Province of
British Columbia
MINISTRY OF ENVIRONMENT
LANDS AND PARKS

BC
Environment

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wrong #
File: ~~76800-20/05079~~

September 20, 1996

CP Rail
PO Box 50
Revelstoke BC V0E 2S0
Attention: Eric Williamson / Ed Palsz

and
s.22

Re: Landslide on Brooklyn Creek

Attached is a copy of my report on the slide off the CP Rail Line at the tributary to Brooklyn Creek.

Yours truly,

Dwain Boyer, P. Eng.
Engineering Section Head

DCB:lp

cc: Conservation Officer Service, Castlegar

attachment

FILE REPORT: ~~76800-20/05079~~

CPR Landslide Brooklyn Creek

Background:

May 22, 1996 s.22 called the office to report a landslide off the abandoned CPR line on the west side of Arrow Lake.

He reported that a section (200 ' long) of the railway fill had slide into Brooklyn Creek and there is the potential for another larger slide that could damage s.22 water intakes and properties. It could reach the Arrow Lake. There are 5 recreation homes adjacent to the creek, on the lake, that are at risk.

s.22 speculated that the slide occurred a few weeks ago. s.22
s.22

Site Investigations:

May 22 evening I had a conversation with s.22 May 23, I am attending the site. I called CPR Revelstoke, May 22 to alert CPR of the problem and ask if they had flown the boundary line recently. Ed Palsz (837-246). He said he would make inquiries and return my call.

Attached 1:50,000 shows the location of the slide. BC 7849 109-111 also cover the area.

I attended the site at 11:00 a.m., took photos, took necessary measurements and recorded some video footage.

Rough dimensions of the fill failed material and pondage are shown on the attached sketches. The slump was on the upstream side of the crossing. (photos 1 - 61) There was no evidence of any culvert through the base of the structure at the time. The upstream side of the railway grade was covered in debris (photos 3, 5 & 6). There was no evidence of a culvert at the downstream side of the railway grade (photos 11 & 12). Approximately 100 m upstream from the crossing, in a 1.3 m wide and 0.6 m deep half culvert (see photos 7, 8 & 9) was used to convey the water by the structure and discharge it on the slope as shown in the sketch and photos 9 & 10. The flow in the creek above the structure was estimated at 7 ft^3/s

Unfortunately, a section of the conveyance channel failed (see photos and sketch) resulting in all the water flowing to the railway crossing embankment. The failure was caused when foundation pedestals were displaced by a minor hill slope failure. The water flowing into and ponding against the fill may have caused the failure of the railway fill.

Approximately 7 ft^3/s was existing the ~~toe~~ toe of the fill as shown in photo 8 and sketch # 1. There was no evidence of distress or weakening of the remaining railway grade. There was no seepage or slumping on the down slope face of the fill and there was only minor evidence of fines emerging at the toe. The base of the fill seems to have a large percentage of large rock.

Waterline on the trees and valley wall upstream of the railway grade suggest that water levels (pondage) has been 2-3 metres higher than today. (Could also be marks left when the fill failed).

The estimated distance from the crossing to full pondage upstream is 100 m. Pondage on May 23 was 78 m.

At 2:30 p.m. I called Ed Palsz; CP Rail. He advised that they had not flown the line yet, but had plans to do so in 2 weeks. They had not received any notification of a landslide. When asked what should be done I advised him to inspect the site. At a minimum they could fix the bypass channel to get through high water. There is still plenty of snow in the mountains and we can expect higher runoff when we get a warm spell.

I also walked to the Pup Creek crossing and noted that the culvert under this large fill is partially blocked. The concrete wing wall on the right side of the inlet structure has fallen into the channel.

On Sept. 18, 1996, I walked the creek channel down to the lake and had a better look at the downstream side of the railway grade. By digging into the fill I was able to confirm that there was a concrete culvert under the fill. The downstream side has been buried for many decades. It is unlikely that a significant volume of material in the form of a debris flow, initiated by a mass failure of the railway grade, would reach the properties on the lakeshore. At the site the gradients are steep enough to mobilize a debris flow. However, there are a number of flatter reaches downstream where the main volume of debris would arrest. During such an event there would obviously be major impacts on water quality. The water supply system for the residents would be damaged. Also, there could be flooding of private property.

Office Assessment:

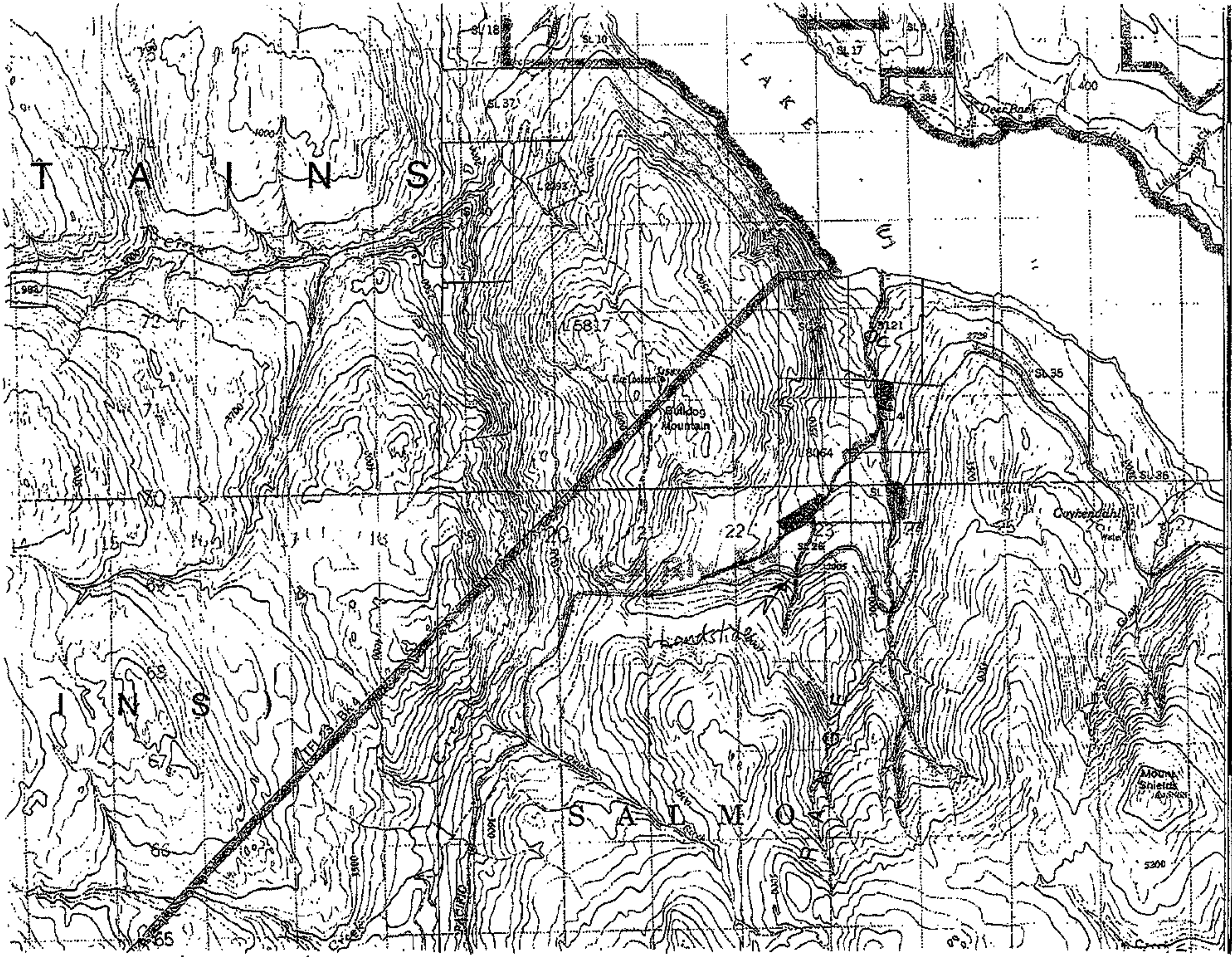
May 24 a.m., Eric Williamson; structural engineer 489-6305 (w), 489-8675 (cell), 489-7428 (autotel), returned my call to advise that he had flown the line April 30 and the crossing was fine. He advised that he would discuss with Ed Palsz and get back to me so I could advise[s.22]

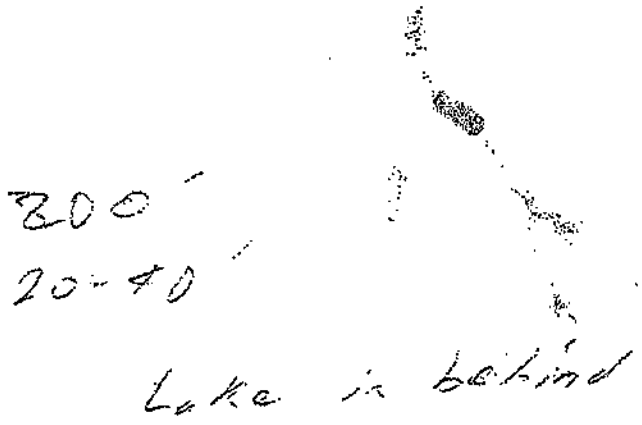
I plotted the profile of the creek channel and examined air photos. If the railway fill fails it will run on the 20% slope to the confluence with Brooklyn Creek (see location map) and down Brooklyn Creek some distance. However, there appears to be a low gradient reach about 600 m long, where a lot or all of the course material may settle out.

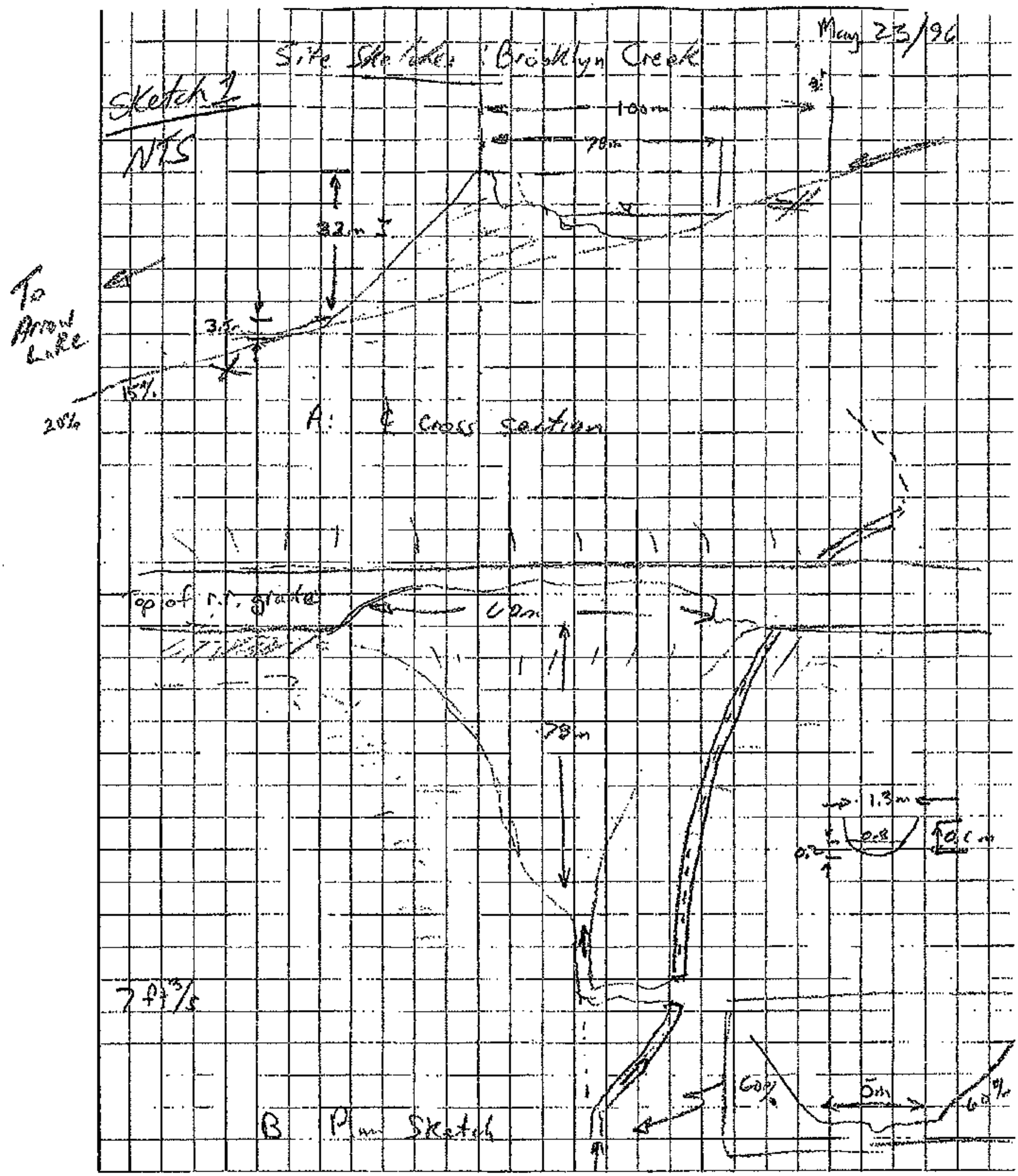
However there would be a significant impact on water systems and a flood way during the freshet could cause property damage. A debris flow event would also have negative impact on the fishery resource.

Dwain Boyer

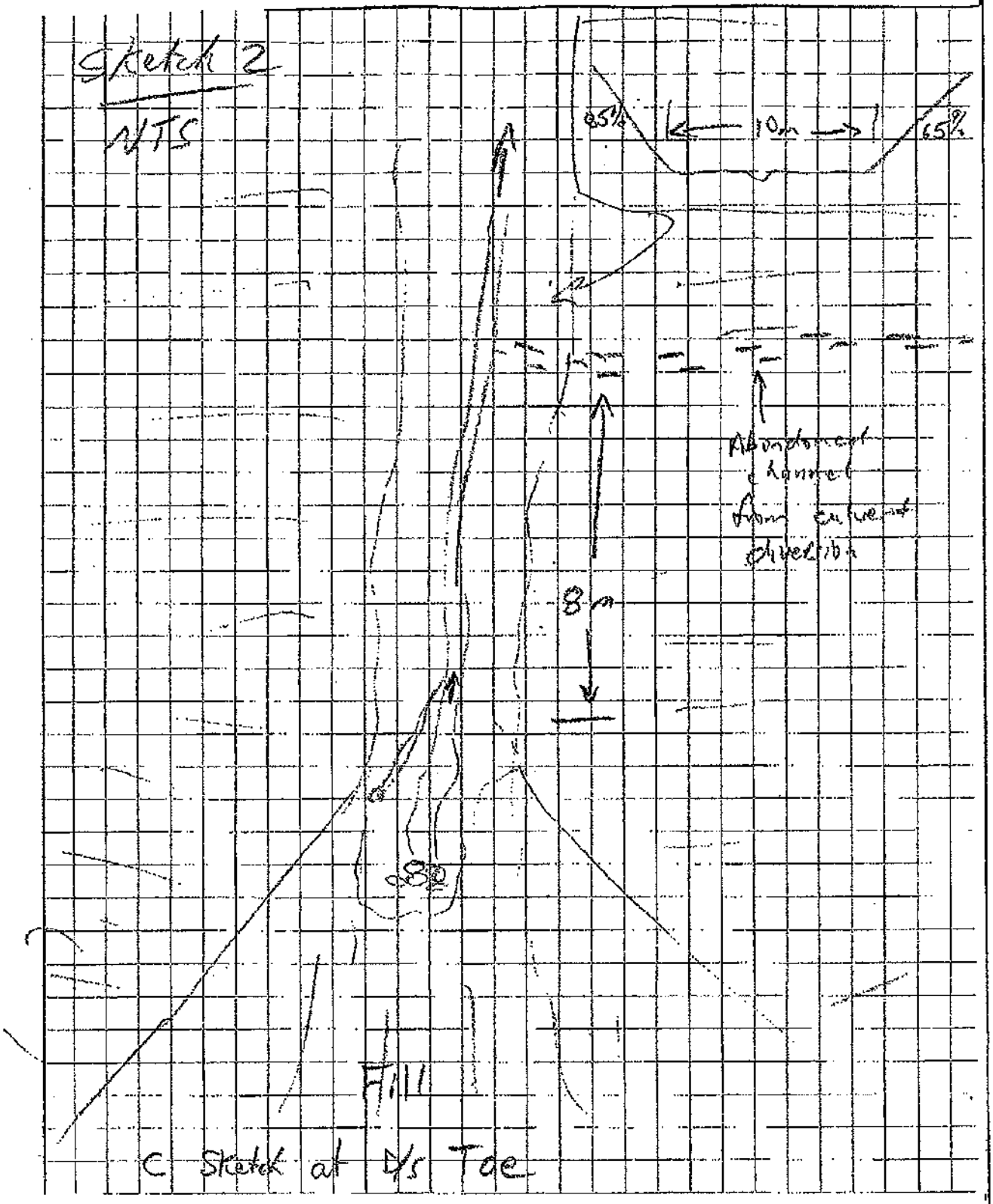
Dwain Boyer, P. Eng.
Engineering Section Head

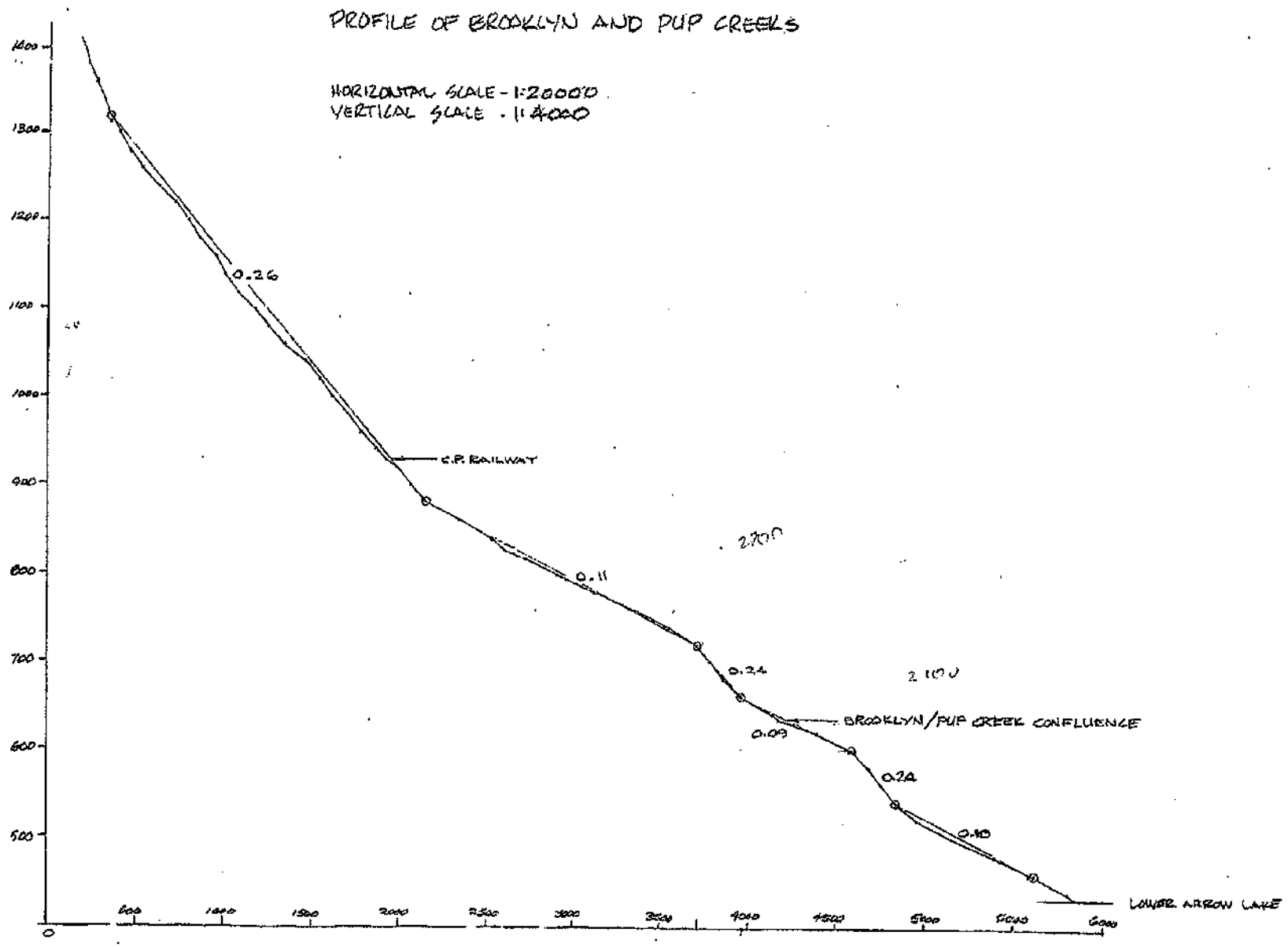

T A I N S
L A K E
SL 18
SL 10
SL 17
SL 37
L 400
L 5817
Bulldog Mountain
SL 35
SL 36
Mount Shields
I N S
S A L M O


200'
20-40
Lake in behind



May 23/96
Brooklyn Creek
Sketch 1
NTS
100m
78m
32m
3.5m
To Arrow Lake
15%
20%
A:
cross section
Top of
grade
60m
78m
1.3m
0.8
0.2
10cm
7 ft³/s
60%
5m
60%
B
Sketch


Sketch 2
NTS
85%
10m
65%
Abandonment channel from culvert diversion
8m
Fill
C Sketch at D/S Toe


PROFILE OF BROOKLYN AND PUP CREEKS
HORIZONTAL SCALE - 1:20000
VERTICAL SCALE - 1:4000
1800
1300
1200
1100
900
800
700
600
500
0.26
C.P. RAILWAY
2700
0.11
0.24
2100
BROOKLYN/PUP CREEK CONFLUENCE
0.09
0.24
0.40
LOWER ARROW LAKE
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000

BROOKLYN CREEK - CPR FAILURE

MAY 23, 1996

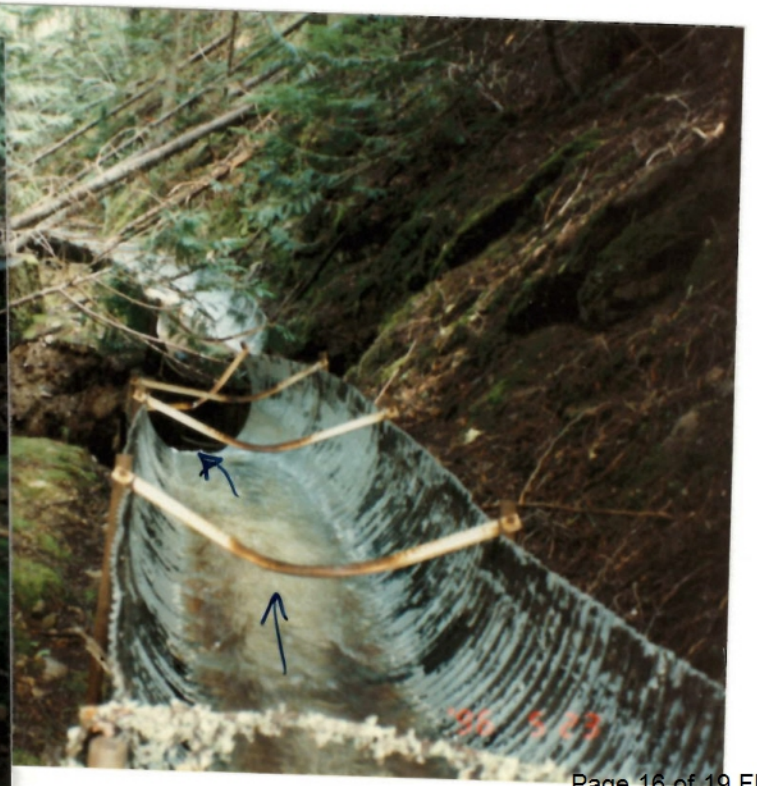
1. View of fill failure looking east
2. Closer view of fill failure looking east
3. Closer view of fill failure looking east - diversion channel
4. View of remaining fill
5. View of gully upstream from vantage point on top of railway fill
6. View of failure looking west
7. View of half culvert side hill diversion channel. Arrow points to diversion structure
8. View of failed section of channel
9. End of diversion channel
10. Dry channel down slope where water was previously diverted
11. Flow emerging from downstream toe of fill. Arrows show two spots where flow emerges
12. Closer view of main flow from toe of fill.

(6)


Diversion Structure
Original channel
'96 5 23

7


Bridge behind F.P.
'96 5 23


'96 5 23

8

(9)

(10)

11

12