crossing at km 59.6 where several attempts were made to stabilise the slope, culminating in the current pile wall. Other significant problems have occurred at the Fence slide (previously Zone B1) and at the Makeout and Michelin slides (Previously Zones D1 and D2).

Although there have been site investigations and site visits conducted for other specific problems along Hwy 744, no test holes have been drilled at this site (PH12).

Although there may have been slide bowls at these locations before, major retrogression occurred in 1997 after relatively wet years in 1996 and 1997, culminating in destruction of the guardrail at Slide 1. Reconstruction of the slope with compacted gravel occurred at this slide (previously referred to as Debris Slide 1) in March 1998. Significant erosion at the toe of the re-constructed gravel slope occurred in August 1998. The slope was repaired again in September 1998 with installation of a drain and reinforced fill (might have been either geogrid or geotextile reinforcement – this is not clear in the previous part A review).



### **3.2 Chronology**

|                |   |
|----------------|---|
| 1984           | Hwy 744 first paved   |
| March 1998     | Presentation of designs by Agra Earth and Environmental (AEE) for repairs of Debris Slides 1 (Heart Slide 1) and 6 – reconstruction of the slopes with granular fill.   |
| April 1998     | Repair of Debris Slides 1 (Heart Slide 1) and 6.  |
| August 1998    | Failure of the repaired slope at Debris Slides 1 (Heart Slide 1) and 6. AEE proposed repairing the slope with a drain and reinforced fill.  |
| September 1998 | Repair of Debris Slide 1 (Heart Slide 1).   |
| October 1999   | Hwy 744 re-paved.   |
| May 2001       | Water observed in the roadside ditch adjacent to Slides 1 to 4.   |
| May 2002       | Water observed in the roadside ditch adjacent to Slides 1 to 4.   |
| May 2003       | Water observed in the roadside ditch adjacent to Slides 1 to 4.   |
| June 2004      | Fresh movement at Slide 2.  |
| June 2005      | Additional retrogression of Slide 2. Guardrail moved from ditch area to edge of paved road/lay-by. Some cracking observed in the backscarp of Slide 3.  |
| June 2006      | Widening of Slide 2.  |
| May 2007       | Some seepage noted in the backscarp at the north end of Slide 1. Cracking and vertical offset north and south of Slide 2, with possible expansion towards Slide 3. Additional movement of failed material within the bowl of Slides 2 and 3. Some cracking on either side of Slide 4. |
| June 2008      | Water noted in the ditch at the south end of Slide 1. Further expansion of Slide 2, though only slight retrogression towards the road. Ponded water and fresh debris noted in the bowl of Slide 2. Fresh movement at Slide 4 and retrogression by about 0.5 m.                        |





**NOTES:**

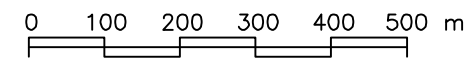
1 LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.

**Alberta** Transportation

PEACE REGION (PEACE RIVER/HIGH LEVEL)  
JUDAH HILL

**KEY PLAN**

**FIGURE 1**



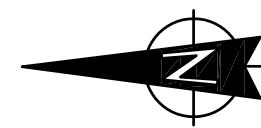
|          |          |             |                  |             |                |
|----------|----------|-------------|------------------|-------------|----------------|
| DRAWN BY | ICB      | DESIGNED BY |                  | APPROVED BY |                |
| SCALE    | 1:10,000 | DATE        | OCTOBER 29, 2008 | FILE No.    | 15-16-213A-C1A |



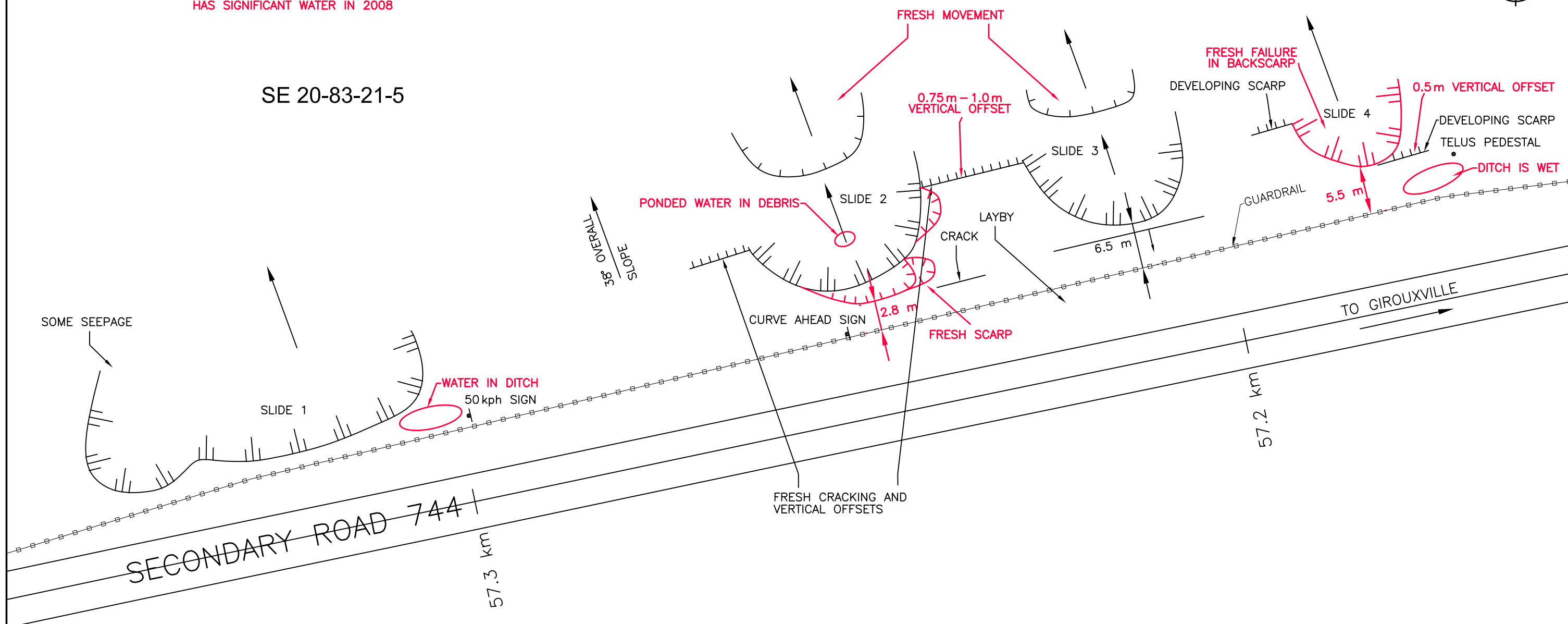
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SAG POND AT BASE OF SLIDE  
HAS SIGNIFICANT WATER IN 2008



SE 20-83-21-5



NOTES:

1 LOCATION DATA RECORDED USING HAND HELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.

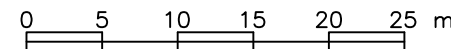
2 2008 OBSERVATIONS SHOWN IN RED

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PEACE REGION (PEACE RIVER/HIGH LEVEL)  
PH12 HEART RIVER SLIDES

SITE PLAN

FIGURE 2



|          |       |             |                  |             |                |
|----------|-------|-------------|------------------|-------------|----------------|
| DRAWN BY | ICB   | DESIGNED BY |                  | APPROVED BY |                |
| SCALE    | 1:500 | DATE        | OCTOBER 29, 2008 | FILE No.    | 15-16-213A-COA |



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