

SLOPE STABILITY HAZARD ASSESSMENT
3064 - 3070 ALLENBY ROAD

Report

to

COWICHAN VALLEY REGIONAL DISTRICT

March 1, 1982
File: 17-971-1

Thurber Consultants Ltd.
Victoria, B.C.

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March 1, 1982

File: 17-971-1

Cowichan Valley Regional District
137 Evans Street
Duncan, B.C.
V9L 1P5

Attention: Mr. Howard Schesser
Deputy Director of Planning

**SLOPE STABILITY HAZARD ASSESSMENT
3064 - 3070 ALLENBY ROAD**

Dear Sir:

1. INTRODUCTION

This letter presents the results of our assessment of the slope stability hazard relating to 4 houses located on Allenby Road, about 1 mile south of Duncan. You authorized this assessment on December 15, 1981.

The location of the 4 houses is shown on Dwg. 17-971-1-1 in the Appendix. The houses are small wood framed structures without basements. Three of them (i.e. those located at 3064, 3066 and 3068 Allenby Road) are currently vacant and their owner, Mr. Don Bhandar, proposes to upgrade them to meet housing standards, and to rent them out. The fourth house, located at 3070 Allenby Road has been upgraded and is presently occupied.

The houses are within an area which is classified by the CVRD as a hazard land. It is their policy that

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"Development on hazard lands shall be prohibited unless adequate protective measures are taken to prevent possible damage or loss of life"

Mr. Bhandar retained B.H. Levelton and Associates to assess the slope stability hazard of his 3 houses. In a report, dated June 9, 1981, B.H. Levelton and Associates stated:

"With the present conditions the possibility of a major slope failure affecting the existing building locations is considered to be very remote. Provided that the present slope topography, vegetation and drainage are not disturbed, the slope should remain in its present condition for the anticipated lifetime of the buildings. Localized sloughing or washouts may be expected in response to heavier than normal groundwater flows, precipitation or seismic activity, but should not significantly affect the building site."

This report was reviewed by Mr. L. de Boer, Supervising Geotechnical Engineer of the Geotechnical and Materials Branch of the B.C. Ministry of Transportation and Highways. He stated that "even localized sloughing could result in sufficient damage to endanger the occupant's life" and recommended against approving continuous occupancy of the houses because of landslide risk.

2. GEOLOGY AND LANDSLIDE HISTORY OF THE AREA

The area classified as a hazard land by the CVRD encompasses a steep slope at a point about 120 ft high formed by toe erosion by the ancestral Cowichan River. The slope runs parallel to Allenby Road along its southwest side. It is classified as a hazard land for a distance of about 1/3 of a mile.

In 1975 a large surficial debris slide occurred on the slope at a point located less than 1000 ft southeast from the subject houses. This slide, which occurred following some excavation at the toe of the slope, resulted in the destruction of a building.

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A building adjacent to the site of the destroyed building was occupied by B.C. Telephone Corporation at that time. It was vacated because of the perceived risk. Thurber Consultants Ltd. investigated the slope above the former B.C. Telephone building and, in a report dated October 1976, made recommendations for extensive stabilization measures. Such measures were carried out during 1977 and the building is again being used.

Test drilling done in conjunction with the 1976 study indicated that the stratigraphy of the slope above the former B.C. Telephone building is as follows: the upper unit on the slope consists of up to 27 ft of very stiff fissured silty clay. This is underlain by 3 to 30 ft of compact sand followed by a 0 to 5 ft thick layer of coarse gravel. Below this is a layer of hard silty clay which probably extends to the base of the slope where it is probably mantled by fluvial sands and gravel from the Cowichan River. A substantial amount of groundwater seepage was noted at about the mid-slope level.

About December 10, 1981 a small slide occurred along the southeast boundary line of the Bhandar property. The slide originated at the top of the slope and involved about 50 cu yds of material. An amphitheatre about 20 ft in diameter and 15 ft deep was formed in the fissured silty clay of the top soil unit. The material was evidently saturated when the slide occurred as it flowed through a narrow exit from the amphitheatre, down a small existing ravine, over the less steeply sloped surface of the existing colluvium near the toe of the slope, and over the level ground towards Allenby Road. Some of the debris flowed beyond the line of the back of the houses. It was, however, deflected away from the house at 3064 Allenby Road by trees and by the lay of the land.

3. ASSESSMENT OF THE SLOPE

3.1 Method of Investigation

The site was visited on 2 occasions: a preliminary visit was made on December 15, 1981. At that time we received copies of the pertinent correspondence and had a brief look at the slope from its top and its toe. A second visit was made on December 22, 1981. At this time

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the entire slope above the houses was examined in detail and numerous photographs were taken. In addition, the slope was surveyed by stadia along 2 traverse lines. The survey results are plotted on Dwg 17-971-1-1, which is appended.

3.2 Description of the Slope

It is expected that the stratigraphy of the slope on the subject property is similar to that noted on the slope above the former B.C. Telephone building (see Section 2).

The slope has been oversteepened by toe erosion by the ancestral Cowichan River. Average slope angles in the upper part of the slope were measured at 36 to 45°. A number of barren scarps were noted; the one shown on profile A on Dwg. 17-971-1-1 is 16 ft high and has a slope of 63°. The ground surface is less steep near the base of the slope because of a build-up of colluvium at the toe.

The bottom one-third to one-half of the slope is mantled by soft wet colluvium which consists of sand and clay materials which have been carried downslope by sloughing. Colluvium also exists higher up the slope wherever its movement is prevented by vegetation. At numerous locations several feet of colluvium had collected behind relatively large trees.

A shallow ditch has been dug along the toe of the slope behind the 3 houses to collect runoff coming down the slope. At the time of the site visits (ie after a rainy period) the flow rate in the ditch was roughly 20 gallons per minute. A substantial fraction of this flow is from groundwater seeping out of the slope about halfway up. There are several tanks on the slope which act as cisterns for collecting domestic water.

The slope is fairly sparsely wooded. There are numerous large trees and stumps scattered over the slope. In certain distinct areas however, large trees are absent, and only small deciduous trees are present. Many of these small trees are curved or bent as a result of surficial soil movement. These areas have linear markings that appear to be slide scars. There is no evidence of recent deep seated landsliding at this site.

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3.3 Discussion of Landsliding

As discussed in Section 2 (above), the slope within the designated hazard area has a known history of surficial sloughing. There is also abundant evidence that surficial sloughing occurs relatively frequently on this specific property. The evidence includes:

- 1) The presence of large amounts of colluvium at the toe of the slope;
- 2) Existing barren scarps;
- 3) The presence of young bent trees in certain areas on the slope.
- 4) The slide that occurred on or about December 10, 1981.

The major factor causing the sloughing is simply the steepness of the slopes. Except at the toe, the slope angles exceed the frictional angles of repose of the soils involved; thus the soils are being supported in part, by their cohesive strength. With time, and particularly in association with groundwater, the surficial soils are becoming softened and they are losing their cohesive strength. This leads to shallow surface sloughing.

Secondary factors contributing to sloughing include erosion by water flowing over the slope and the natural toppling of trees. This apparently occurs from time to time as a result of the undercutting of the roots and the build-up of colluvium on the upslope side of the trunks.

3.4 Hazard Due to Landsliding

It is considered that the geometry, groundwater conditions and, presumably, the stratigraphy of this site are similar to those at the site of the 1975 landslide which destroyed a building. Also, the debris from the December 10, 1981 slide could have damaged one of the houses, judging by its mass and the extent of its movement, had it followed a different course.

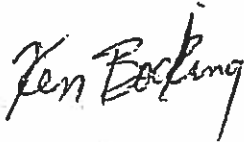
Based on the observation and site history it is the writer's opinion that there is a significant risk of debris from the sloughing striking any of the 4 houses with sufficient momentum to cause damage. This presents a

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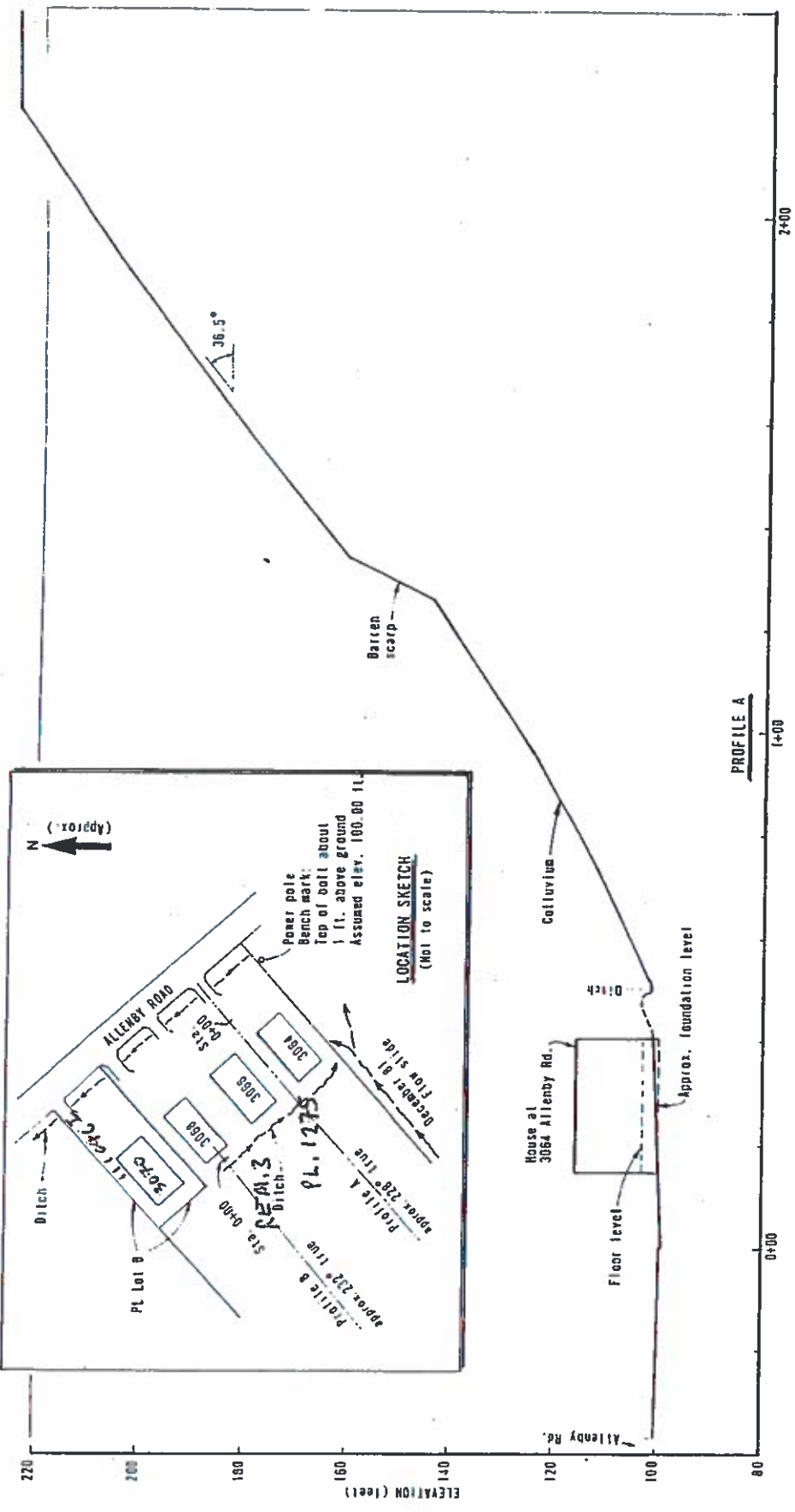
risk of injury to any occupants of the houses. We therefore recommend that the CVRD consider action to prevent occupancy of the houses or to require suitable measures to be taken to stabilize the slope.

Yours very truly,
Thurber Consultants Ltd.
G.F. Buck, P. Eng.
Review Principal

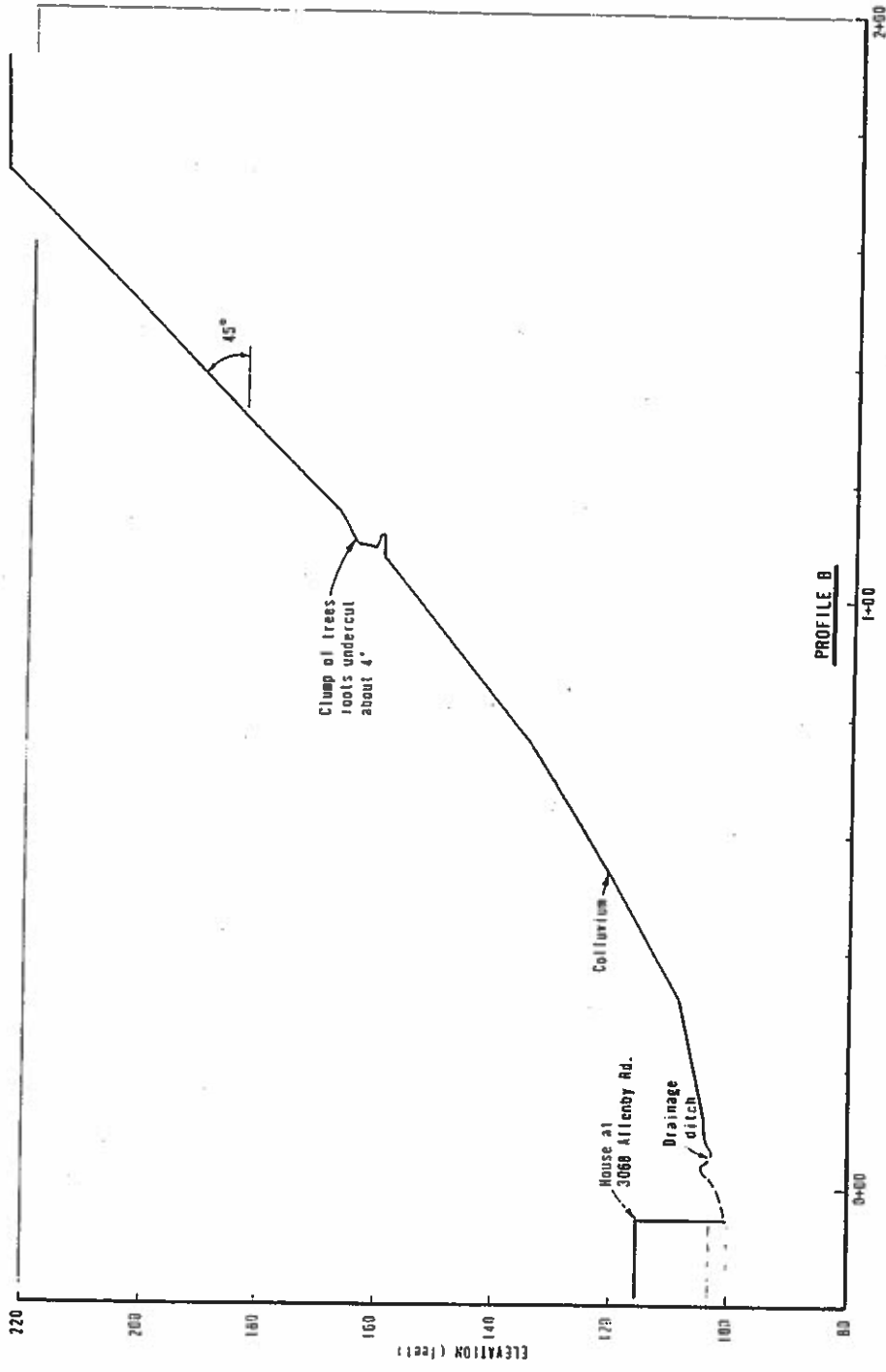
A handwritten signature in black ink that reads "Ken Bocking". The signature is written in a cursive, slightly slanted style.

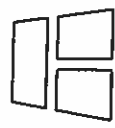
K.A. Bocking, P. Eng.
Project Engineer

KAB/rp
Appendix



NOTE:
 Profiles surveyed by stadia - Dec. 22, 1981



		Conichan Valley Regional District	
		SLOPE PROFILES	
3068 Allenby Rd.		Duncan, B.C.	
DATE	D.R.S.	DRAWN BY	
Jan. 11, 1982		THURBER CONSULTANTS LTD., Geotechnical Engineers	
SCALE	1" = 20'		

