Province of
British Columbia
MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

BC Environment
Omineca-Peace

Water Management Branch
Third Floor - 1011 Fourth Avenue
Prince George, British Columbia
V2L 3H9
Telephone: (604) 565-6436
Facsimile: (604) 565-6629

LL 14
D27

File: 76800-20
Nechako

October 22, 1996

George Lipke
Prince George Nechako Rotary
Prince George, B.C.

Dear Mr: Lipke:

Re: Nechako Trail Erosion Problem

Further to our site inspection of the erosion problem on the Nechako River Trail system, near the fish hatchery, I am writing in order to provide you with my observations and recommendations for remedial work at this site.

Problem Definition

The trail system at this location appears to be constructed of fill, placed into the active channel of the river (likely to avoid adjacent private property). This has resulted in two problems; the trail system lies within the fastest portion of the river, and the fill consists of unconsolidated highly erodable material. The trail was protected by rock riprap approximately two years ago and the surface was paved this spring, both of which are now failing due to erosion.

Unusually large ice flows last winter, combined with high water levels this summer resulted in damage to several similar structures, as well as this one, along the Nechako River this year. Examining portions of the remaining riprap indicates several deficiencies which contributed to the failure of the structure including; undersized rock, overly steep placement angle, rock not keyed into the riverbed, as well as general poor rock placement.

.../2

Possible Solutions

The following discusses several possible solutions to this problem, however most were quickly ruled out for a river of this size and character.

Rock filled gabions (wire baskets) are sometimes used for erosion protection, particularly on small streams and ditches. However, they are easily damaged by ice and debris, and would not last very long in a large river such as the Nechako.

Ridged wall structures such as "lock blocks" or steel bin walls tend to produce deep scour holes next them as a result of the smooth surfaces. This often results in failure of the structure. Damage by ice and high construction costs do not favour this type of structure. In addition, these structures will leave result in a vertical wall which does not fit in with the park setting and may pose a liability problem.

Another alternative would be to purchase all or a portion of the adjacent lots and relocating the trail system further back from the river. This may prove to be the cheapest solution in the long term, and would provide additional environmental and aesthetic benefits.

A rock riprap design similar to the original structure appears to be the most practical structural solution for this type of river system and application. However, a more substantial design than the previous structure would be required.

Recommendations

Purchase of adjacent property and relocation of the trail offers the best chance of long term success, and provides other aesthetic and environmental benefits.

The recommended structural solution is a properly designed and constructed rock riprap revetment. A preliminary design for rock riprap is attached, which shows a typical cross-section for this location. The present trail system would have to be widened from the existing 2 metres to 4 metres in order to accommodate equipment working on the structure (excavator, dump trucks). Particular attention should be paid to quality and size of rock, proper placement and slope control, as well as keying (trenching) the toe of the riprap well into the bed of the river (at least 1 metre).

.../3

Our measurements show that approximately 60 metres of the previously protected bank has been damage, with an additional 35 metres in poor condition. The design utilizes 11.2 m^3 per metre of length, for a total of 672 m^3 based on 60 m of bank, and 1064 m^3 based on 95 m of bank. A rough cost estimate for this work based on \$30/ m^3 of placed rock and a 20% contingency for other work would be \$24,000 and \$38,000 respectively.

It should be noted that this is a minimum design. Larger rock applied thicker than shown would give a better chance of success, however this may not be practical.

Please be advised that any structural solution which requires instream work or modification of the shoreline will require the approval of this office and the Federal Department of Fisheries and Oceans

I hope that this provides enough information for your group to evaluate the alternatives. Please contact me at 565-6436 if you have any questions.

Yours truly,

Glen Davidson, P.Eng.
Head, Engineering Section
Omineca-Peace Region

:GWD

BROKEN ROCK RIPRAP SPECIFICATIONS

SI METRIC UNITS			IMPERIAL UNITS		
% BY WEIGHT FINER THAN	MASS (kg)	APPROX. EQUIVALENT DIAMETER (mm)	% BY WEIGHT FINER THAN	MASS (lb.)	APPROX. EQUIVALENT DIAMETER (inches)
100	2400	1200	100		
NOT MORE THAN 50	700	790	NOT MORE THAN 50		
NOT MORE THAN 10	15	220	NOT MORE THAN 10		

mm = MILLIMETRE

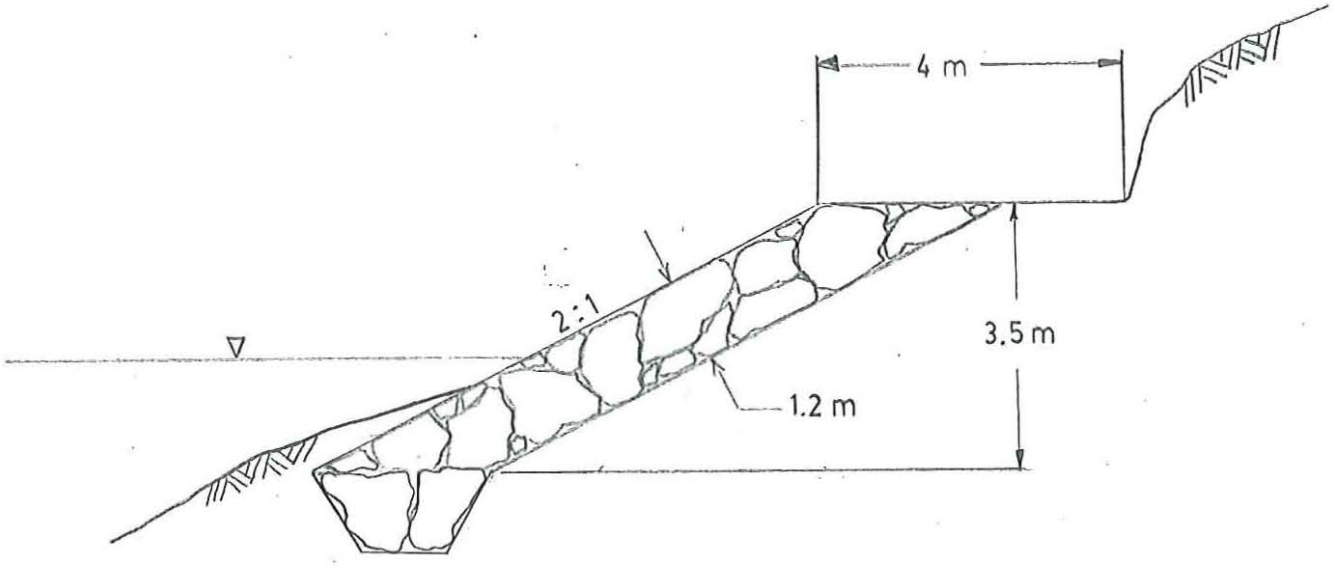
kg = KILOGRAM

1000 mm = 1 m (METRE) = 3.28 FEET

1 kg = 2.2 lb.

RIPRAP SHALL:

1. CONSIST OF DENSE, DURABLE, ROUGHLY EQUIDIMENSIONAL, ANGULAR PIECES.
2. BE CLEAN AND REASONABLY WELL GRADED COVERING THE COMPLETE ALLOWABLE SIZE RANGE.



Province of British Columbia
Ministry of the Environment

TO ACCOMPANY REPORT ON

Nechako River near Fish Hatchery

SCALE: VERT. 1:100
HOR. 1:100

DATE Oct. 21, 1996

ENGINEER

FILE No.

DWG. No. 1

bcil 6659 wrs

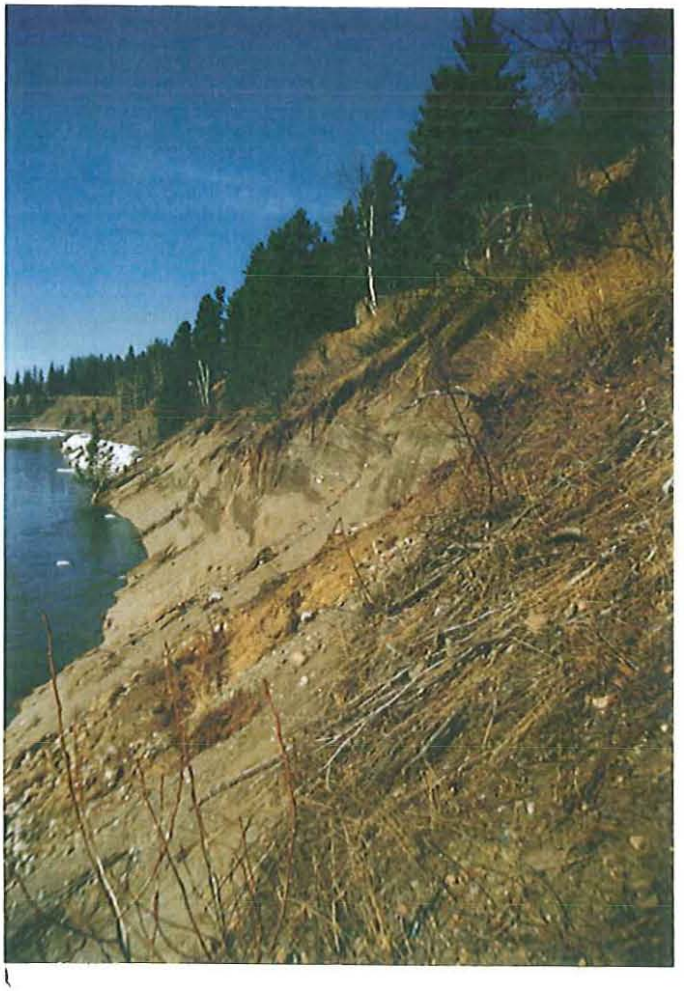
s.22 Property

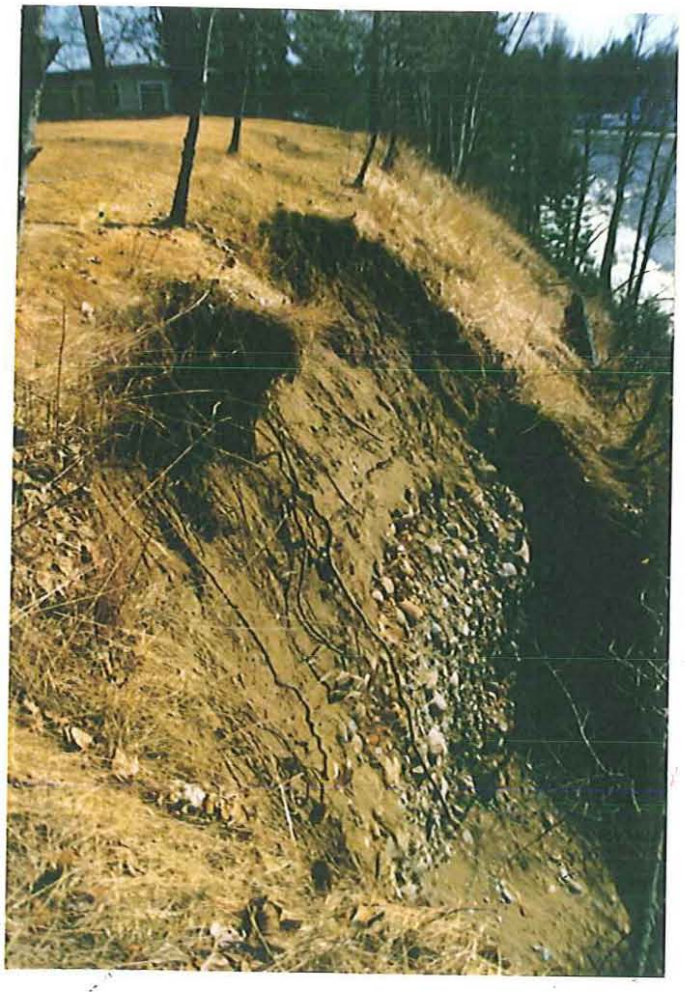
Aspen Lane

Prince George.

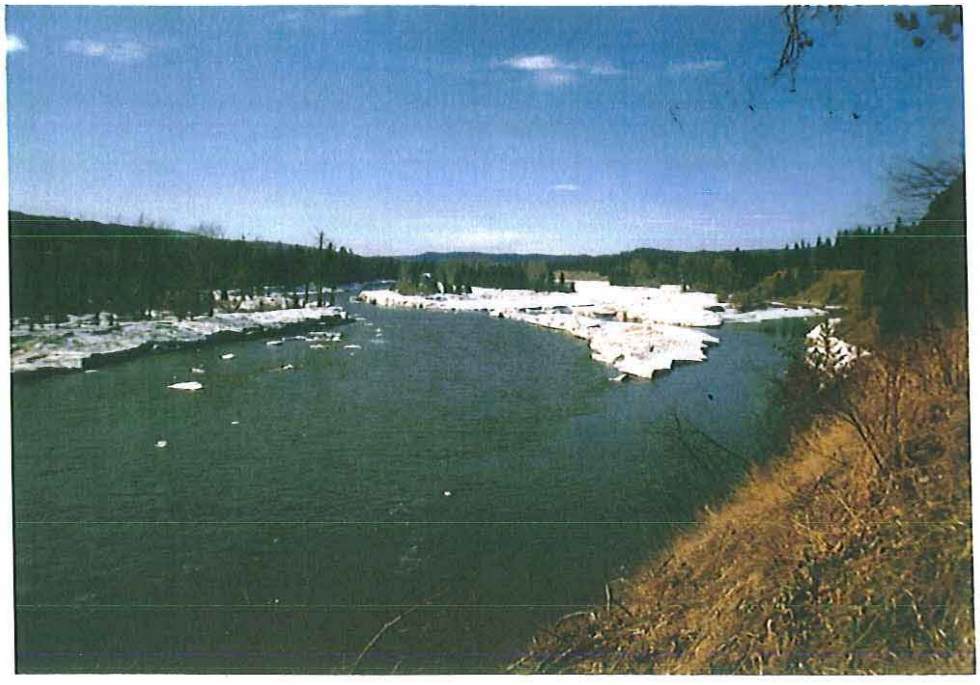
Mar 24/97

Apr 9/97





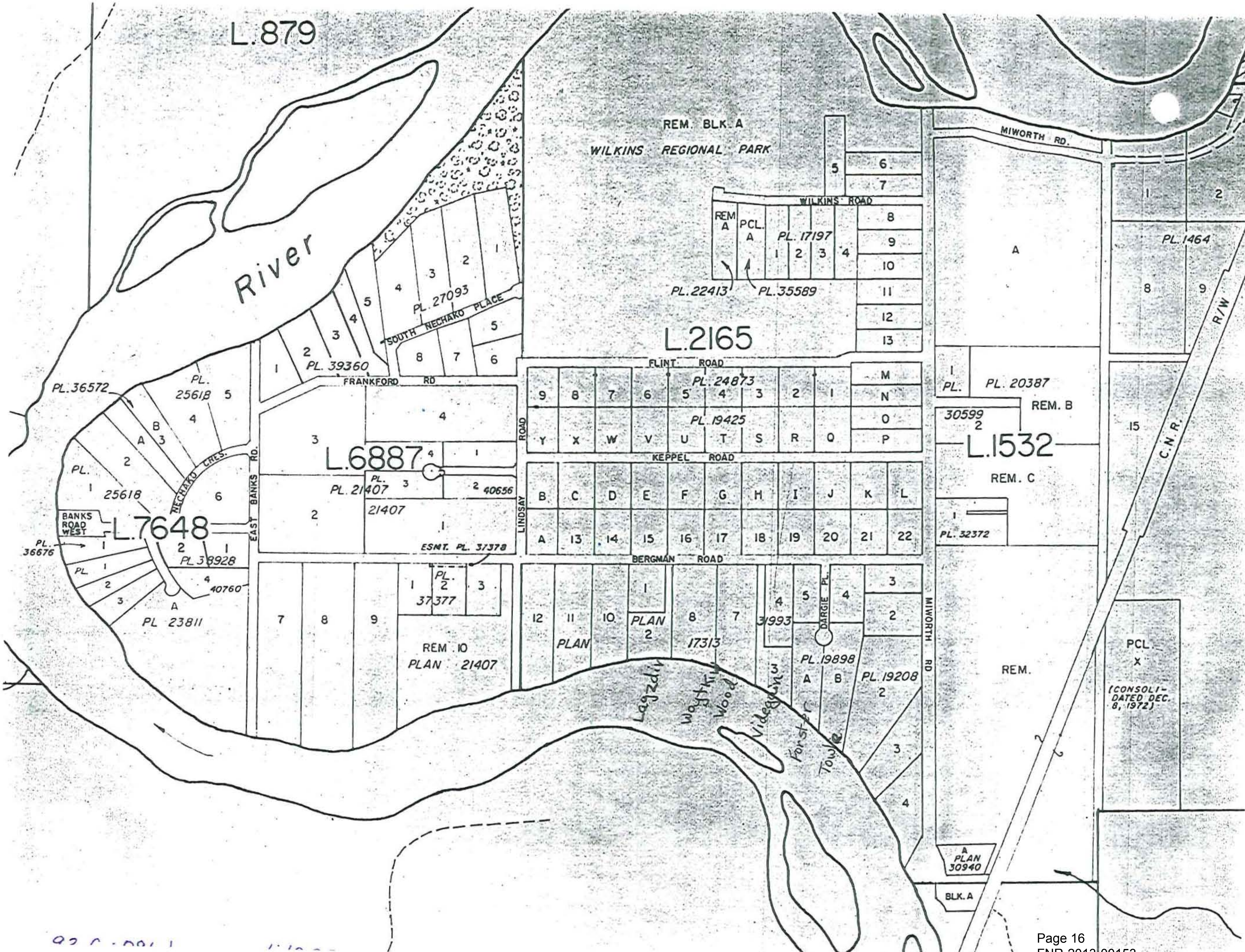
Nechako River



Upstream View from Aspen Lane

April 9, 1997

Downstream View from Aspen Lane

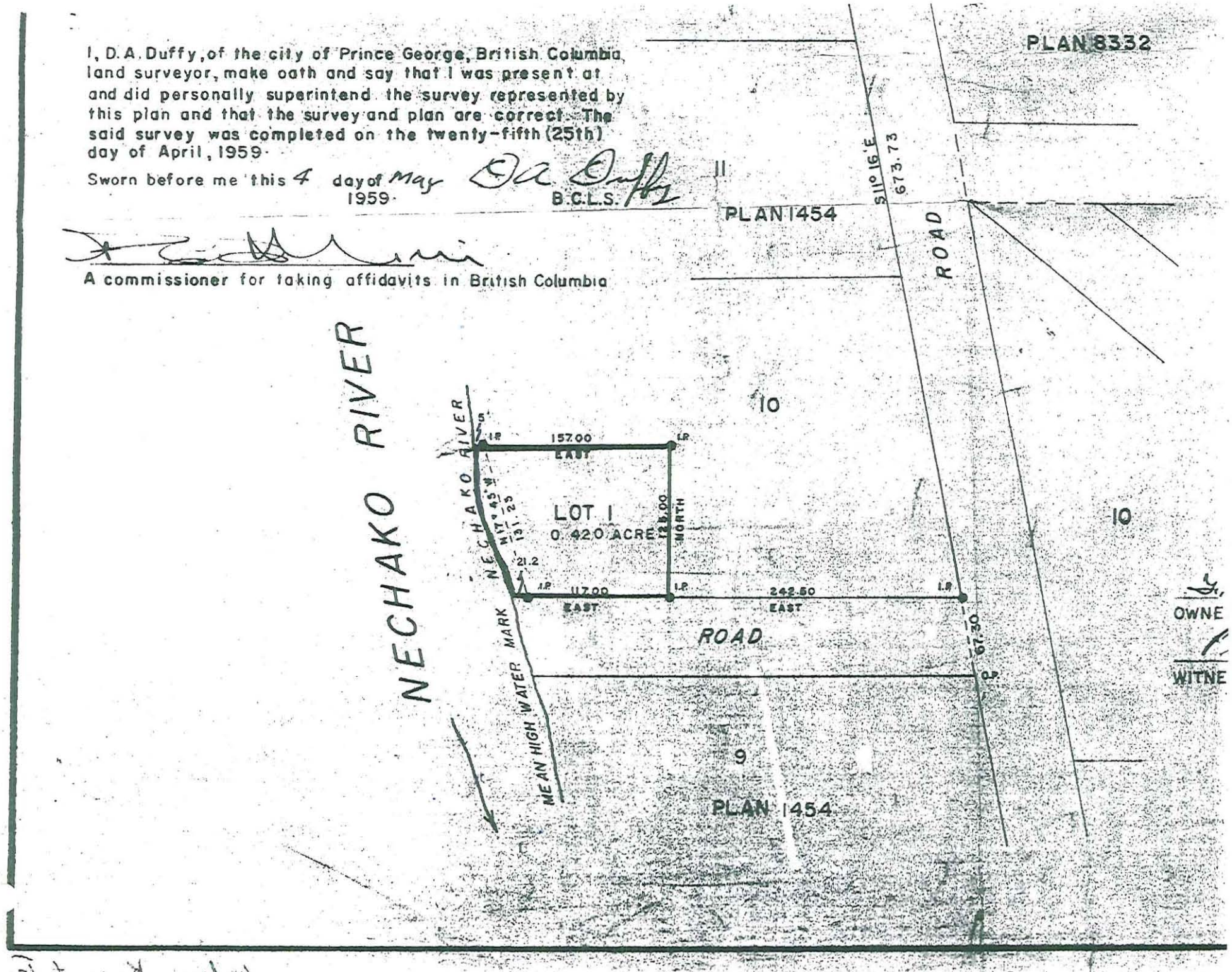

L.879
River
REM. BLK. A
WILKINS REGIONAL PARK
WILKINS ROAD
MIWORTH RD.
PL. 17197
PL. 22413
PL. 35589
REM A
PCL. A
PL. 1464
C.N.R. R/W
L.2165
PL. 27093
SOUTH NECHAKO PLACE
PL. 39360
FRANKFORD RD
FLINT ROAD
PL. 24873
PL. 19425
KEPPEL ROAD
BERGMAN ROAD
LINDSAY ROAD
PL. 36572
PL. 25618
L.6887
PL. 21407
40656
NECHAKO CRES.
EAST BANKS RD.
BANKS ROAD WEST
L.7648
PL. 36676
PL 38928
40760
PL 23811
ESMT. PL. 37378
PL. 37377
REM. 10 PLAN 21407
PLAN 17313
31993
DARGIE PL.
PL. 19898
PL. 19208
MIWORTH RD
PL. 20387
REM. B
30599
L.1532
REM. C
PL. 32372
REM.
PCL. X
(CONSOLIDATED DEC. 8, 1972)
A PLAN 30940
BLK. A
Lagzdin
Woytkiw
Wood
Videgain
Forster
Towle

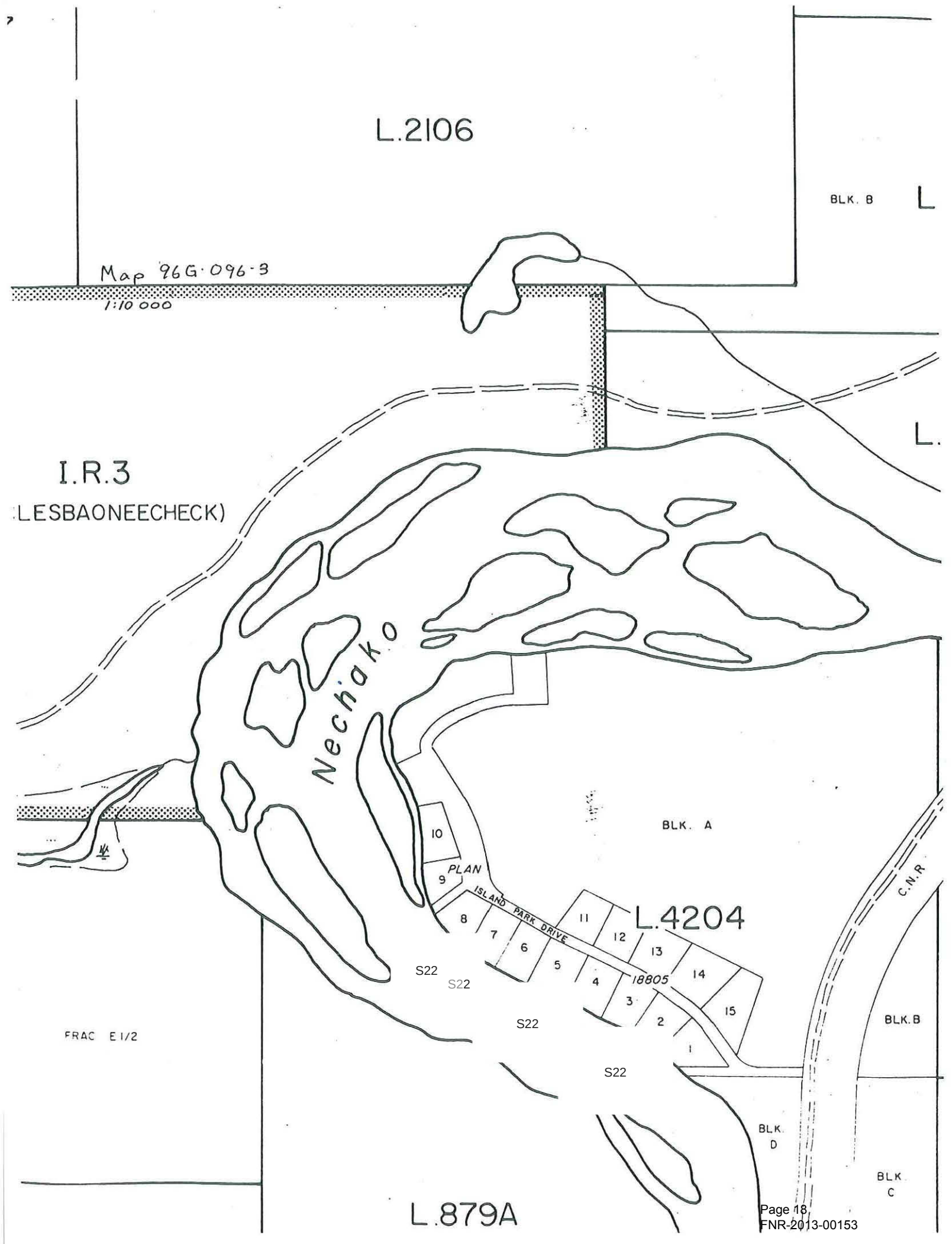
I, D.A. Duffy, of the city of Prince George, British Columbia, land surveyor, make oath and say that I was present at and did personally superintend the survey represented by this plan and that the survey and plan are correct. The said survey was completed on the twenty-fifth (25th) day of April, 1959.

Sworn before me this 4 day of May 1959.

D.A. Duffy
B.C.L.S.

A commissioner for taking affidavits in British Columbia




L.2106
BLK. B
L
Map 96G·096-3
1:10 000
L.
I.R.3
(LESBAONEECHECK)
Nechako
BLK. A
10
9
PLAN
ISLAND PARK DRIVE
L.4204
8
7
6
5
4
3
2
1
11
12
13
14
15
18805
S22
S22
S22
S22
C.N.R
BLK.B
FRAC E 1/2
BLK.
D
BLK
C
L.879A

s.22

facsimile transmittal

To: Mr. G. Davidson Fax: 565-6629

From: S22 Date: June 26, 1997

Re: Water level of Nechako River Pages: 2

CC:

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Notes: I am concerned by the continued rise of the Nechako River, which is now carrying out relentless erosion of its banks, and I have expressed my concern, about more releases of water by Alcan, to the Comptroller of Water Rights (see attached fax). I hope you will counsel the Comptroller that a release of 14,000 cfs should not be contemplated until the Stuart River falls sufficiently that increased flows from Alcan's reservoir do not cause the Nechako to rise above its current level (i.e. the level on 06/26/97).

Respectfully

S22

To: Mr Jack Farrell, Comptroller of Water Rights

Fax: 1-250-387-1898

From: s.22

Date: June 26, 1997

Pages: 1 page(s) including this page.

fax

s.22 I wish to convey to you my concern at the frequency and rate with which water releases are made by Alcan at the Skins Lake Spillway during the period of high flows from the Stuart River into the Nechako.

Even before the effect of the release of the 12, 000 cfs is felt here at Pr. George, there is significant erosion of the banks of the Nechako. Today, and during the past week, the river has been eroding the bank at a level at which 60 year old pine trees are growing. I understand that what we are witnessing is an unusual circumstance (a high snow pack in the watershed of the rivers draining into the Nechako). Nonetheless, I think that until the flows from the Stuart fall you should not grant Alcan the right to increase its flows from Skins Lake because irreversible harm will be done to properties downstream.

I would like to also express alarm at a reason often given to justify the increased releases by Alcan, specifically that the releases are necessary to safeguard the integrity of the Kenny Dam. Is this a truthful reason for allowing releases? If it is, shouldn't the dam be strengthened? Could the dam, when filled to its capacity, withstand a mild earthquake?

With respect,

s.22

Province of British Columbia

Ministry of Environment

FILE NO. 55.5018 ~~55-175~~

DATE April 9/97.

SUBJECT Nechako River Bank Erosion s.22 Property.

ATTENTION OF: GD

Notes to File

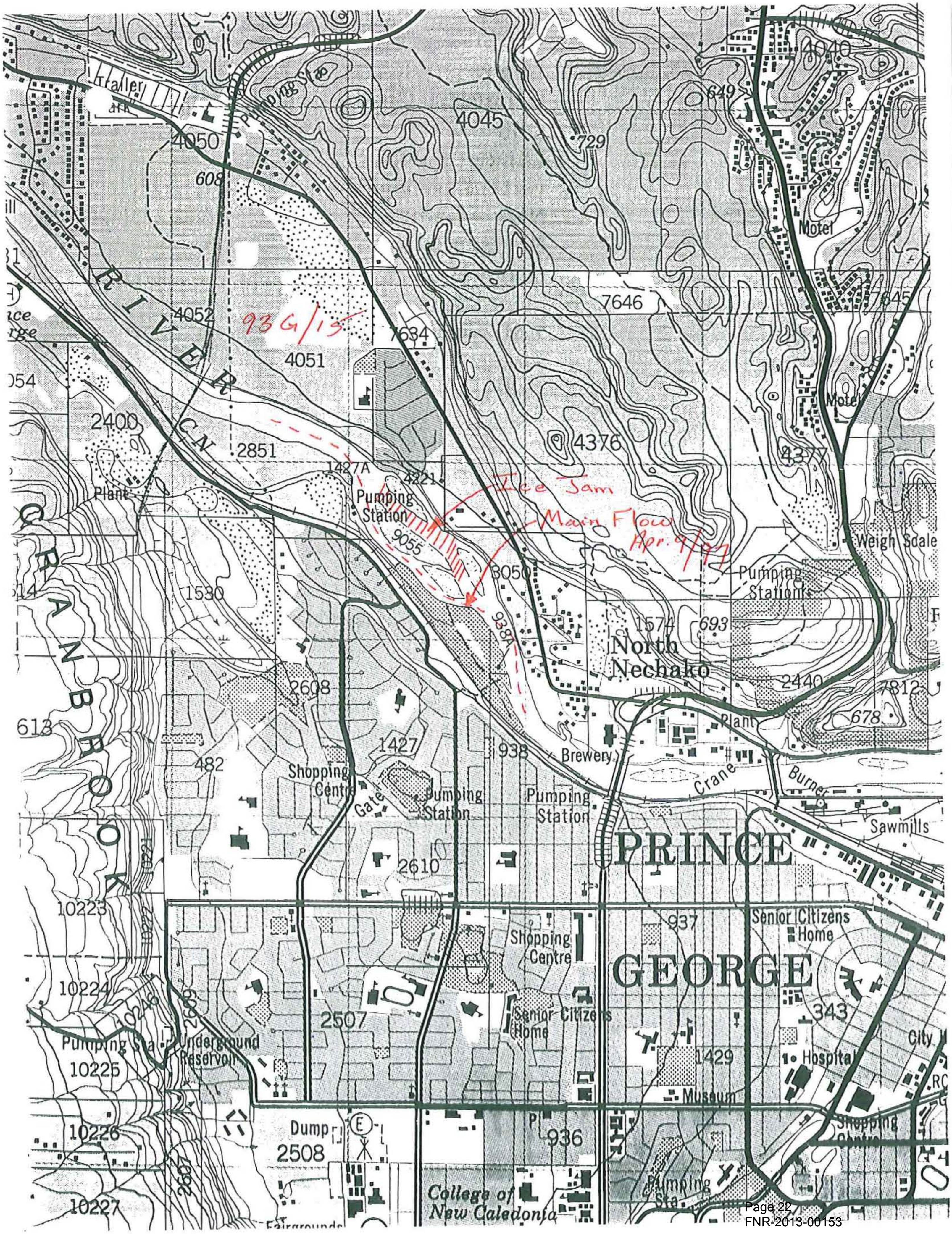
REMARKS LL + GD visited site and measured bank heights, located the slope failure and measured the distance between the house and bank etc.

Dwg attached

Just u/s the river was mainly flowing around the islands along the right bank then being directed to the left bank at s.22 property. The center of the river there was mainly plugged with ice. (see map).

See also subdivision info File 55.461018 Nechako PG 2 above Old Nechako.

SIGNATURE L. Egan.


93 G/15
Ice Jam
Main Flow
Apr. 9/97
Trailer Park
Pumping Sta
RIVER
CN
CRANBROOK
Plant
Pumping Station
Pumping Stations
North Nechako
Brewery
Crane
Burner
Sawmills
Weigh Scale
Motel
PRINCE
GEORGE
Shopping Centre
Gate
Senior Citizens Home
Pumping Sta
Underground Reservoir
Dump
Museum
Hospital
City
College of New Caledonia
Fairgrounds
4040
4045
4050
4051
4052
7634
7646
4376
4377
2400
2851
1427A
4221
9055
3050
938A
1574
693
2440
7812
678
649
729
608
1530
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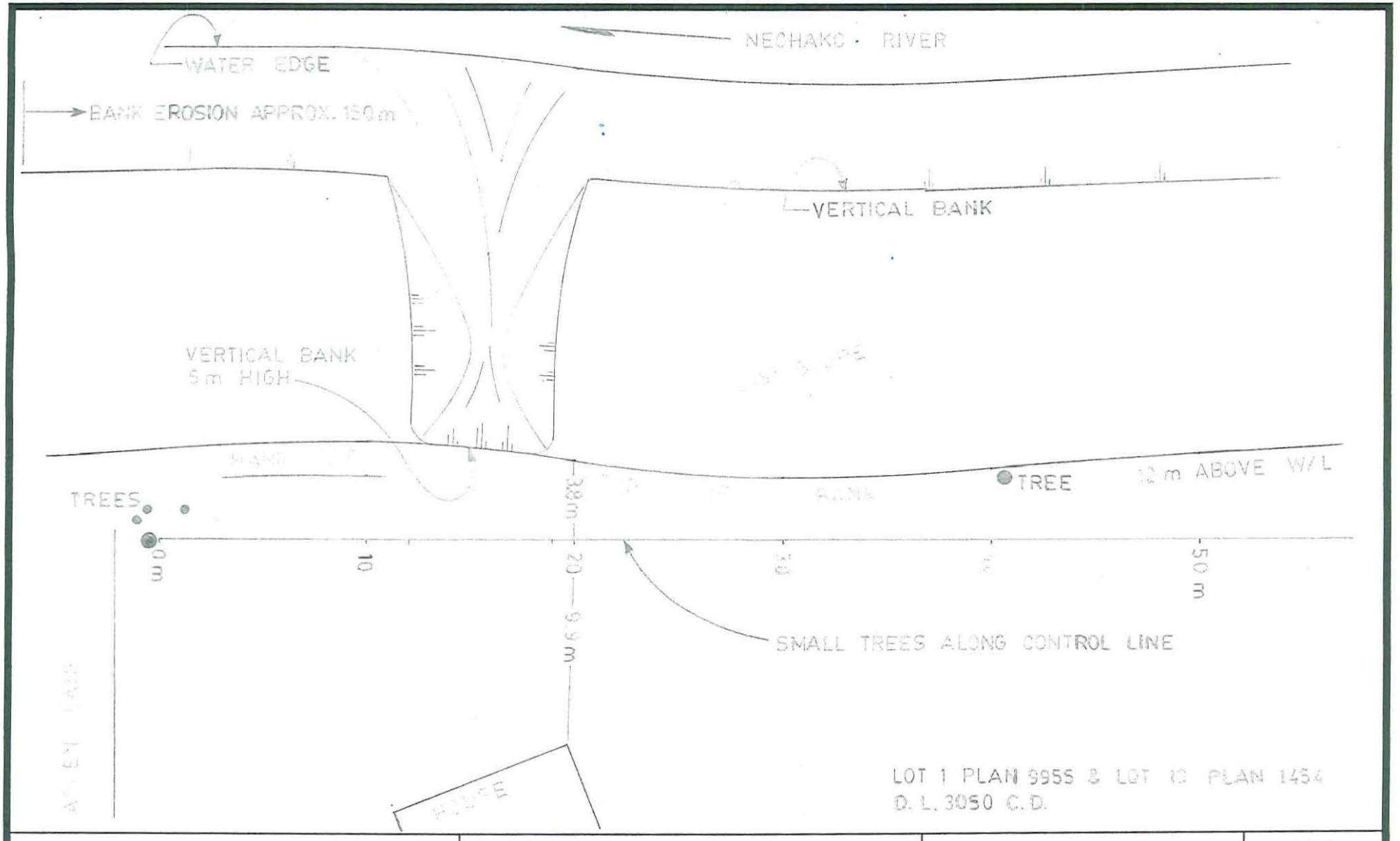
936



Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

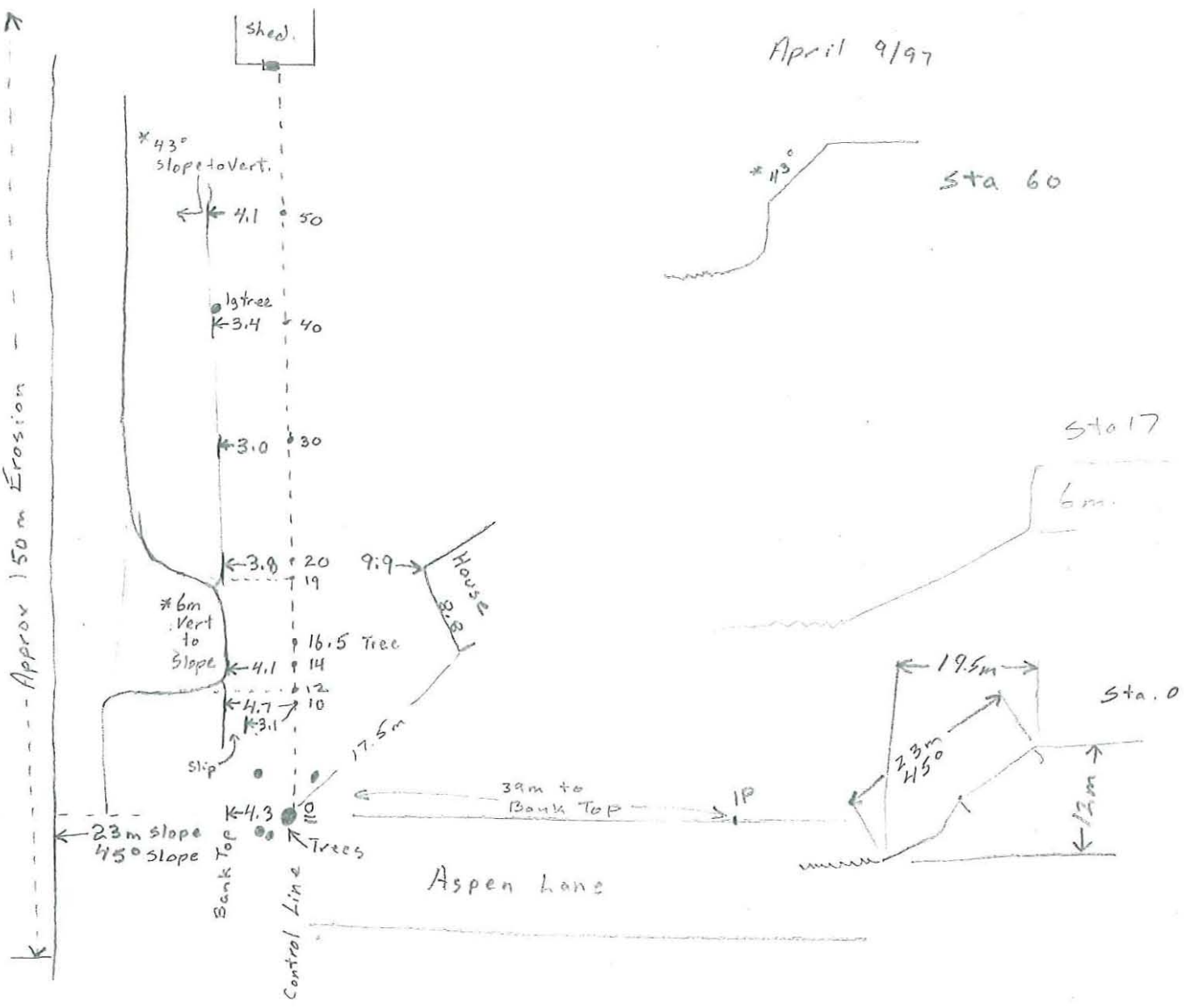
NECHAKO RIVER BANK EROSION

SCALE: VERT. 1:250
HOR.

DATE APRIL 9, 1967

WILLIAMS PROPERTY

FILE No. DWG. No. 1


April 9/97
Shed
*43° slope to Vert.
4.1
50
lg tree
3.4
40
3.0
30
3.8
20
19
9.9
House
3.8
*6m Vert to Slope
16.5 Tree
4.1
14
12
4.7
10
3.1
17.5m
Slip
39m to Bank Top
IP
4.3
0
23m slope 45° slope
Bank toe
Trees
Control Line
Aspen Lane
Approx 150m Erosion
*43°
Sta 60
Sta 17
6m.
19.5m
Sta. 0
2.3m H5°
1.5m

...ring are astronomic and are derived from
...n 1454

I.B. indic... an iron post found.
I.P. indic... an iron post planted.

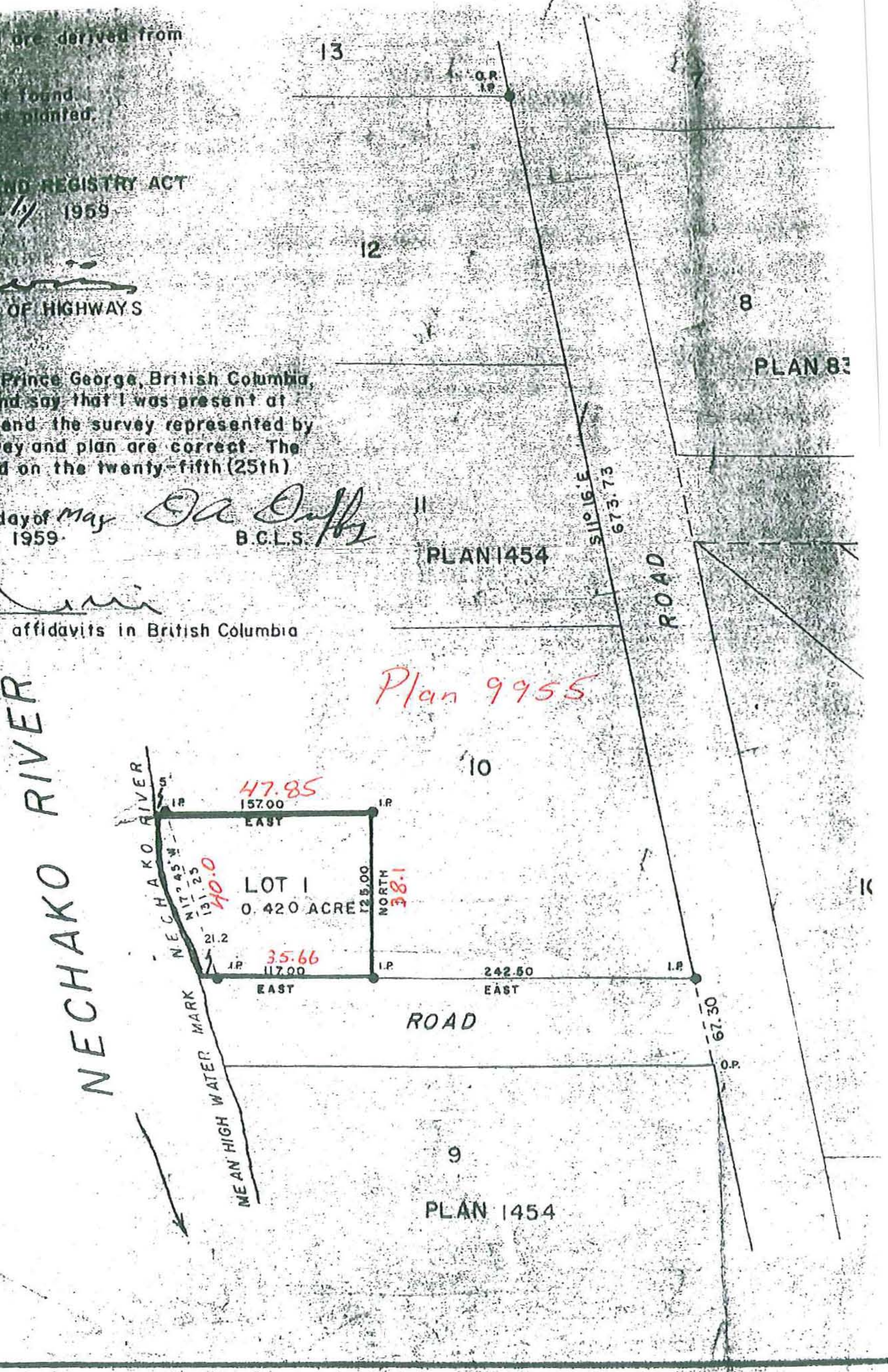
...ROVED UNDER THE LAND REGISTRY ACT
THIS 2nd DAY OF July 1959

...OVING OFFICER, DEPT. OF HIGHWAYS

...A. Duffy of the city of Prince George, British Columbia,
...surveyor, make oath and say that I was present at
...did personally superintend the survey represented by
...plan and that the survey and plan are correct. The
...survey was completed on the twenty-fifth (25th)
...of April, 1959.

...before me this 4 day of May 1959. B.C.L.S.

...mmissioner for taking affidavits in British Columbia



Province of British Columbia Ministry of Environment

FILE NO. Nechako. R.

DATE June 18/97

SUBJECT Major Property Erosion on Nechako R.

s.22

ATTENTION OF:

Glen

REMARKS

5 Residences impacted on Island Park Drive

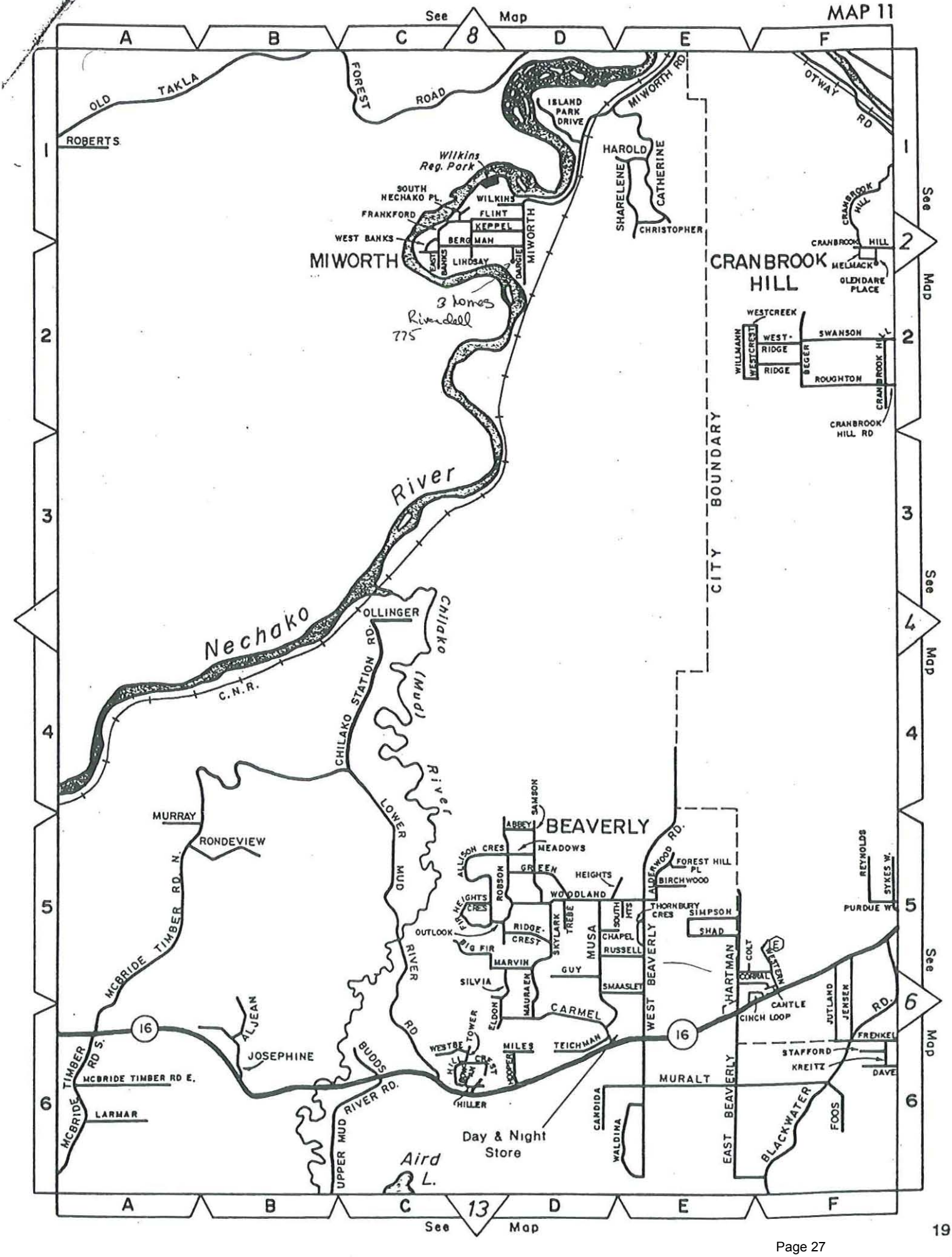
- Bank is approx 50 - 60' high
- Banks were at 45° slope, now they are near vertical
- Houses about 50' from bank top and not at immediate risk yet.
- Erosion at bottom of bank about 30'
- Erosion at top of bank about 3'

s.22 wanted names of consultants who may provide some sort of solution.

We talked about Rip rap, gabions, placing trees etc.. High banks and the high water would make ~~work~~ remedial work difficult and expensive.

June 19th s.22 called Graham Eng.:
Not much can be done right now.
Graham mentioned using a concrete blanket but that requires a 2:1 slope.

SIGNATURE


MAP 11
See Map 8
See Map 13
A
B
C
D
E
F
1
2
3
4
5
6
See Map 2
See Map 4
See Map 6
OLD TAKLA ROAD
FOREST ROAD
ROBERTS
ISLAND PARK DRIVE
MIWORTH RD
OTWAY RD
HAROLD
SHARELENE
CATHERINE
CHRISTOPHER
Wilkins Reg. Park
SOUTH NECHAKO PL.
WILKINS
FRANKFORD
FLINT
KEPPEL
WEST BANKS
BERGMAN
EAST BANKS
LINDSAY
DARCIE
MIWORTH
3 homes
Riverdell
775
CRANBROOK HILL
CRANBROOK HILL
MELMACK
GLENDARE PLACE
CRANBROOK HILL
WESTCREEK
WILLMANN
WESTCREST
WEST RIDGE
RIDGE
BEGER
SWANSON
ROUGHTON
CRANBROOK HILL
CRANBROOK HILL RD
CITY BOUNDARY
Nechako River
OLLINGER
Chilako (Mud)
C.N.R.
CHILAKO STATION RD.
MURRAY
RONDEVIEW
MCBRIDE TIMBER RD N.
LOWER MUD RIVER RD
ABBEY
SAMSON
BEAVERLY
ALLISON CRES
MEADOWS
GREEN
HEIGHTS
ROBSON
WOODLAND
FIR HEIGHTS CRES
OUTLOOK
RIDGE CREST
SKYLARK
TREBE
SOUTH HTS
CHAPEL
RUSSELL
MUSA
BIG FIR
MARVIN
GUY
SILVIA
MAURAEN
ELDON
CARMEL
SMAASLET
ALDERWOOD RD.
FOREST HILL PL
BIRCHWOOD
THORNBURY CRES
SIMPSON
SHAD
WEST BEAVERLY
HARTMAN
COLT
CORRAL
CANTLE
CINCH LOOP
REYNOLDS
SYKES W.
PURDUE W
JUTLAND
JENSEN
FRENKEL
STAFFORD
KREITZ
DAVE
MURALT
EAST BEAVERLY
BLACKWATER
FOOS
CANDIDA
WALDINA
ALJEAN
JOSEPHINE
BUDOS
MCBRIDE TIMBER RD E.
MCBRIDE TIMBER RD S.
LARHAR
UPPER MUD RIVER RD.
WESTBEE
TOWER HILL
CR
ST
MILES
TEICHMAN
HILLER
Day & Night Store
Aird L.
16
16

BRITISH COLUMBIA

File: 76800-20/Van. Nechako River

July 03, 1997

Provincial Emergency Program
1541 Ogilvie St
Prince George, BC
V2N 1W7

Attention: Bob Kelly

Dear Bob:

Re: Nechako River Erosion

Please find attached a copy of a interim report on erosion problems in on the Nechako River in the Prince George area.

For the past several weeks we have been looking into erosion problems at several locations, resulting from the current high flow conditions of the Nechako River. While several homes are threatened, none appear to be at immanent risk at present. However, if the current rate of erosion continues, some of the homes could be threatened in the near future. The report defines the current area of erosion and documents some of the problems to date.

We will continue to monitor the problems and look into the possibility of remedial works. PEP should be involved at this point since it appears that there could be some threat to these homes in the near future.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region

cc: Bob Bugslag, Ministry of Environment Lands and Parks, Victoria

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
Plaza 400, 3rd Floor
1011 4th Avenue
PRINCE GEORGE BC V2L 3H9
Telephone: 565-6436
Facsimile: 565-6629

BRITISH COLUMBIA

File: 76800-20/Van. Nechako River

July 03, 1997

City of Prince George
1100 Patricia Blvd.
Prince George, BC
V2L 3V9

Attention: Rob Whitwam, Emergency Coordinator

Dear Rob:

Re: Nechako River Erosion

Please find attached a copy of a interim report on erosion problems in on the Nechako River in the Prince George area. Two the of the sites lie within the City of Prince George.

For the past several weeks we have been looking into erosion problems at several locations, resulting from the current high flow conditions of the Nechako River. While several homes are threatened, none appear to be at immanent risk at present. However, if the current rate of erosion continues, some of the homes could be threatened in the near future. The report defines the current area of erosion and documents some of the problems to date.

We will continue to monitor the problems and look into the possibility of remedial works. At this point we are involving both the Provincial Emergency Program and the City of Prince George since some remedial action may be required in the near future.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
Plaza 400, 3rd Floor
1011 4th Avenue
PRINCE GEORGE BC V2L 3H9
Telephone: 565-6436
Facsimile: 565-6629

NECHAKO RIVER EROSION NEAR PRINCE GEORGE

INTERIM REPORT

Ministry of Environment, Lands and Parks

June 30, 1997

Introduction

The Nechako River has undergone two significant hydrologic events within the last year; large ice jams (both freeze-up and break-up) as well as high spring freshet flows. As a result of the prolonged high flows significant bank erosion is occurring at the present time, and a number of homes and properties are at risk.

The purpose of this interim report is to identify some of these locations and provide a general assessment of problem areas. While recent erosion of the bank is evident at many locations, this report is concerned only with those locations where structures are at risk, and does not address damage to property alone.

At the present date the Nechako river is flowing at approximately 1000 m3/s at Isle Pierre, with approximately 33 % of this flow spilling from the Alcan reservoir and the majority of the flow originating from the Stuart River system. This represents a flood event in the order 1 in 20 years at Isle Pierre; the fifth highest flow (per year) on record since 1950. Flows of this magnitude have been occurring for the last month and are anticipated to continue for the next several weeks.

The ice jams of last fall (Nov/Dec 1996) resulted in very high water levels at a few localized areas, along with significant scouring of banks and vegetation during formation and break-up events. A detailed analysis of the events leading up to the ices jams of November 1996 can be found in the report Review of Water Management in the Nechako River Basin, March 1997, by Brian Scarfe.

The following is a list of some of the more significant sites where active erosion is ongoing and could threaten homes or structures in the near future. An attached map with shows site locations with corresponding numbers. In addition, preliminary cross-sections were surveyed at many of the house locations. These surveys will be repeated at various times in the future in order to estimate erosion rates and assess the risk to individual homes.

1. Cottonwood Island/Nechako River Trail System (Prince George)

A paved trail system along the Nechako River, built co-operatively by local volunteers, service groups and the City of Prince George has been damaged at several locations. Ice has scoured riprap along portions of the trail and high water levels this spring has undermined some of the paved portions of the trail. In addition several structures such as bridges and viewing platforms were damaged by high water. Sections of the trail remain flooded and some of the seriously damaged sections remain closed. A detailed assessment of the damage cannot be completed until after water levels drop.

2. Aspen Lane (Prince George) - s.22 Property

Severe bank erosion began on the 14 metre high riverbank adjacent to the s.22 home around mid March during break-up of the river ice. Water currents during the break-up appear to have reactivated the erosion along approximately 150 m of the bank. Although this area has remained relatively stable in recent years (30 year old house), it is in an area of historic bank erosion, which probably began stabalizing after the construction of the Kenney Dam in the 1950's.

A recent site visit indicated that the area of active erosion is continuing to expand, and is now greater than 150 m and affects the upstream and downstream properties. At present only the s.22 home is at risk. While their home does not appear to be at imminent risk of failure, continued erosion at this location could make the home unsafe sometime in the future. Initial measurements in March indicated that the house was 13.7 m from the top of the bank, with some of the gravel bank still in a sloped formation with erosion progressing at the toe. The most recent site visit on June 27 indicated that the house was now 12.5 m from the top of the bank (survey drawings attached), and that the slope was now near vertical over much of the affected length.

While there appears to be very little that can be done to prevent further erosion at this time due to high water and unstable slope conditions, it may be possible to construct some form of bank protection once water levels drop. However, the long length of affected slope and the highly erodable nature of the soils would mean that any bank protection scheme will likely be very expensive. In addition, the height of the bank and steep access will make construction very difficult and add to the expense.

3. Island Park Drive (Miworth) - s.22 properties

A long outer bend along the Nechako in the Miworth area (several km upstream of Prince George), is experiencing active erosion and could eventually affect up to 6 homes of this 15 lot subdivision. Homes on two of the properties s.22 , located approximately 18 metres from the top of the bank, near the most active area of erosion appear to be at greatest risk. Although these homes are not at immediate risk of failure, both (and potentially the other four) homes could be at risk in the near future if the erosion continues at it's present rate.
This is also an area of historic erosion, which has likely become much more stable since the construction of the Kenny Dam. Two of the properties, s.22 have constructed

some form of bank protection to the slope approximately 18 years ago. The protection work on the s.22 property consisting of a series of concrete slabs laid along the base of the slope appears to be performing well and the slope remains stable at this time. The debris applied to the slope of the s.22 property appears to be slowing the rate of erosion, however the slope has not been stabilized.

From the above examples it appears stabilizing the bank is possible at these locations; however this could prove very difficult, costly and potentially dangerous under the current high water conditions. Once water levels drop a comprehensive survey, design and cost analysis is required.

4. Dargie Place/Bregman Road (Miworth) -

s.22

Active erosion on the outside of a long bend is presently affecting 7 properties. The situation is similar to the area described above in # 3, however the bank height is much higher in this case. Observations of undisturbed portions of the slope indicate that this bank has been subject to only minor erosion in recent years, however the toe of the slope has now become very active and has result in an oversteepend slope. The bank is now vertical at some locations and active erosion has now reached the top of the slope on several properties.

While none of the homes appear to be at immediate risk of failure, several houses will become unsafe if the erosion continues. The most active erosion appears to be taking place on Lot 7, Pl 17313 s.22 , where a trailer is located. Based on the house locations and erosion rates it is estimated that the home on Lot 3, Pl 31993 s.22 , located approximately 18.2 m from the top of the slope is at highest risk.

5. North Nechako Road

The extension of North Nechako Road upstream of the city limits was damaged by winter ice approximately 0.5 km upstream of the city. The same road was under water at km 1.5 due to high flows in the river. This road which accesses several private properties, a native reserve and the site of a summer bluegrass music festival is located on Crown Land and Native Reserve. A recent inspection indicates that gravel fill was added to the flooded portion of the road (km 1.5) and some additional work was completed on the steep slope section (cutbanks) at km 0.5. While the road is now passable, it is not in ideal condition and cannot be considered safe. In additional, the section at km 0.5 is subject to further erosion by the river and is also vulnerable to slope failure from above.

Due to the poor and unsafe conditions of this road, as well as the potential cost to upgrade it, the Provincial Ministry of Transportation and Highways is reluctant assume responsibility for the road.

Summary/Recommendations

It is likely that erosion at all of the above sites will remain active while the Nechako River flows continue to run at the present high levels. The Nechako is expected to flow relatively high all summer, however it is anticipated the a some reduction in flow, from the present should occur by mid to late July. At this time the rate of erosion at the base of these sites should be substantially reduced. However, the slopes will still continue to erode back until the slope attains a stable angle of approximately 37°. In some cases this will bring the top of the slope very close to the existing houses (see attached drawings).

At the time of writing, all tributaries to the Nechako River, including the Stuart had peaked and were starting to decline. Alcan have previously deferred large releases from their reservoir during the peak flows on other systems and are now spilling at a rate of 12,000 cfs. This spill combined with the powerhouse flows (5000 cfs) are almost equal to the current reservoir inflow of 19,000 cfs. It was anticipated that the inflows, which had been as high as 35,000 cfs would soon drop below 17,000 cfs, prior to the reservoir filling so that a further increase in spill at the Skins Lake Spillway may not be required.

BC Environment staff will continue to monitor erosion rates and investigate options with regard to erosion protection. Cross-section surveys will be repeated at key locations. At present it does not appear that there are any reasonable bank protection schemes which could be undertaken safely and practically while the river is at such a high flow. However, after the river level drops, it may be possible apply some form of bank protection, in an attempt to stabilize the slope as was achieved at the S22 property. It is also possible that moving the affected homes may be less expensive than protecting the bank, and may offer a better chance of success over the long term. This is offen the case when large rivers such as the Nechako are involved.

While erosion protection remains the responsibility of the individual property owner, the Provincial Emergency Program (PEP) may provide some financial assistance in the case of imminent risk to homes. They may also provide some assistance in relocating houses if they are at imminent risk of failure. However financial assistance is applied on a case specific basis and is subject to conditions of the Disaster Financial Assistance Program. This preliminary report will be forwarded to PEP for their consideration.

Glen Davidson, P.Eng.
Head, Engineering Section
Omineca-Peace Region

Province of British Columbia
Ministry of Environment and Parks
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON

Nechako River
Bank Erosion

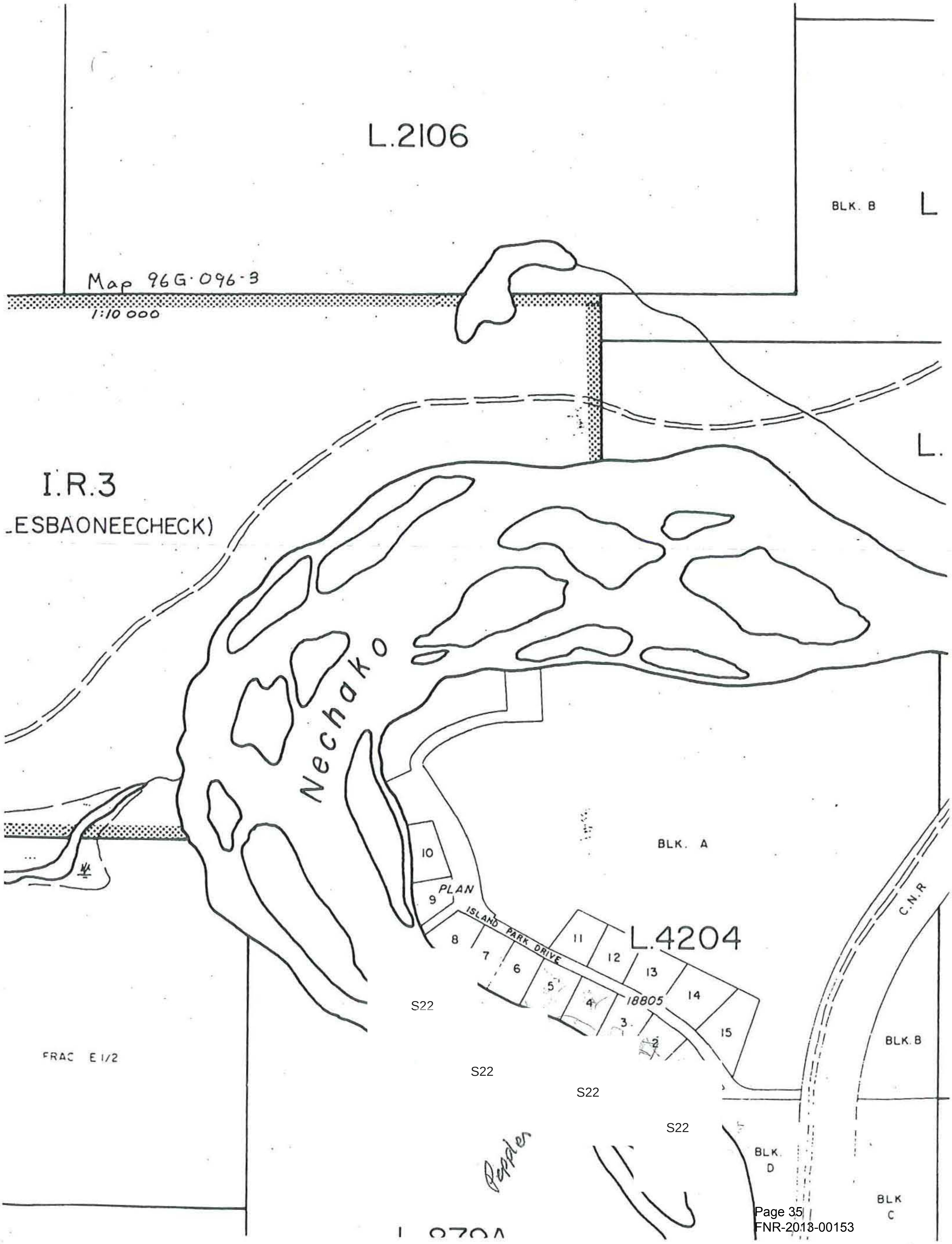
SCALE: VERT.
HOR.

DATE
June 27 1997

ENGINEER

FILE No. DWG. No.

BCIL 7674-M.E.


L.2106
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Nechako
10
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ISLAND PARK DRIVE
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18805
L.4204
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Peppler
BLK. D
BLK C
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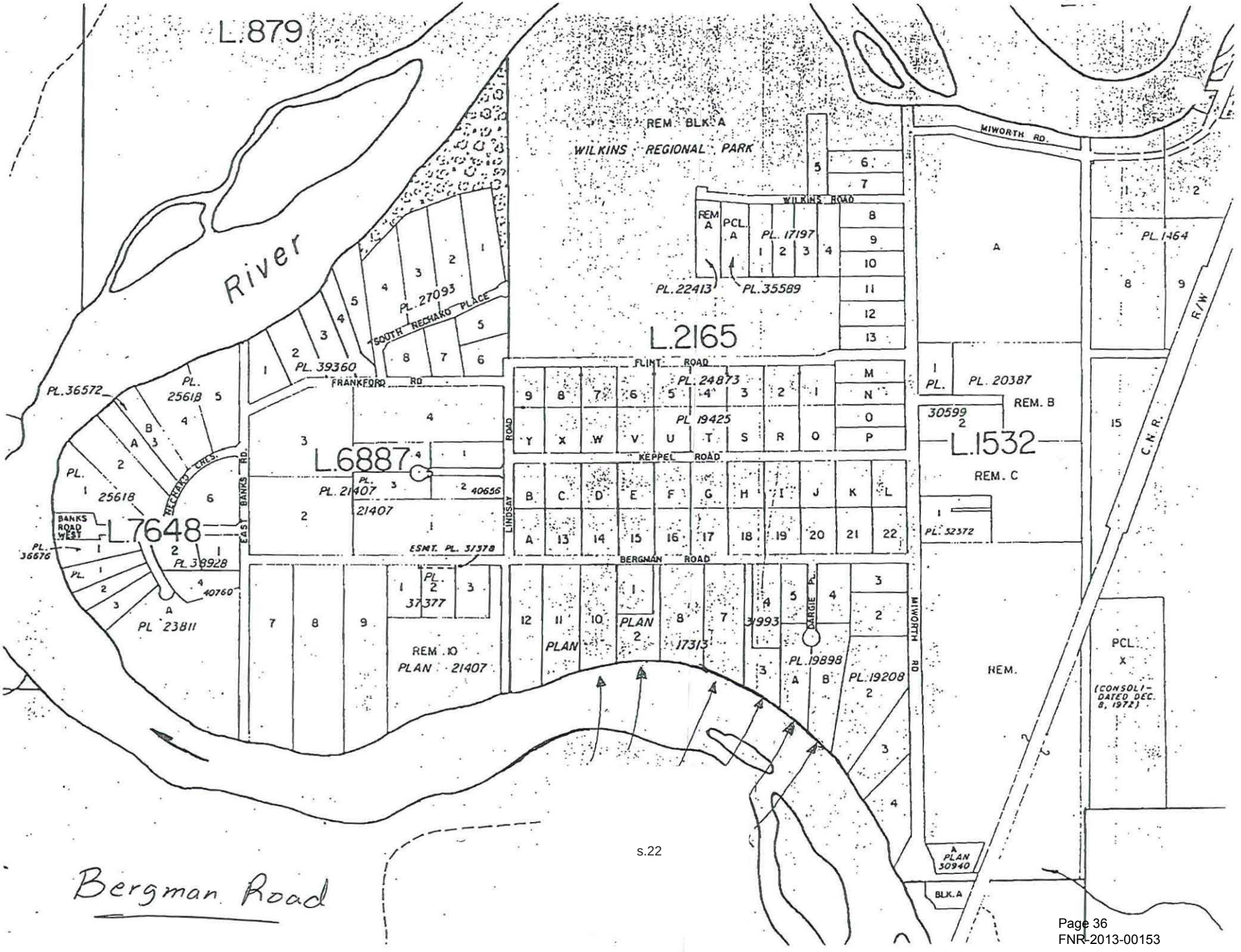
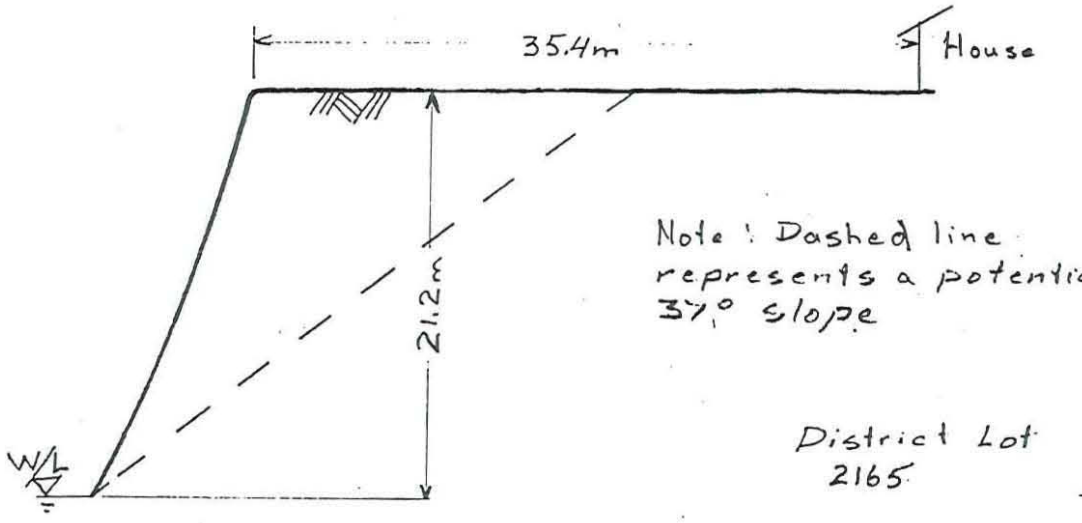
S22
S22
S22


L.879
River
REM. BLK. A
WILKINS REGIONAL PARK
WILKINS ROAD
REM A
PCL. A
PL. 17197
PL. 22413
PL. 35589
L.2165
PL. 27093
SOUTH RECHARD PLACE
PL. 39360
FRANKFORD RD.
FLINT ROAD
PL. 24873
PL 19425
KEPPEL ROAD
BERGMAN ROAD
L.6887
PL. 21407
21407
40656
ESMT. PL. 31378
L.7648
BANKS ROAD WEST
EAST BANKS RD.
RECHARD CRES.
PL. 25618
PL. 36572
PL. 38928
40760
PL 23811
PL. 37377
REM. 10
PLAN 21407
PLAN 17313
PLAN 31993
PL. 19898
PL. 19208
DARGIE PL.
LINDSAY ROAD
MIWORTH RD.
PL. 1464
PL. 20387
REM. B
30599
L.1532
REM. C
PL. 32372
REM.
PCL. X
(CONSOLIDATED DEC. 8, 1972)
C.N.R. R/W
PLAN 30940
BLK. A
Bergman Road

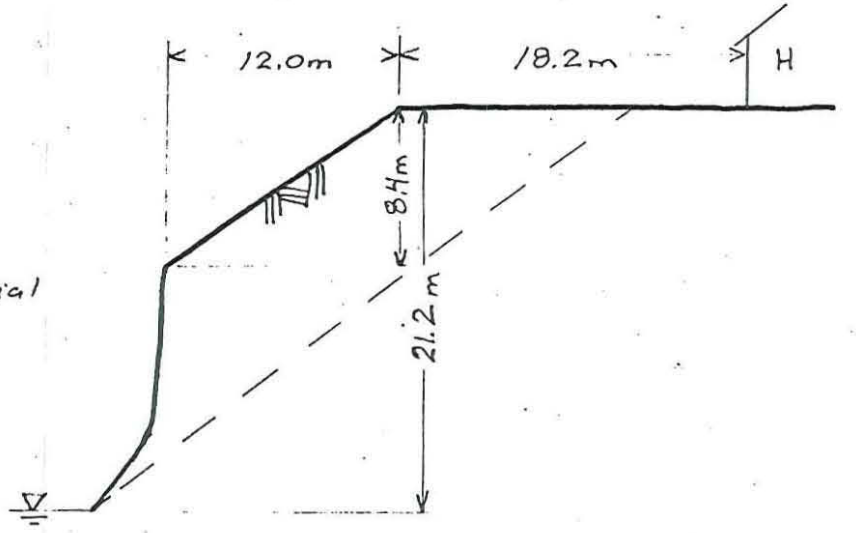
s.22



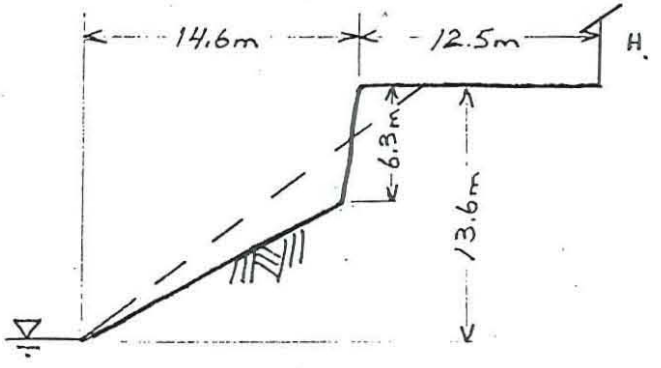
Note : Dashed line represents a potential 37° slope

District Lot 2165

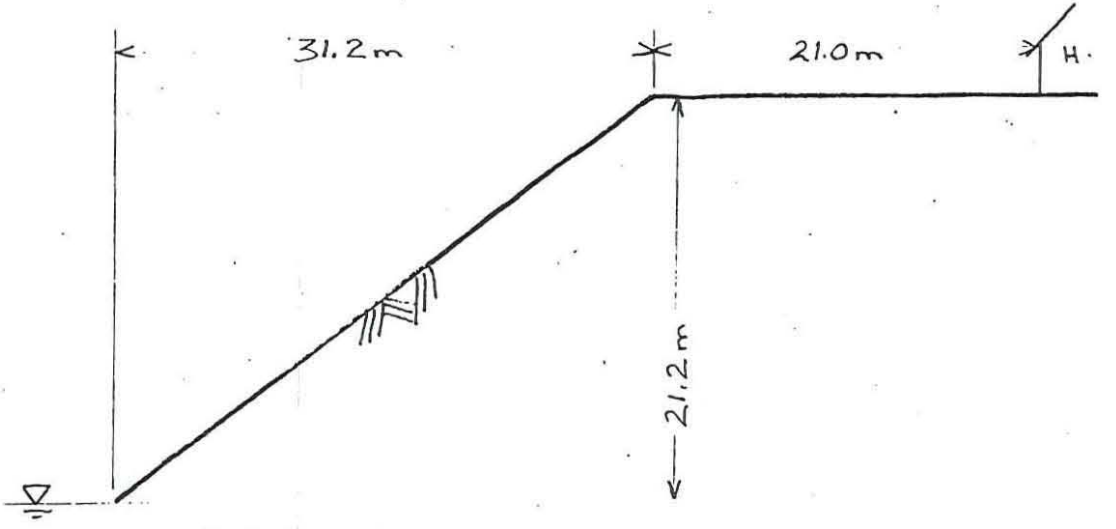
Lot 7
Plan 17313 - s.22



Lot 3
Plan 31993 - s.22

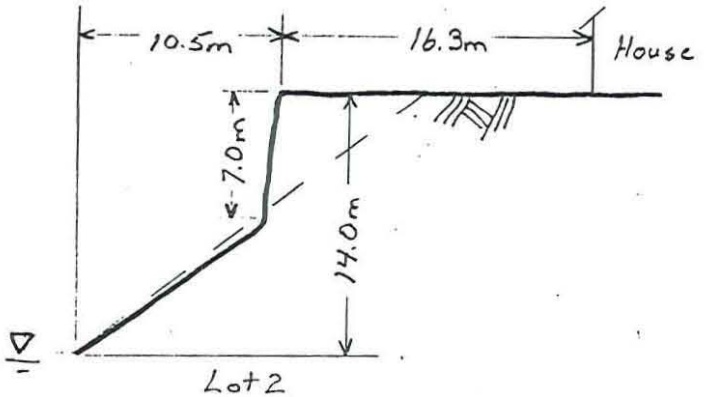


Aspen lane -
D.L. 3050 s.22

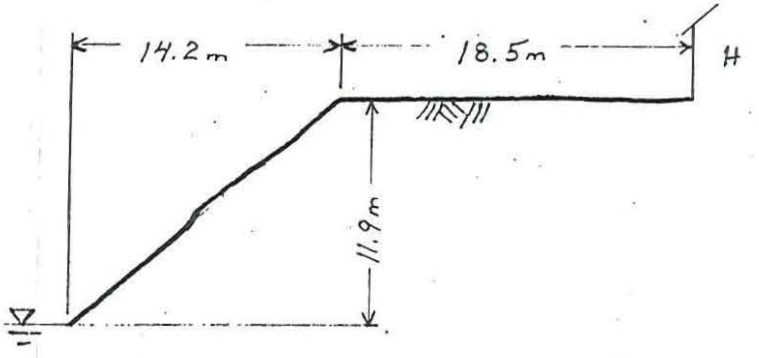


Lot 2 Plan 17313 - s.22

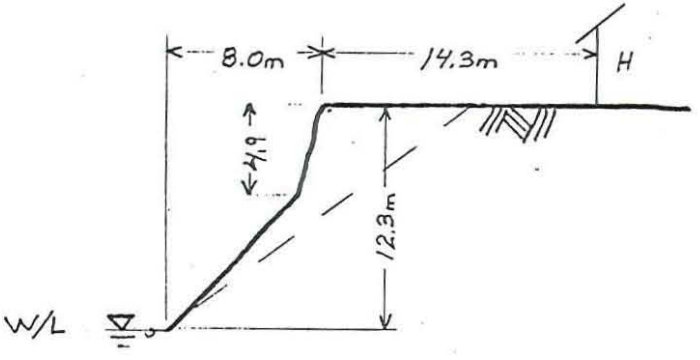
Province of British Columbia Ministry of Environment and Parks WATER MANAGEMENT BRANCH	TO ACCOMPANY REPORT ON Nechako R. Bank Erosion	SCALE: VERT. 0 10m HOR. 0 10m DATE June 27, 1997 ENGINEER FILE No. DWG. No.



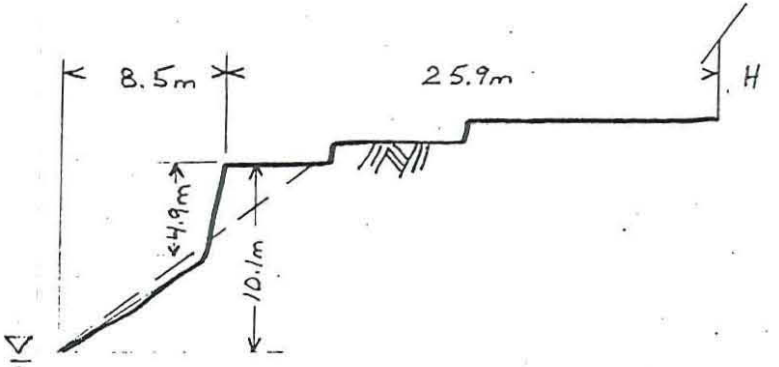
Lot 2
Plan 18805 s.22



Blk D - s.22



Lot 3
Plan 18805 - s.22

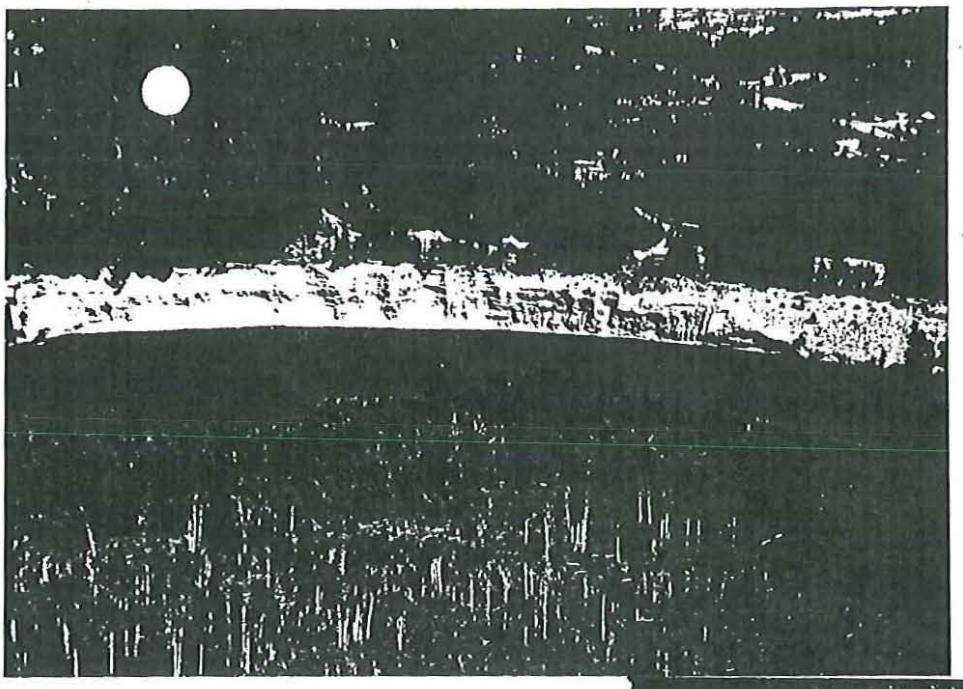


Lot 4
Plan 18805 - s.22

Note! Dashed line represents a potential 37° slope

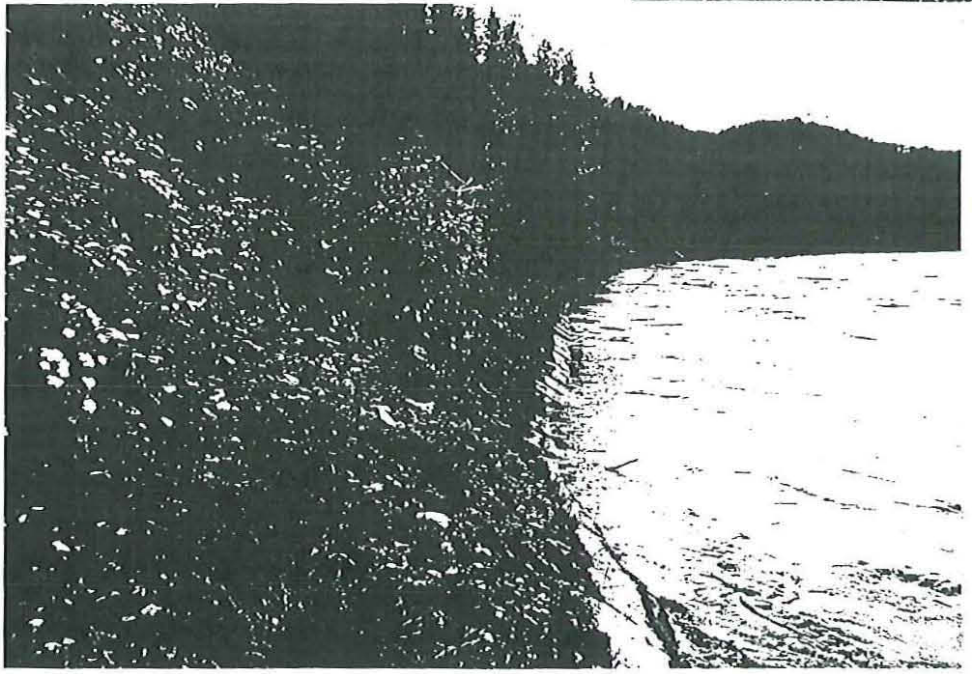
District Lot 4204

Province of British Columbia Ministry of Environment and Parks WATER MANAGEMENT BRANCH	TO ACCOMPANY REPORT ON Nechako R Bank Erosion	SCALE: VERT. 0 10m HOR. DATE: June 27, 1997 ENGINEER FILE No. DWG. No.



Bergman Rd/Dargie Place

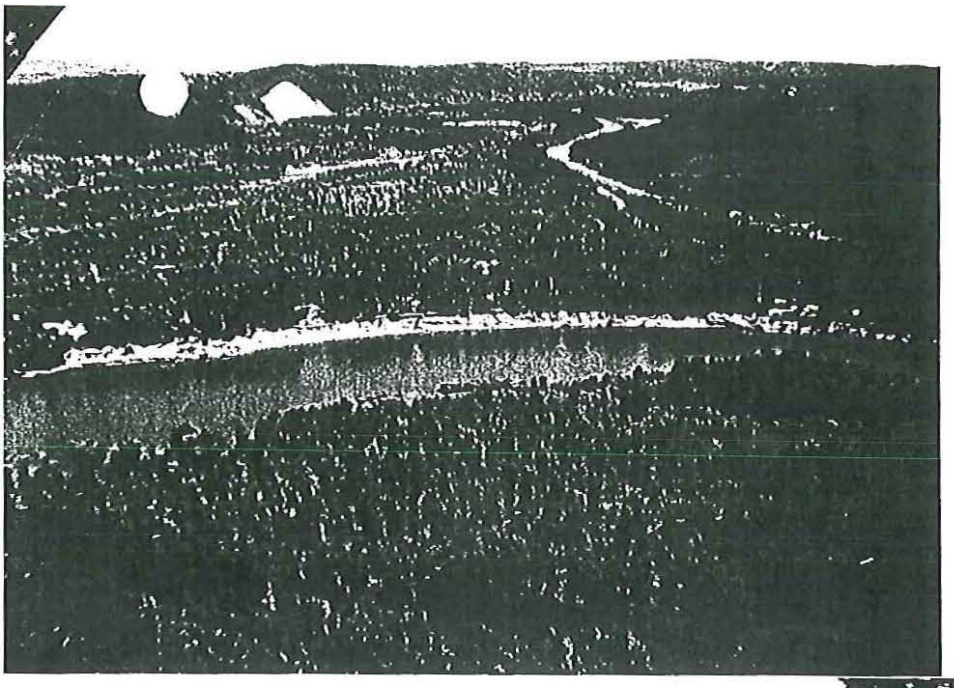
s.22 Property with
s.22 property in background
Island Park Drive



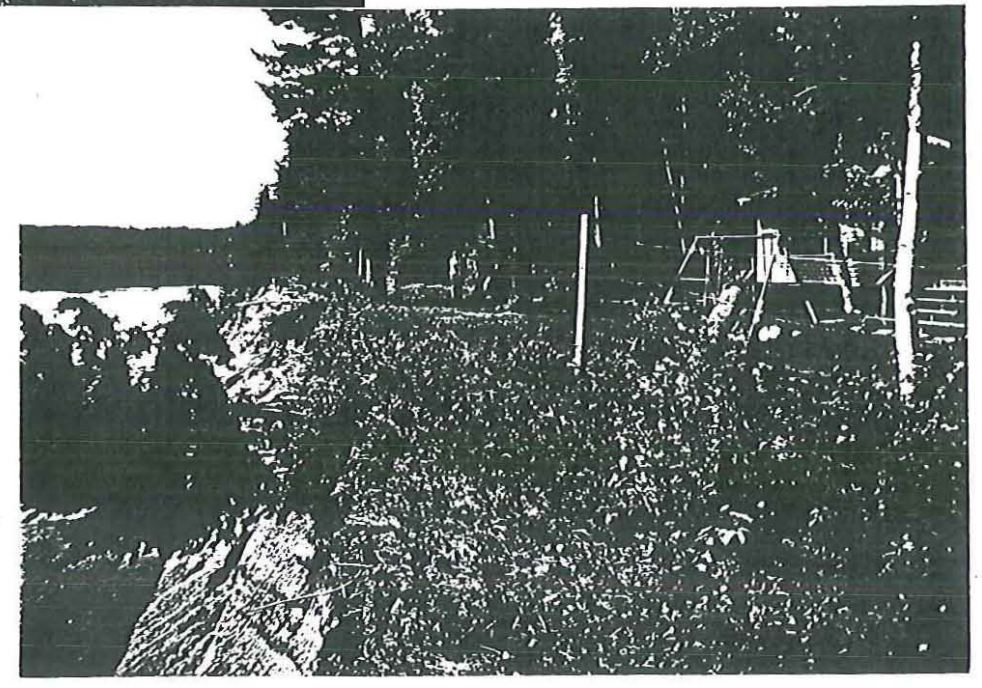
s.22 Property
Island Park Drive

Note Concrete bank protection

Photo Date: June 27, 1997



Island Park Drive
Miworth



s.22 Property
Island Park Drive

s.22 Property
Bergman Road

Photo date : June 27, 1997

MINISTRY OF ENVIRONMENT, LANDS & PARKS

WATER MANAGEMENT BRANCH
2nd Floor - 765 Broughton Street
Victoria, British Columbia
V8V 1X4

FAX TRANSMISSION

from

FAX (250) 387-1898

TO: Glen DAVIDSON FAX NO: _____

FROM: Don Finlay TEL NO. 387-9537

Re: Glen

As Promised, here is info on House Moving. The 1985 prices must be multiplied by approx. 1.25 to get 1997 prices.

Your Photographs are now being made into slides. Bob CAMERON will send you back the originals, as I

s.22

Sorry for the delay.

Don F

No. of Pages (including this one): 8
Date: July 23/97

File No. P78-44

FORM OF TENDER
AND
WORK AGREEMENT

PROJECT: s.22 et al, Flood Reduction

s.22 Houses
Move and Raise to Flood Construction Elevation

s.22 House
Raise to Flood Construction Elevation

In consideration of payments hereinafter stipulated, I/We, the undersigned, having examined all documents and having visited the sites, do hereby agree to perform and execute on behalf of and for:

s.22
hereinafter referred to as the Owners

the following work(s):

a) Raise and move the s.22 house at

b) Raise and move the s.22 house at S22

c) Raise the s.22 house at S22

all as indicated on the attached Willis, Cunliffe Tait/Delcan dwg. nos. 35-1639-1/35, 1 (Rev. B) and 2 (Rev. B), 35-1639-2/35, 1 (Rev. B), 2 (Rev. B) and 3, 35-1639-3/35, 1 (Rev. A) and 2 (Rev. A) and Water Management Branch dwg. no. 85-8-1,

and as described on the attached Appendices A, B and C,

and/or as directed.

I/We further understand and agree to the following specific conditions which are to apply throughout the period of this agreement:

1. All the necessary tools, equipment, supplies and personnel required to complete the above works within the allotted time shall be supplied by the contractor.

2. The contractor shall keep himself fully informed of and shall comply with all the applicable municipal, provincial and federal legislation and regulations, including requirements of the Workers' Compensation Board and the Building Department, Regional District of Fraser-Cheam.

3. In particular, all operations shall be carried out subject to the provisions of the Forest Act, Water Act and Fisheries Act and regulations pursuant thereto. Amongst other things, the contractor shall be responsible for maintaining such fire prevention equipment and personnel as may be required.

... 2

4. All work is to be confined to the area or areas as shown on the drawings and/or defined by the Director, Water Management Branch or his duly appointed representative (hereafter referred to as the Director).

5. All work shall be carried out and completed to the satisfaction of the Director.

6. Construction or work shall be completed within six (6) weeks after all approvals are granted but, in any event, not later than August 18, 1985.

7. The contractor shall indemnify and save harmless the Owners and the Crown from and against all losses, claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or received by reason of any act or omission of the said contractor, his agents, sub-contractors, or employees in the execution of the work. The contractor is required to carry adequate liability insurance, proof of which should be furnished upon request by the Owners.

8. Subject to all the conditions of this agreement, payment will be made to the contractor in accordance with the following schedule of bid prices:

Work	Bid Price
a) Raise and move the s.22 house	$ 36,288.00
b) Raise and move the s.22 house	$ 32,207.00
c) Raise the s.22 house	$ 23,172.00
as described elsewhere in this agreement and in the attached Appendices A, B and C	
Total lump sum bid and contract price	$ 91,667.00

9. The Owners agree to pay the contractor for fifteen (15) percent of the cost of the work(s), upon completion and approval of such work(s) by the Director and to place a further ten (10) percent of the cost of the work(s) in a trust account, as a holdback required under the Builders Lien Act, to be released to the contractor on the fourty-first (41) day after completion and after the obligations under Clause 10 have been fulfilled.

Payment of the remaining seventy-five (75) percent of the cost of the work(s) shall be made directly to the contractor by the Water Management Branch after the contractor has submitted a signed, itemized invoice certifying that the Owners' fifteen (15) percent shares have been received and the Owners' ten (10) percent shares have been placed in trust. Invoice(s) should be submitted to:

Director, Water Management Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X5
Attention: Mr. B. McMullen, P. Eng.

10. After completion of the works under this Contract and the payment of all obligations resulting from it, the Contractor shall submit to the Owners a Statutory Declaration, as required under the Builders Lien Act, that all assessments for Workers' Compensation, Unemployment Insurance, equipment charges, and wages connected with the contract have been made and there is no outstanding lien or claim.

11. In the event of failure by the contractor to comply with the regulations and instructions outlined in or authorized by this agreement, the Owners reserve the right to cancel this agreement; in which case payment for work completed prior to termination shall be made on the basis of the difference between the bid prices and the cost of completing the work covered by this agreement.

12. In the event of previously unforeseen circumstances, the Owners reserve the right to terminate this agreement at any time without claim other than for expenses incurred under the terms of the agreement up to and inclusive of the date of such termination.

13. The contractor shall not, without first obtaining the written consent of the Owners and the Director, make any assignment or award of any sub-contract for the execution of work under this agreement.

14. The contractor shall ensure that all rights-of-way, access, approvals, and building permits have been obtained prior to commencing any aspect of construction work.

15. This tender shall form a work agreement only if accepted by the Owners and approved by the Director, Water Management Branch within thirty (30) days from date of tendering. The lowest nor any other bid need not necessarily be accepted.

(4)

Tendered at:

Regional District - Fraser-Cheamthis 2nd day of July, 1985.

VOTHAW BUILDERS LTD

Signature of Contractor

Signature of Witness

46685 Fraser Ave., Chilliwack, B.C.
Address of Contractor

1578 Walnut Pl. Victoria B.C.
Address of Witness

Firm No. 96128-141 Class 0706 00
Workers' Compensation Board

PROPOSED EQUIPMENT	YEAR	MODEL	SERIAL NO.

Accepted:

S22

Approved:

Date

APPENDIX A

General Requirements for

Raising and Moving the s.22 House Located at S22

1. Construct new foundation for house (as per plans).
2. Prepare to move house:
   a) Disconnect services (electrical, plumbing, water, downpipes, heating, etc.) as required;
   b) Support or dismantle fireplace as required.
3. Raise house, move to, place on, and connect to new foundation.
4. Rebuild fireplace, if dismantled, and repair walls and roof as required.
5. Connect services (electrical, sewer, water, heating, downpipes, etc.) as required.
6. Provide sufficient and safe temporary access to the dwelling in accordance with the Building Department requirements - Regional District of Fraser-Cheam.
7. Restore house to pre-move conditions (as required):
   a) Repair all exterior damage;
   b) Repair all cracks in interior walls and ceiling;
   c) Paint exterior and interior.

Note: At the discretion of the contractor, the house may be moved to the new site before the construction of the foundation.

APPENDIX B

General Requirements For

Raising and Moving the s.22 House, located at S22

1. Construct new foundation for house and carport (as per plans).

2. Prepare to move house and attached carport.

   a) Disconnect services (electrical, plumbing, water, downpipes, etc.) as required.
   b) Brace carport and/or separate from house as required.
   c) Support fireplace as required.

3. Raise house and carport, move to, place on, and connect to new foundation.

4. Reconnect carport to house, if moved separately, and repair siding and roof as required.

5. Connect services (electrical, sewer, water, downpipes, etc.) as required.

6. Provide sufficient and safe temporary access to the dwelling in accordance with the Building Department requirements - Regional District of Fraser-Cheam.

7. Restore house and carport to pre-move conditions (as required):

   a) Repair all exterior damage;
   b) Repair all cracks in interior walls and ceilings;
   c) Paint exterior and interior.

Note: At the discretion of the contractor, the house and carport may be moved to the new site before the construction of the foundation.

APPENDIX C

General Requirements For

Raising the s.22 house located at S22

1. Prepare to raise house and adjacent building.

   a) Disconnect services (electrical, plumbing, downpipes, water, heating, etc.) as required
   b) Remove patio roofs and supports
   c) Remove trees and shrubs as required for access

2. Raise house and adjacent building and support as required.

3. Extend existing foundation and construct new foundation (as per plans).

4. Lower house and adjacent building onto, and connect to, new foundations.

5. Connect services (electrical, sewer, water, heating, downpipes, etc.) as required.

6. Provide sufficient and safe temporary access to the dwellings in accordance with the Building Department requirements - Regional District of Fraser-Cheam.

7. Restore house and attached building to pre-move conditions (as required):

   a) Repair all cracked exterior stucco and other damage;
   b) Repair all cracks in interior walls and ceilings;
   c) Paint exterior and interior.

BRITISH COLUMBIA

File No.:

July 25, 1997

Distribution List

Re: Nechako River Erosion

Enclosed for your attention is a portion of a Ministry of Environment, Lands and Parks produced Nechako River Erosion Near Prince George Interim Report.

All problems identified in the report appear to be long-term as the river bank erosion has occurred over many years. However, unsafe conditions may now exist and the report indicates people are potentially at risk.

It is requested you advise those potentially at risk - as identified in the report - within your jurisdictional area. The Ministry of Environment, Lands and Parks has been requested to advise you directly of any relevant changes as they continue their investigation of the erosion problems.

Yours truly,

A.J. (Tony) Heemskerk
Director

RGJ/rb

Enclosure: MELP Report

Ministry of Attorney General

Provincial Emergency Program

Mailing Address:
PO Box 9201 Stn Prov Govt
Victoria BC V8W 9J1
Telephone: (250) 387-5956
Facsimile: (250) 952-4888

Location:
455 Boleskine Road
Victoria

Province of British Columbia

Provincial Emergency Program

To Glen Davidson:

For your information

With the Compliments of

Ron Johnson

SHARING THE RESPONSIBILITY Emergency Preparedness

INCORPORATED A.D. 1915

CITY OF PRINCE GEORGE
"B.C.'s NORTHERN CAPITAL"
1100 PATRICIA BOULEVARD, PRINCE GEORGE, B.C. V2L 3V9
TELEPHONE: (604) 561-7600 • FAX (604) 561-0183

September 15, 1997

A.J. (Tony) Heemskerk, Director
Provincial Emergency Program
PO Box 9201 Stn Prov Govt
Victoria, B.C.
V8W 9J1

Dear Sir:

Nechako River Erosion

Your letter of July 25, 1997 to George Paul concerning Cottonwood Island /Nechako River Trail System (Prince George) and Aspen Lane (Prince George) - s.22 Property was referred to me.

The City of Prince George will be submitting a claim regarding Cottonwood Island/Nechako River Trail System.

The City Engineer has visited the s.22 property and has spoken with the owner. The City considers erosion of the s.22 property to be a private property matter and therefore, not the responsibility of the City.

Yours truly,
CITY OF PRINCE GEORGE

R. Whitwham

Rob Whitwham
Director of Administrative Services

cc: George Paul, City Manager
Gary Champagne, Director, Public Works
Tom Madden, Director, Leisure Services

BRITISH COLUMBIA Ministry of Environment, Lands and Parks

Water Management Branch
2-765 Broughton Street
Victoria, BC V8V 1X4

FAX COVER SHEET

Date: July 16/97 Time:

To: Glen DAVIDSON	Telephone:
	FAX:
From: Don Finlay	Telephone: 387-9537
	FAX: 387-1898

Number of pages including cover sheet 2

MESSAGE:

Glen - sorry for the delay in getting this to you

Hope it helps

Any questions - please phone

Don F

* Glen - note corrections to previously sent sheet. Thanks

Nechako RIVER

UNIT COST DETERMINATION

1. Cost at pit as indicated by owner $14.00/cubic metre but I suspect in order to obtain the sizes we need, twice as much rock would have to be blasted (i.e. 50% waste) making the unit cost **$28.00** per cubic metre (includes pit development, blasting, and sorting).

2. Using an estimate of 40 minutes per load round trip time and loading time of 6 minutes:
   - require 6.67 trucks (see chart 1). i.e. start with 6 trucks and add the 7th when the haul distance increases
   - 10 loads per hour (see chart 2)
   - 63 cubic metres per hour (see chart 6)
   - $600.60 per hour (see chart 7)
   - **$9.53** per cubic metre (see chart 8)

3. Placement using an excavator (average cost per hour $155.25) and 63 cubic metres of riprap delivered per hour = **$2.46** per cubic metre

4. **Total: $28.00 + $9.53 + $2.46 = $40.00 per cubic metre.**

Note: A contingency factor and an allowance for access development is not included in the unit cost estimate.

DRF

D. Finlay
Deputy Inspector of Dykes

Drf 1/07/97

BRITISH COLUMBIA

File: 76800-20
Vanderhoof Nechako River

April 14, 1998

addressee

Dear Sirs::

Re: Request for Proposal for Engineering Services - Nechako River Erosion Study

Further to our recent discussion, the Land & Water Branch, Ministry of Environment, Lands and Parks invites your proposal to undertake studies and prepare a report assessing erosion conditions at 3 selected locations along the Nechako River near Prince George.

The locations of the project together with general requirements and specifications are contained in attachment A. A preliminary study along with river survey data is available from the Land & Water Branch for the project.

You are requested to submit a proposal including:

1. A description of the components of work. The anticipated final completion date is June 30, 1998

2. The names, resumes and compensation rates of the principal, specialist(s) and design personnel who will be assigned to the project, including any sub-consultants which may be required. Details of previous experience to be made available only on request.

3. A listing of any recommended revisions and/or additions to the services and requirements set out in Attachment "A".

4. A total project cost based on two parts:

    - a fee based on hours worked times and all inclusive hourly rate (rate quoted would include the cost of computer and any other equipment required to perform the work), and,
    - expenses (i.e. travel costs, etc.)

The contract price would be the price quoted which should not exceed fees plus expenses. The consultant would be expected to sign a BC Government Service Contract (General) with the Lands and Water Branch, Ministry of Environment, Lands and Parks, Omineca-Peace Region.

. . . /2

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
325 - 1011 Fourth Avenue
PRINCE GEORGE BC V2L 3H9
Telephone: (250) 565-6155
Facsimile: (250) 565-6629

Proposals shall be assessed including the following aspects:

- quality of submission;
- understanding of the scope of the project;
- capability and experience of the proposed Project manager;
- capability and experience of the firm;
- in-house staff resources;
- performance of similar work on past jobs;
- local knowledge;
- time to complete;
- estimated fee.

If the proposal is accepted by the Ministry, a standard contract agreement will be signed authorizing expenditures up to the amount determined in item 4. above, or as otherwise agreed; and noting the mutually agreed date for the completion of services by the consultant.

A copy of the proposal shall reach this office by 4:00 PM, April 30, 1998, for the attention of Glen Davidson.

If you require additional information or have any questions, please contact the undersigned at (250) 565-6436.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region

GD/ha

ATTACHMENT "A"

TERMS OF REFERENCE

Background

A series of ice jams during the winter of 96/97 followed by large spring freshet flows resulted in considerable scour and erosion along the lower reaches of the Nechako River. As a result a number of properties were damaged and several homes now remain at risk of damage from further erosion or bank failure. A preliminary investigation was conducted by Water Management Branch staff which identifies the problem sites along with initial surveys of the affected areas. An investigation is now required to assess the risk of each structure, and evaluate the options for remediation along with cost estimates for each potential solution. This report will provide risk assessment and remediation options for the affected residents and will provide guidance for any possible financial assistance programs offered by the province.

Scope of Work

1. The three selected sites include:
   a) Aspen Lane (lot 1, Pl. 9955, Lot 3 Pl. 10589, Lots 10, 11, Pl. 1454, Cariboo Land District) District Lot 3050
   b) Island Park Drive (Lots 1 to 6, Pl 18805, Cariboo Land District) District Lot 4204
   c) Dargie Place/Bergman Road (Lots A & B, Pl 19898, Lots 2,3, Pl 31993, Lots 7,8,10 Plan 17313, Cariboo Land District) District Lot 2165
2. Review historic data, existing surveys and preliminary investigations.
3. Conduct additional surveys and geotechnical investigations of the affected areas.
4. Prepare a risk assessment of the affected structures based on the present slope conditions at the sites, and possible futures erosion rates.
5. Provide a description of river erosion patterns, along with some discussion of anticipated future trends as they relate to the affect sites.
6. Recommend minimum setback requirements for future housing construction and in-ground sewage disposal systems at the selected sites.
7. Develop mitigative options for the affected structures and sewage disposal systems (where required), including; structure relocation (on existing property), erosion protection works (revetment) and the possible effects of no mitigation.
8. Provide preliminary cost estimates for each option along with discussion and recomendations for the best alternative.

Time Frame

A draft report (2 copies) should be provided to the Ministry of Environment, Lands and Parks two weeks prior to the final date of completion of this project which is June 30, 1988, at which time 20 copies of the final report shall be submitted.

Additional Information

The Ministry Shall:

1. Provide on a loan basis background information, including:
   a) Interim Report - Nechako River Erosion Near Prince George, June 30, 1997
   b) preliminary survey data
   c) river survey data (Aspen Lane site only)
   d) air photo (as available)

2. Advise on Ministry policy as required.

3. Review the draft report and provide comments within five (5) working days.

4. Meet with the consultant in his office to discuss interim progress and transmit materials.

The Ministry will contact affected property owners and arrange for access to the specific properties.

ATTACHMENT "A"

TERMS OF REFERENCE

Background

A series of ice jams during the winter of 96/97 followed by large spring freshet flows resulted in considerable scour and erosion along the lower reaches of the Nechako River. As a result a number of properties were impacted and several homes now remain at risk of damage from further erosion or bank failure. A preliminary investigation was conducted by Lands and Water Management staff which identifies the problem sites along with initial surveys of the affected areas. An investigation is now required to assess the risk of individual structures and properties, and evaluate the options for remediation along with cost estimates for each potential solution. This report will provide risk assessment and remediation options for the affected residents along with guidance for any possible financial assistance programs offered by the Province.

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0145 - E1

City of Prince George,
Public Works Department
Engineering Division
505 - 4th Avenue
PRINCE GEORGE, BC V2L 3H9
Ph: (250)561-7500 Fax: 561-7502

facsimile transmittal

To: GLEN DAVIDSON Fax: 565-6629

From: DWAYNE HALLDARSON Date: APR. 15/98

Re: Nechako Erosion Study Pages: 1

CC:

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Notes: Glen:

Based on our telephone discussion of the objectives of the study, I think your terms of reference are good.

One item we didn't talk about which I'm not sure you thought of is the flooding of our water pump station in [redacted] Wilson Park (PW601) A review of that property would be helpful if it could be included in your terms of reference.

Thanks

Dwayne.

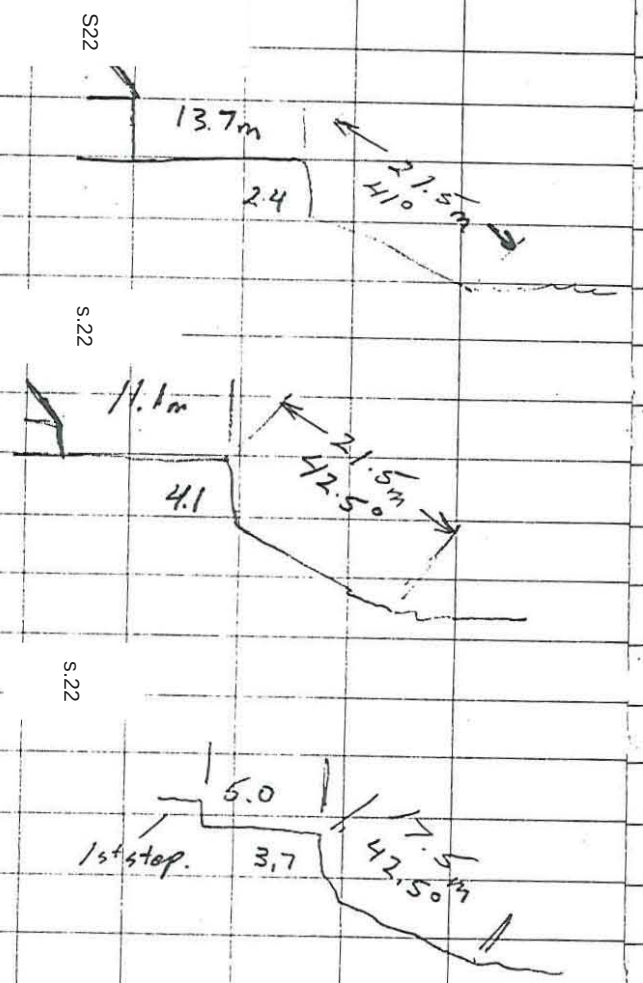
CONFIDENTIAL

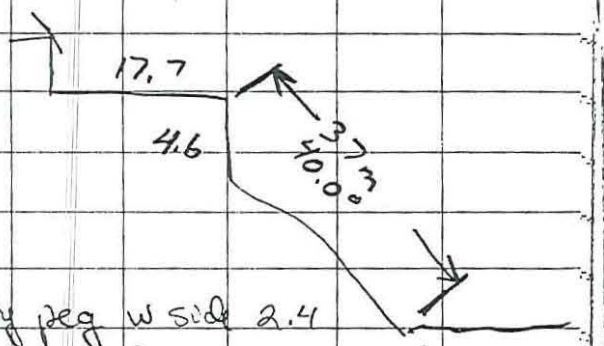
LL + GD

Nechako River Erosion

Oct 20/97

#13395 House with Rock Chimney.





Notes

- property peg w side 2.4
- peg 6.7 m from 3rd steel fence post

LL
GD
EW.

Aspenlane Nov. 6/97

1997 Nechako River Erosion Surveys

		Apr 9	June 27	Jul 7	Jul 21
Aspen Lane	[redacted]				
–	s.22	13.7	12.5	12.45	
Island Park Dr					
–			25.9	25.4	25.4
–	s.22		14.3	12.5	11.4
–			16.3	16.4	14.6
Bergman Rd					
–			21.0		
–	s.22			20.5	
–			35.4		

BRITISH COLUMBIA

File: 76800-20
Vander/Nechako River

April 16, 1998

Howie Christensen
Agra Earth & Environmental
610 Richard Road
Prince George, BC V2K 4L3

Dear Howie:

Re: Request for Proposal for Engineering Services - Nechako River Erosion Study

Further to our recent discussion, the Land & Water Branch, Ministry of Environment, Lands and Parks invites your proposal to undertake investigations and prepare a report assessing erosion conditions at 3 selected locations along the Nechako River near Prince George.

The locations of the project together with general requirements and specifications are contained in attachment A. A preliminary report along with some river survey data has also been included.

You are requested to submit a proposal including:

1. A description of the components of work with the anticipated final completion date of June 30, 1998

2. The names, resumes and compensation rates of the principal, specialist(s) and design personnel who will be assigned to the project, including any sub-consultants which may be required. Details of previous experience to be made available only on request.

3. A listing of any recommended revisions and/or additions to the services and requirements set out in Attachment "A".

4. A total project cost based on two parts:

   - a fee based on hours worked times and all inclusive hourly rate (rate quoted would include the cost of computer and any other equipment required to perform the work), and,
   - expenses (i.e. travel costs, etc.)

The contract price would be the price quoted which should not exceed fees plus expenses. The consultant would be expected to sign a BC Government Service Contract (General) with

. . . /2

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
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PRINCE GEORGE BC V2L 3H9
Telephone: (250) 565-6155
Facsimile: (250) 565-6629

the Lands and Water Branch, Ministry of Environment, Lands and Parks, Omineca-Peace Region.

Proposals shall be assessed including the following aspects:

- quality of submission;
- understanding of the scope of the project;
- capability and experience of the proposed Project manager;
- capability and experience of the firm;
- in-house staff resources;
- performance of similar work on past jobs;
- local knowledge;
- time to complete;
- estimated fee.

If the proposal is accepted by the Ministry, a standard contract agreement will be signed authorizing expenditures up to the amount determined in item 4. above, or as otherwise agreed; and noting the mutually agreed date for the completion of services by the consultant.

A copy of the proposal shall reach this office by 4:00 PM, April 30, 1998, for the attention of Glen Davidson.

If you require additional information or have any questions, please contact the undersigned at (250) 565-6436.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region

GD/ha

ATTACHMENT "A"

TERMS OF REFERENCE

Background

A series of ice jams during the winter of 96/97 followed by large spring freshet flows resulted in considerable scour and erosion along the lower reaches of the Nechako River. As a result a number of properties were impacted and several homes now remain at risk of damage from further erosion or bank failure. A preliminary investigation was conducted by Lands and Water Management staff which identifies the problem sites along with initial surveys of the affected areas. An investigation is now required to assess the risk of individual structures and properties, and evaluate the options for remediation along with cost estimates for each potential solution. This report will provide risk assessment and remediation options for the affected residents along with guidance for any possible financial assistance programs offered by the Province.

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2. Advise on Ministry policy as required.

3. Review the draft report and provide comments within five (5) working days.

4. Meet with the consultant in his office to discuss interim progress and transmit materials.

5. Contact affected property owners and arrange for access to the properties.

BRITISH COLUMBIA

File: 76800-20
Vander/Nechako River

April 16, 1998

Dave McDougall
GeoNorth Engineering Ltd.
302 -1777 3rd Avenue
Prince George, B.C. V2L 3G7

Dear Dave:

Re: Request for Proposal for Engineering Services - Nechako River Erosion Study

Further to our recent discussion, the Land & Water Branch, Ministry of Environment, Lands and Parks invites your proposal to undertake investigations and prepare a report assessing erosion conditions at 3 selected locations along the Nechako River near Prince George.

The locations of the project together with general requirements and specifications are contained in attachment A. A preliminary report along with some river survey data has also been included.

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Environment and Lands
Omineca-Peace Region
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PRINCE GEORGE BC V2L 3H9
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the Lands and Water Branch, Ministry of Environment, Lands and Parks, Omineca-Peace Region.

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If you require additional information or have any questions, please contact the undersigned at (250) 565-6436.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region

GD/ha

ATTACHMENT "A"

TERMS OF REFERENCE

Background

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   d) air photos (as available)

2. Advise on Ministry policy as required.

3. Review the draft report and provide comments within five (5) working days.

4. Meet with the consultant in his office to discuss interim progress and transmit materials.

5. Contact affected property owners and arrange for access to the properties.

GEONORTH ENGINEERING LTD.

302 - 1777 Third Avenue
Prince George, B.C., V2L 3G7
Phone (250) 564-4304
Fax (250) 564-9323
E-mail geonorth@mag-net.com

April 30, 1998

B.C. Ministry of Environment, Lands and Parks
325 - 1011 Fourth Avenue
Prince George, BC V2L 3H9

Attention: Mr. Glen Davidson, P.Eng.

Dear Sirs:

RE: Nechako River Erosion Study

Introduction

We are pleased to submit this proposal to provide engineering services to investigate and assess erosion conditions along the Nechako River, as outlined in your request for proposal dated April 16, 1998. Your interim report dated June 30, 1997 provides background to the three sites to be addressed by this study: Bergman Road and Island Park Drive, both in Miworth, and Aspen Lane in Prince George.

The objective of this study is to assess the risk to each of 17 properties, review remediation options and their cost, and discuss erosion patterns and anticipated future trends.

In the approximately 20 years prior to 1997, the rate of bank erosion along the Nechako River has been very slow. Construction of the Kenney Dam in 1952 by Alcan on an upper reach of the Nechako River has helped to attenuate annual peak flows. Water Survey of Canada has recorded the Nechako River flow at Isle Pierre since 1950. The data show that peak flows in the period between 1977 and 1996 did not exceed 650 m^3/s. During three of the nine previous years, between 1968 in 1976, the flow exceeded 650 m^3/s. Two of those events exceeded 1,000 m^3/s. Overall, the 20 years prior to 1997 have produced uneventful flows with very low erosion rates, allowing some vegetation to become established on the river bank.

I have visited several of the properties and agree that the bank is undermined and unstable at some locations. Several buildings will be at risk of damage by an erosion event similar to that of 1997. We believe we can assist you by assessing this risk, developing feasible remedial actions and providing preliminary cost estimates.

Company Background

GeoNorth Engineering Ltd. was formed on January 1, 1997 to purchase the assets and continue providing consulting services to clients of R. E. Graham Engineering Ltd. We specialize in soil related issues and have extensive experience with slope stability assessments and soil erosion control. We also offer river engineering services, particularly as they relate to peak flow estimates and bank protection. GeoNorth Engineering Ltd. successfully completed over 400 projects during 1997, of which about 50 include the calculation of design flow, stage and velocity, as well as specifications for erosion control measures.

We recently provided design, tender, contract administration and construction review services to Northwood Pulp and Timber Limited for revetment of about 220 m of Fraser River at their Prince George Sawmill. The project was completed within the allocated budget and on schedule. Other projects, including those carried out by R.E. Graham Engineering Ltd., are an evaluation of Akie River erosion at a bridge crossing north of Mackenzie, B.C., assessment of erosion and sedimentation patterns of Dragon Creek in Quesnel, followed by an evaluation of set back from the bank crest to address slope stability concerns, as well as more than 200 bridge and culvert crossings. We can provide a list of projects and clients at your request.

We propose to have Garry Hollingshead, Ph.D., P.Eng. act as project engineer. Garry joined Graham Engineering in 1994 and has 25 years of consulting engineering experience. His background includes four years as manager of river engineering aspects of the proposed Canadian Arctic Gas Study Ltd. pipe line, which included design of over 600 river crossings from Prudhoe Bay, Alaska, along the McKenzie River corridor to southern Canada. Dave McDougall, M.Eng., P.Eng. will provide project review. Dave has worked as a consulting engineer in northern B.C. since 1981 and has carried out several assessments of large bridge crossings, including HEC-2 analysis to model stream flow characteristics. Their resumes and a summary of the company background are attached.

We propose to subcontract site survey work to Greg Crough of Foresight Survey and Design Ltd. Greg has over 15 years of survey, layout, construction review and drafting experience.

To prepare accurate cost estimates for house moving and revetment construction, we will obtain estimates from contractors who are directly involved with that type of work.

Methods

To carry out the assessments we propose the following work program:

1. Review historic data, existing surveys, preliminary investigations and soil conditions exposed on the eroded slopes.

2. Conduct a survey using EDM equipment to determine existing slope shape and locate houses, septic fields, property pins, and existing high water marks.

3. Prepare topographic site plans and cross sections to determine slope geometry for the properties identified in the request for proposal.

4. Assess the stability of the river bank and the risk to houses.

5. Inspect historical air photos, assess and discuss erosion trends and anticipated future erosion rates. Our risk assessment will relate the gradation of observed bed and lower bank soils to the stage and velocity necessary to initiate erosion. The combination of critical duration for such flows and their return period will establish risk of significant further erosion, bank failure and potential for damage to structures.

6. Provide set back recommendations to accommodate existing conditions and anticipated erosion rates.

7. Design and cost mitigative options for those properties at greatest risk. This will include cost estimates to move several of the houses and possibly their septic fields, as well as estimates to protect the banks with revetment or alternative protection.

8. Discuss the effects of no mitigation work.

Cost Estimate

The following estimate is intended to be a maximum, not be exceeded unless conditions change, and then not without your prior approval. Our charges will be for the actual time and disbursements required to complete the work. A summary of applicable rates is attached.

Field Work		
Sr. Engineer, 8 hrs @ $95/hr	$ 760	
Site Survey, by Foresight Survey and Design Ltd., copy of proposal attached,	1,600	
Handling, 10%	160	
Cost estimates by Contractors: Beler Structural Movers Ltd. and Northern Building Movers, allow	$1,200	
		$3,720

Laboratory Testing		
Sieve Analyses, 3 @ $110 ea.	$ 330	
		$ 330
Office Work		
Analysis, Discussions, Report Preparation,		
Sr. Engineer, 24 hrs @ $95/hr	$2,280	
Review Engineer, 4 hrs @ $95/hr	380	
Drafting, 30 hrs @ $58/hr	1,740	
Clerical, 12 hrs @ $40/hr	480	
Disbursements: photos, colour photocopies, courier, allow,	50	
		$4,930
		$8,980
Miscellaneous & Contingencies, 10%		$ 898
Total (not including G.S.T.)		$9,878

We look forward to working on the project and can carry out the work within the schedule specified in the request for proposal. Please call me or Garry Hollingshead if you have any questions or if you would like anything discussed in more detail.

Yours truly,
GeoNorth Engineering Ltd.

Per: D.J. McDougall, M.Eng., P.Eng.
DJM/pm

GeoNorth Engineering Ltd.

302 - 1777 Third Avenue
Prince George, B.C., V2L 3G7
Phone (250) 564-4304
Fax (250) 564-9323
E-mail geonorth@mag-net.com

COMPANY BACKGROUND

GeoNorth Engineering Ltd. was formed on January 1, 1997 by David J. McDougall, M.Eng., P.Eng., to purchase the assets of R.E. Graham Engineering Ltd. David McDougall has worked as a geotechnical engineering consultant in central and northern British Columbia since 1981, and joined R.E. Graham Engineering Ltd. in 1986. R.E. Graham Engineering Ltd. was established in 1982 by Robert E. Graham, P.Eng., who has provided geotechnical engineering services to central and northern British Columbia since 1962. Robert Graham will continue working on several specific projects and will be a subconsultant to GeoNorth Engineering Ltd.

SERVICES PROVIDED

GeoNorth Engineering Ltd. specializes in soil related issues: foundations, soil mechanics, slope stability, groundwater, materials search and aerial photo terrain interpretation. Other services include surface water hydrology, and construction inspection and testing. Company personnel have provided consulting services to a large number of subdivision, industrial, institutional and commercial projects. The company works with several affiliated firms to provide a broad range of geoscience consulting and materials testing services. The geographical area served by the company extends approximately from 100 Mile House north to the Yukon border and from the Queen Charlotte Islands east into northwestern Alberta.

Since the introduction of the B.C. Forest Practices Code, the company has provided services to both forest licensees and Ministry of Forests to assist in compliance with the Code and in managing aspects of harvesting and road design, construction and deactivation in difficult, steep terrain. The company works with civil and structural engineers, and geomorphologists to meet all aspects of design and code requirements.

Computer capabilities include AutoCad (vers. 14), Softdesk and EDS packages (for digital terrain modelling), WordPerfect, G-Slope (slope stability assessment), WEAP (driven pile analysis), HEC-1 and 2 (hydrology), Lotus 123, Quatro and Microsoft Office Pro (Word, Excel, Access, Power Point).

PROJECTS

Since 1982, R.E. Graham Engineering Ltd. completed more than 1,400 projects in central and northern B.C., in which David McDougall and the staff of GeoNorth Engineering Ltd. have played a large part. In addition, GeoNorth Engineering Ltd. has completed approximately 300 projects. Clients include all levels of government and types of industry. Lists of projects and clients related to specific types of experience are available on request.

Pages 76 through 79 redacted for the following reasons:
- -
s.22

HOURLY RATES AND DISBURSEMENT CHARGES

Hourly Rates

Review Engineer	$95/hr
Senior Engineer	$95/hr
Intermediate Engineer	$75/hr
Junior Engineer	$65/hr
Technologist	$57/hr
Technician	$44/hr
Drafting	$58/hr
Clerical	$40/hr

Disbursements

Vehicle	$0.40/km
Meals & Accommodation	$100/night
Photographs	$1.25 each
Other disbursements	Cost + 10%

Other disbursements include drilling and excavation costs, travel expenses, equipment rentals, shipping, and colour photocopies.

Rates for specific laboratory tests are available on request.

Terms

Accounts are payable on receipt. If unpaid within 30 days after the invoice date, interest at a rate of 2% per month (24% per annum) will be charged from the invoice date.

April 30, 1998

Foresight Survey and Design Ltd.
4673 Snowdrop Drive, Prince George, B.C. Canada V2K 3H8
Telephone: (250) 962-8211 • Fax: (250) 962-8231 • E-mail: foresite@netbistro.com

Estimate

Date: April 27, 1998

Client: Dave McDougall
GeoNorth Engineering Ltd.
302-1777 Third Ave.
Prince George, B.C. V2L 3G7

Project: Nechako River Erosion Study

From: Greg Crough
Foresight Survey and Design Ltd.
4673 - Snowdrop Drive
Prince George, B.C. V2K 3H8

Please except the following costs to complete the above project as discussed in my office April 24,1998. Note, the following estimate is not to be exceeded.

Unit		Detail	Unit Cost	Total
16.00	hour	Survey crew	$67.50	$1080.00
2.00	hour	Senior technician - download and fault lines.	$40.00	$80.00
2.00	day	Survey equipment	$110.00	$220.00
2.00	day	Vehicle	$30.00	$60.00
				$0.00
				$0.00
				$0.00
Sub Total				$1440.00
10% Contingency Fee				$144.00
TOTAL (Not including GST)				$1584.00

Please call me if you have any questions.

Thank you.

BRITISH COLUMBIA

File: 76800-20
Vanderhoof/Nechako River

August 5, 1998

Bob Kelly
Provincial Emergency Program
1541 S Ogilvie Street
PRINCE GEORGE, BC
V2N 1W7

Dear Bob:

Re: Nechako River Erosion near Prince George

As you are aware, the Ministry of Environment, Lands and Parks has been investigating erosion problems on the Nechako River following several high water events within the past few years. A local consultant was retained to investigate the problem at several locations along the river. This study is now complete and I enclose a copy for your review and consideration, along with a copy of the letter which was sent to the affected property owners (along with a copy of the report).

While the study concludes that none of the homes are presently unsafe, the consultant has identified six homes which may be at high risk if one or more high water events (similar to what occurred last year) were to occur in the future. I have spoken to a number of these homeowners; most are very concerned and some are considering remedial action such as relocating their homes.

While I do not believe that the provincial government has any legal obligation to offer financial assistance, it may be cost-effective for the province to enter into some type of cost-sharing arrangement with the homeowners at this time rather than waiting for them to qualify for disaster financial assistance in the future. I would like to discuss the options further with you and any possible assistance programs which may be funded through PEP. I would then be in a better position to provide cost estimates based on the work of this recent report.

Please contact me if you require any additional information or discussion.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region

/GD

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
325 - 1011 Fourth Avenue
PRINCE GEORGE BC V2L 3H9
Telephone: (250) 565-6436
Facsimile: (250) 565-6629

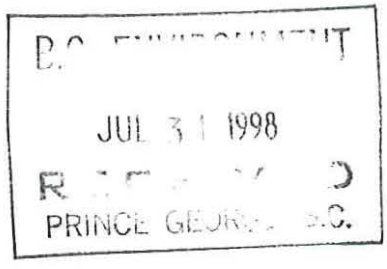
GEONORTH ENGINEERING LTD.

302 - 1777 Third Avenue
Prince George, B.C., V2L 3G7
Phone (250) 564-4304
Fax (250) 564-9323
E-mail geonorth@mag-net.com

July 31, 1998

Ministry of Environment, Lands and Parks
1011 Fourth Avenue
Prince George, B.C. V2L 3H9

File No. K-371



Attention: Mr. Glen Davidson, P.Eng.

Dear Sirs:

RE: NECHAKO RIVER BANK EROSION

Twenty copies of our geotechnical report on the above project are enclosed.

Please call me if you have any questions or if you would like additional copies of the report.

Yours truly,
GeoNorth Engineering Ltd.

Per: D.J. McDougall, M.Eng., P.Eng.
DJM/
Enclosures - 20

BRITISH COLUMBIA

FILE COPY

File: 76800-20
Vander/Nechako

May 13, 1998

«FirstName»
«Address1»
«City»

Dear «FirstName»:

Re: Nechako River Erosion Study

Several locations along the bank of the Nechako River near Prince George are actively eroding as a result of high water events in recent years. Your property has been identified by staff from the Ministry of Environment, Lands and Parks as an area where erosion may affect existing or future building construction.

As a result the Ministry has retained the services of a local engineering consultant, GeoNorth Engineering Ltd. to undertake an assessment of the present bank conditions and the potential for future erosion along these areas. Staff and contractors from GeoNorth may be in contact with you and may wish to access you property in order to complete this assessment. I ask for your co-operation in this regard.

I have attached a copy of the terms of reference for this study for your information. Once the study is complete, I will make a copy of the final report available to you.

Please feel free to contact me at (250) 565-6436 if you have any questions or would like any additional information.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region.

/GD
cc: Dwayne Halldorson, City of Prince George
Gordon Simmons, Fraser-Fort George Regional District

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
325 - 1011 Fourth Avenue
PRINCE GEORGE BC V2L 3H9
Telephone: (250) 565-6436
Facsimile: (250) 565-6629

s.22

PROPERTIES COVERED BY STUDY AREA IN REGIONAL DISTRICT							
District_lot	Plan_num	Lot	Lot_size	Owner_full_name	House_numb	Street_name	Phone
4204	18805	1	2.4			(vacant)	
4204	18805	2	2.24				
4204	18805	3	2.3				
4204	18805	4	2.25				
4204	18805	5	2.55				
4204	18805	6	2.2				
2165	19898	A	3.41	s.22	s.22		S22
2165	19898	B	5.09				
2165	31993	2	3.84				
2165	31993	3	4.25				
2165	17313	7	5.87				
2165	17313	8	5.95				
2165	17313	10	5.22				

ISLAND PARK DRIVE – V2M 7B7

DARGIE PLACE – odd - V2M 7C3
even

BERGMAN ROAD – V2M 7C2

– postal code does not exist anymore

– civic addresses have NEW postal codes now

RR#6, Stn. B

District, PID # 013-289-683

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26322.000	00

BULK MAIL

S22

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$114,400

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0090	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 1.03		S22420	257	1120	MATHIE RD

	CLASS	ACTUAL VALUE	DESCRIPTION	ASSESSED VALUES GENERAL	ASSESSED VALUES SCHOOL/OTHER
LAND	1	42,100	LAND	42,100	42,100
IMPRMTS	1	74,900	BUILDINGS	74,900	74,900
		117,000	TOTAL	117,000	117,000

Lot 1, Plan 9955, District Lot 3050, Cariboo Land District, PID # 003-667-928

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26323.000	00

BULK MAIL

S22

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$187,000

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0140	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 0.42		X7782	257	3658	ASPEN LANE

	CLASS	ACTUAL VALUE	DESCRIPTION	ASSESSED VALUES GENERAL	ASSESSED VALUES SCHOOL/OTHER
LAND	1	74,100	LAND	74,100	74,100
IMPRMTS	1	112,000	BUILDINGS	112,000	112,000
		186,100	TOTAL	186,100	186,100

Lot 3, Plan 10589, District Lot 3050, Cariboo Land District, PID # 012-699-314

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26324.000	00

BULK MAIL

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$155,200

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0090	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 0.72		PE37847	257	3643	ASPEN LANE

	CLASS	ACTUAL VALUE	DESCRIPTION	ASSESSED VALUES GENERAL	ASSESSED VALUES SCHOOL/OTHER
LAND	1	84,000	LAND	84,000	84,000
IMPRMTS	1	75,000	BUILDINGS	75,000	75,000
		159,000	TOTAL	159,000	159,000

GTS 8036522

BCAssessment 1998 AUTHENTICATED ROLL COPY

Parcel A, Plan 12033, District Lot 3050, Cariboo Land District, PID # 012-483-796

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26325.000	00

BULK MAIL

s.22

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$143,100

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0140	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 1.43		100567M	257	1282	NORTH NECHAKO RD

	CLASS	ACTUAL VALUE	DESCRIPTION	ASSESSED VALUES GENERAL	ASSESSED VALUES SCHOOL/OTHER
LAND	1	44,200	LAND	44,200	44,200
IMPRMTS	1	97,500	BUILDINGS	97,500	97,500
		141,700	TOTAL	141,700	141,700

Lot 3, Plan 12033, District Lot 3050, Cariboo Land District, PID # 012-522-456

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26326.000	00

BULK MAIL

s.22

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$117,200

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0090	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 0.49		072017M	257	1271	MATHIE RD

	CLASS	ACTUAL VALUE	DESCRIPTION	ASSESSED VALUES GENERAL	ASSESSED VALUES SCHOOL/OTHER
LAND	1	37,700	LAND	37,700	37,700
IMPRMTS	1	82,500	BUILDINGS	82,500	82,500
		120,200	TOTAL	120,200	120,200

Lot 1, Plan 12423, District Lot 3050, Cariboo Land

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$441,200

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0162	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 .40		PH4036	257	865	SYDNEY PL

S22

1 IMPRMTS	348,000	BUILDINGS	348,000	348,000	
	440,400	TOTAL	440,400	440,400	

Lot 10, Plan 1454, District Lot 3050, Cariboo Land District, Except Plan 9955, PID # 004-415-221

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26283.000	00

BULK MAIL

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$153,500

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0080	10	060

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 2.06		PB47505	257	3584	ASPEN LANE

s.22

1 LAND	112,000	LAND	112,000	112,000	
1 IMPRMTS	46,000	BUILDINGS	46,000	46,000	
	158,000	TOTAL	158,000	158,000	

NAME & ADDRESS # 02 FOLIO # 90-26283.000

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26283.000	13

BULK MAIL

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH	PROPERTY LOCATION

s.22

LAND IMPRMTS					

Lot 11, Plan 1454, District Lot 3050, Cariboo Land District, EXC R/W PL 20750 , PID # 004-415-256

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26284.000	00

BULK MAIL

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$275,000

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0150	00	000

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
3 1.94		PC39876	257	1239	NORTH NECHAKO RD

s.22

1 LAND	110,000	LAND	110,000	110,000	
1 IMPRMTS	164,000	BUILDINGS	164,000	164,000	
	274,000	TOTAL	274,000	274,000	

Lot 12, Plan 1454, District Lot 3050, Cariboo Land District, PID # 015-388-905

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26285.000	00

BULK MAIL

REG	ELCT	IT	LOC	SPEC (MUN)	IMP DIS	RHB	SERVICE AREA	PREVIOUS ROLL VALUE
14						15		$407,000

GENS	INDIAN BAND	DEFINED	SPEC (REG)	TEN	BCT	SUPP	ALR	UPC	MAN CL	L USE	ACT USE
				01					0160	10	060

DIMENSIONS	LANDS FILE	DOCUMENT NUMBER	NEIGH		PROPERTY LOCATION
2.26		U21259	257	1277	NORTH NECHAKO RD

s.22

1 LAND	126,000	LAND	126,000	126,000	
1 IMPRMTS	281,000	BUILDINGS	281,000	281,000	
	407,000	TOTAL	407,000	407,000	

GTS 8036522

BCAssessment 1998 AUTHENTICATED ROLL COPY

* CLASS	ACTUAL VALUE	DESCRIPTION	ASSESSED VALUES GENERAL	ASSESSED VALUES SCHOOL/OTHER
1 LAND	127,000	LAND	127,000	127,000

Lot 13, Plan 1454, District Lot 3050, Cariboo Land District, Except Plan 20750, PID # 013-889-427

AREA	SCHL	JURIS	ASSESSMENT ROLL NUMBER	EQTY
26	57	226	90-26286.000	00

BULK MAIL

ATTACHMENT "A"

TERMS OF REFERENCE

Background

A series of ice jams during the winter of 96/97 followed by large spring freshet flows resulted in considerable scour and erosion along the lower reaches of the Nechako River. As a result a number of properties were impacted and several homes now remain at risk of damage from further erosion or bank failure. A preliminary investigation was conducted by Lands and Water Management staff which identifies the problem sites along with initial surveys of the affected areas. An investigation is now required to assess the risk of individual structures and properties, and evaluate the options for remediation along with cost estimates for each potential solution. This report will provide risk assessment and remediation options for the affected residents along with guidance for any possible financial assistance programs offered by the Province.

Scope of Work

1. The three selected sites include:
   a) Aspen Lane (Lot 1, Pl. 9955, Lot 3 Pl. 10589, Lots 10, 11, Pl. 1454, all of D.L. 3050, Cariboo Land District)
   b) Island Park Drive (Lots 1 to 6, Pl 18805, D.L. 4204, Cariboo Land District)
   c) Dargie Place/Bergman Road (Lots A & B, Pl 19898, Lots 2,3, Pl 31993, Lots 7,8,10 Plan 17313, all of D.L. 2165, Cariboo Land District)
2. Review historic data, existing surveys and preliminary investigations.
3. Conduct additional surveys and geotechnical investigations of the affected areas.
4. Prepare a risk assessment of the affected structures based on the present slope conditions at the sites, and possible futures erosion rates.
5. Provide a description of river erosion patterns, along with some discussion of anticipated future trends as they relate to the affect sites.
6. Recommend minimum setback requirements for future building construction and inground sewage disposal systems at the selected sites.
7. Develop mitigative options for the affected structures (including water and sewage systems) including; structure relocation (on existing property), erosion protection works (revetment) and the possible effects of no mitigation.
8. Provide preliminary design and cost estimates for each option along with discussion and recomendations for the best alternative.

Time Frame

A draft report (2 copies) should be provided to the Ministry of Environment, Lands and Parks two weeks prior to the final date of completion of this project which is June 30, 1988, at which time 20 copies of the final report shall be submitted.

s.22

Mr. Gordon Simmons
Fraser-Fort George Regional District
987 – 4th ave.
Prince George, BC

Dear Mr. Simmons

Re: Island Park property erosion

During the spring and early summer of 1997 our property s.22 experienced significant erosion due to high water run-off and high release rates at the Skins Lake spillway. Since the initiation of the erosion, we have been in contact with Mr. Glen Davidson of the Ministry of Environment regarding our concerns relative to the future safety of our house. We have followed his advice to wait for the results of the consultant's report (GeoNorth Engineering) before taking further action. We have received the report and now wish to pursue what seems to be the best option given our circumstances, which is to move our house.

We realize that people who live along rivers must take some responsibility for events such as flooding. However, we took several measures before building our house to avoid this problem, and we know that some of the water volume was due to problems encountered by Alcan (e.g. one tunnel not working, and the ice-jam in the early winter), in addition to the high snow-pack. Therefore we are distressed that despite what we thought was good planning, we now have this problem.

s.22

His advice was that the bank still had some eroding to do near the top, in order to lay back to the natural angle of repose, but the controlled water flow, and the evidence of trees etc. on the bank itself, indicated that undercutting by high water was unlikely. Even so, we decided to be conservative and locate the house back significantly from the minimum required set-backs. As you have seen in the consultant's report, our house is now just under 11m from the future top of the bank.

Although the house is not hazardous at the present time, s.22

s.22

s.22

s.22 if you wish to discuss this. I look forward to hearing from you.

Sincerely,

s.22

cc: Glen Davidson, Ministry of Environment, Lands and Parks

ENVOYEZ À / SEND TO

DE - FROM: Geo North Engineering Ltd

DÉPARTEMENT - DEPARTMENT:

BC Ministry of Environment
Pr. George
Attn: Glen Davidson

DATE: Aug 19/98.

SUJET - SUBJECT: Nechako River Bank Erosion Study

MESSAGE

Enclosed is an unbound copy of our report in exchange for a bound copy, as discussed.

Regards,
Dave.

PARTIE DU BAS POUR RÉPONDRE - USE LOWER PORTION FOR REPLY | RÉPONSE DE - REPLY FROM | DATE

POUR RÉPONDRE: CONSERVEZ LA COPIE UN ET RETOURNEZ LA COPIE TROIS
TO REPLY: RETAIN FIRST COPY - RETURN THIRD COPY

BLUELINE A 20-B Memo Inter-Bureau - Inter-Office Memo

BRITISH COLUMBIA

File: 76800-20
Vander/Nechako

August 5, 1998

ORiginal

SEE ATTACHED LIST

Dear "Property Owner":

Re: Nechako River Erosion Study

Further to my letter of May 12, 1998, GeoNorth Engineering Ltd., on behalf of the Ministry of Environment, Lands and Parks, has now completed a study of erosion at several locations along the Nechako River. Since your property has been included in this study, I am enclosing a copy of the report for your review.

While the Ministry currently has no plan to address future erosion at these sites, I will be discussing the risks and possible mitigative options with the Provincial Emergency Program of the Ministry of Attorney General.

Please contact me at (250)565-6436 if you have any questions or would like to discuss the report further.

Yours truly,

Glen Davidson, P.Eng.
Engineering Section Head
Omineca-Peace Region.

/GD
cc: Dwayne Halldorson, City of Prince George
Gordon Simmons, Fraser-Fort George Regional District
Bob Kelly, PEP, Ministry of Attorney General

Ministry of Environment, Lands and Parks
Land and Water Management
Environment and Lands
Omineca-Peace Region
Mailing Address:
325 - 1011 Fourth Avenue
PRINCE GEORGE BC V2L 3H9
Telephone: (250) 565-6436
Facsimile: (250) 565-6629

FirstName	Address1	City

s.22

NECHAKO RIVER BANK EROSION STUDY

MIWORTH AND PRINCE GEORGE, B.C.

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS

GEONORTH ENGINEERING LTD.

302 - 1777 THIRD AVENUE, PRINCE GEORGE, B.C. V2L 3G7

PROJECT No. K-371

June 30, 1998

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

The Nechako River has been partially regulated since construction of the Kenney Dam by Alcan Smelters and Chemicals Ltd. (Alcan) in the early 1950s. As a result of the reduced flow there has been comparatively little bank erosion in the Miworth-Prince George area. During November, 1996 a combination of higher than average flow and a sudden cold snap led to ice jamming in the Lower Nechako River resulting in severe flooding and localized bank erosion in Prince George. Subsequent sustained high flows during May and June, 1997 caused severe bank erosion at Miworth and Prince George, beyond any experienced in recent years.

B.C. Ministry of Environment, Lands and Parks (MoE) personnel investigated river bank damage at several points in 1997/98 and subsequently retained GeoNorth Engineering Ltd. to assess three specific locations and provide a range of feasible solutions. The three areas are:

- Aspen Lane, Prince George;
- Island Park Drive, Miworth; and
- Bergman Road, Miworth.

The work was authorized by a General Service Contract dated 22 May, 1998. The terms of reference include:

- undertaking an erosion investigation of the three selected sites noted above;
- reviewing historic data, existing surveys and summary investigations;
- conducting a thorough topographic survey of the study areas including property pins and highwater marks;
- assessing the stability of the river bank and risk to houses;
- inspecting historical air photos and discussing erosion trends;
- providing minimum setback recommendations for future construction and in-ground sewage disposal systems;

- designing and costing mitigative options for properties at greatest risk;
- discussing the effects of no mitigation work.

2.0 METHOD

We visited each site and discussed the history of erosion with s.22 at Aspen s.22 at Island Park Drive. We also reviewed MoE files and field data collected by MoE staff in 1997, analysed flow records of Nechako River at Isle Pierre and applied the 1996 and 1997 flows to cross sections provided by MoE.

Foresight Survey and Design Ltd. (FSDL) completed topographic surveys of the bank at each site. The results of this work are shown on Drawings 371-1 to 371-6 in Appendix A.

Photogrammetric mapping by Industrial Forestry Services Ltd. compared the river bank locations of the study sites in 1946 and 1996. Photography from 1998 was also used to map the river bank location at the two Miworth sites. The results of this mapping are illustrated on Drawings 371-B1 to 371-B3 in Appendix B.

Mr. W. Cash of Northern Building Movers estimated the cost of moving six specific structures. These estimates are in Appendix C.

A summary of Nechako River flow data and analyses are in Appendix D.

3.0 OBSERVATIONS AND ANALYSES

3.1 Hydrology

Nechako River flows at Isle Pierre have been recorded continuously since 1950 by Water Survey of Canada (Station 08JC002). Since completion of the Kenney Dam in the 1950s, the flow has been partially regulated with the Nautley and Stuart River systems providing the bulk of the unregulated discharge. The Stuart Basin alone contributed more than 55% of the average

flow recorded in the lower Nechako during the period 1981-1994 (BriMar Consultants Ltd., 1997).

Nechako River flow upstream of Fort Fraser is controlled by Alcan to ensure safe operation of the Kenney Dam reservoir and to meet the requirements for protection of fish habitat. Alcan releases water via the Skins Lake spillway to draw down reservoir levels in anticipation of spring melt, to provide suitable flow for Chinook fry, and to cool the river during the months of July and August for returning sockeye salmon.

1996 was a year of above average precipitation and runoff in the Nechako watershed. Alcan therefore increased flows during October, 1996 to reduce reservoir levels closer to the normal operating range. The one week delay in passage of the flood peak from Skins Lake Spillway to Prince George and the onset of very cold weather in mid-November combined to cause major ice jamming in the Lower Nechako in November, 1996 (BriMar Consultants Ltd., 1997). Spectacular ice jams near Cameron Street Bridge caused localized flooding and erosion. The ice jam event apparently directed stream flow towards the left river bank (looking downstream) at Aspen Lane with a velocity and orientation which would not occur during ice-free, peak flow periods.

The high flows during May and June, 1997, including 17 days when the flow exceeded 1,000 m^3/s and a further 72 days when it exceeded 800 m^3/s, caused continuous toe erosion and sloughing of the slope at Island Park Drive and Bergman Road.

We carried out a statistical analysis to determine the return period of the 1997 peak flow. Return period is the interval in years, on average, during which a given discharge rate can be expected to be equalled or exceeded. The peak flow measured in 1997 at the Water Survey of Canada gauge at Isle Pierre was 1,010 m^3/s. This flow was exceeded four times since 1950; 1070 m^3/s in 1952, 1060 m^3/s in 1964, 1080 m^3/s in 1972 and 1050 m^3/s in 1976. A plot that fits the peak flow data to three common statistical relations is shown on Plate 371-D1 in Appendix D. The data indicate that a flow of 1000 m^3/s has a return period of about twenty years. The plot

also shows that a flow of 800 m^3/s has a return period of about five years and a flow of 600 m^3/s has a return period of two years.

The stream flow records show that the peak daily flow exceeded 600 m^3/s in only four years of the 21 year interval between 1975 and 1996. In the preceding period between 1950 and 1974, the peak daily flow exceeded 600 m^3/s during 17 of that 24 year interval. This is illustrated by a graph of annual peak daily flow over the interval of record on Plate 317-D2, and confirms a relatively dry period between 1977 and 1995.

We also analysed daily flow records to compare the duration of the high flows with that of previous years. The flow data are presented in a table on Plates 371-D4 to 371-D7, with a summary on Plate 371-D7. A graph on Plate 371-D3 shows the number of days per year that the average daily flow exceeded 600 m^3/s and 800 m^3/s. This plot clearly illustrates the relatively low flow conditions that existed in the period between 1977 and 1995.

The analyses show that the high flows that occurred during summer, 1997 are not unprecedented, are not statistically unusual and were last exceeded in 1976.

Analysis of the flow conditions at Cross Section 15 of the City of Prince George flood-plain mapping, corresponding approximately to Aspen Lane, indicates that flow velocities were approximately 2 m/s for a period of at least 40 days during 1997. They were likely this large or larger during the short periods coinciding with the ice jamming during mid-November, 1996. Assuming that the channel dimensions at Island Park Drive are similar to those at Section 15, velocities of 2 m/s might be anticipated.

3.2 Slope Material

Slope ravelling at Bergman Road and Island Park Drive has exposed a continuous stratum of sand and gravel to a maximum size of about 75 mm, with an approximately 2 m cap of stiff silt at Island Park Drive. Each slope has a significant amount of gravel sizes at water level and rises from water level at approximately 35°.

The slope at Aspen Lane, on the other hand, is underlain by coarse gravel with some cobbles. This slope is approximately 15 m of sand and gravel, with a layer of cobbles at between 2 m and 4 m depth below the crest. The slope toe is paved with cobbles, having a size range of 100 mm to 200 mm and an estimated mean diameter of 125 mm.

It is noteworthy that the large concrete slabs at river level below Lot 1, Island Park Drive prevented damage and have allowed vegetation to grow on the slope during the last several years. There is also rubble and brush on the slope below Lot 5, Island Park Drive which appears to have reduced erosion at that point.

The natural cobble pavement at the toe of the slopes is formed by selective erosion of the finer grained sand and gravel in the slope above. As the toe is eroded, gravel and cobbles roll down the slope to form a natural revetment at river level. With several years of reduced flows, stability returns to the slope. At Aspen Lane the nominal largest rock size is approximately 125 mm (5 inches). At Island Park it is likely 50 mm (2 inches), and at Bergman Road it is likely 75 mm (3 inches). The limiting velocities therefore, below which these sizes of rocks will not be eroded, are:

- at Aspen Lane, approximately 1.2 m/s;
- at Island Park Drive, approximately 0.8 m/s; and
- at Bergman Road, approximately 0.9 m/s.

These velocities will be exceeded during average peak flow conditions, but significant erosion is unlikely unless the water level is above the average peak level.

3.3 Channel Migration

Plans produced by Industrial Forestry Services Ltd. show river bank locations for 1946 and 1996 and, in the Miworth area, for 1998. Plans on Drawings 371-B1 to 371-B3 in Appendix B illustrate substantial channel movement in some places. The river bank locations are

precise to ±2 m plus the amount from operator error caused by trees that obscure the true location of the crest.

3.3.1 Aspen Lane

The photogrammetric mapping indicates that the crest of the bank retreated about 5 m over the period 1946 to 1996, or about 0.15 m per year. It is probable that most of this change would have occurred during the high flow years of 1952, 1964, 1972 and/or 1976, when there were 15 or more days of flows exceeding 1,000 m^3/s. It is also probable that this bank crest has not moved noticeably in the 20 years since 1976. In fact, s.22 of Lot 1 states that the crest did not move perceptibly for 40 years prior to the ice event in November, 1996. Additional mapping of intermediate years might confirm this.

The legal plans dated 1959 show a "Mean High Water Mark" (MHWM), described by a horizontal distance from property pins. Since the MHWM is between present crest of slope and water level, we expect that it likely represented the crest of slope at the time of the survey. If this is the case, the survey indicates that the crest of the slope at Lot 1 has retreated about 5.5 m since 1959.

3.3.2 Island Park Drive

Island Park Drive is along the outside of a long, sweeping meander bend. The photogrammetric mapping shows that the crest of the bank at this location has moved 20 to 25 m over the period between 1946 and 1996, or approximately 0.5 m per year on average. The mapping shows an additional 5 m in the two years between 1996 and 1998. The average movement between 1946 and 1998 is 0.6 m/year.

This is a natural location for downstream channel migration, where the channel is uncomplicated by bedrock or other constrictions. The channel immediately downstream is wider, shallower and constricted by islands. This reach might be susceptible to ice jamming.

Legal plans dated 1970 show a MHWM which extends past the present edge of water by up to 8.0 m at the property line that separates Lots 3 and 4. The average distance between the MHWM and the edge of water on the date of our survey was 3.7 m at the six lots in this study.

3.3.3 Bergman Road

Bergman Road and Dargie Place residents also live along the outside of a long, sweeping curve. The crest of the right bank in this location has retreated 5 to 7 m between 1946 and 1996. It moved a further 5 m at some points over the period 1996 to 1998. In limited areas, near some of the homes, the photogrammetric mapping suggests that segments of the crest appeared not to move at all during this two year period. The photogrammetric mapping shows on average that the bank crest has moved less than 0.15 m/yr over the 50 years prior to 1996 and less than 2.5 m/yr during 1996 to 1998.

Comparing measurements from a legal plan dated 1967 to our site survey shows that the MHWM extends 3.1 m past the edge of water at the time of our survey at property lines between Lots 6 and 7, and 7 and 3. There was no change at the other property line locations.

4.0 SLOPE STABILITY

Surficial geology mapping of the area by Geological Survey of Canada (Tipper, 1971) indicates that the Nechako River is within a large glacial melt water or outwash channel. The deposits were formed about 10,000 years ago as large, regional, glacial lakes drained. The lakes existed for several hundred years, up to elevation 760 m, as glaciers from the last ice age melted. Drainage to the south was blocked by unmelted ice in the valley bottoms. As the ice melted, the resulting runoff eroded through the accumulated lake deposits and deposited the granular materials exposed in the river banks at the three sites.

The aerial photos and our field visits confirm there are no indications of deep-seated, rotational slides. The granular materials exposed in the banks fail by shallow erosion and ravelling

rather than deep-seated movements. The slopes are at, or close to, an angle of repose. The surveyed cross sections in Appendix A show that this angle is between 32° and 38°.

Erosion at the toe of the slope causes shallow slope failures that work their way up slope. Parts of the slope, particularly near the crest, will stand very steeply for a short period due to roots and capillary tension. The oversteepened slope collapses as the roots degrade and as it is attacked by weather.

4.1 Risk to Houses

Technically, building foundations could be constructed on the river bank provided the toe of the slope was not undermined. In practice, structures are typically set back from the crest to allow for some erosion at the toe and to avoid special design and construction issues associated with foundations on a slope.

The cross sections on Drawings 371-2, 4 and 6, show that several houses are close to the crest of the slope. None of the houses are presently undermined; all are safe for habitation at the time of this report. An erosion event similar to those of 1996/97 could make houses on the following building lots unsafe:

Lot 1, Plan 9955, D.L. 3050, Aspen Lane;
Lots 2, 3 and 5, Plan 18805, Block A, D.L. 4204, Island Park Drive; and
Lot 3, Plan 31993 and Lot 7, Plan 17313, both of D.L. 2165, on Bergman Road.

We can not predict when erosion equal to that resulting from the 1996/97 events will recur.

5.0 RECOMMENDED SETBACK DISTANCES

As discussed above, the slopes in each case are at, or close to, an angle of repose. The slopes fail by erosion at the toe and ravelling, rather than by deep-seated movements. Therefore,

the setback distance is a function of the rate of erosion of the toe of the slope, which can be directly applied to a distance from the crest of the slope. The setback distance from a seasonal high-water mark might not be appropriate, since this method does not take into account the horizontal distance made up by the slope.

We recommend the following setback distances, assuming that the life expectancy of a house is 50 years, that the period between 1946 and 1996 represents average channel behaviour, and applying a factor of safety of 1.5:

- Aspen Lane - 15 m;
- Island Park Drive - 35 m; and
- Bergman Road - 20 m.

6.0 METHODS TO MITIGATE EROSION DAMAGE

We have investigated the following two methods to mitigate erosion damage:

1.) Moving structures as they are threatened by erosion of the slope.
2.) Protecting the toe of the slope with revetment.

These methods and the alternative of not carrying out any work are discussed below. Cost estimates for the mitigative methods are included in each section and are summarized in a table in Section 6.4. The estimates do not include an allowance for G.S.T.

6.1 Aspen Lane

The bank at Aspen Lane is about 14 m high and the length of river bank reviewed in this section is about 180 m long. Based on the setback estimate noted above, the houses at Lot 3, Plan 10589 and Lot 1, Plan 9955, and the deck at Lot 11, Plan 1454 will need to be relocated within 50 years. The house on Lot 1 is at most risk.

The estimated cost to move the house on Lot 1, Plan 9955 is $18,500. A new basement and site cleanup would cost an additional $20,000. There does not appear to be sufficient room on the lot to relocate the house with an adequate setback and still remain within the property lines.

The cost of moving the house on Lot 3 was not estimated by Northern Building Movers. Based on the average cost of moving the six structures he did inspect, we might expect this cost to be $22,000. Unlike the house on Lot 1, there does appear to be sufficient room for relocation on Lot 3.

The toe of the slope could by protected by revetment consisting of either:

- a rip rap berm; or
- precast concrete, articulating mats.

The berm would require an access trail excavated into the slope for gravel trucks to deliver rock and for an excavator to place the rock. The precast concrete mats would consist of concrete panels held together with galvanized cable. The mats would require a heavy, non-woven filter fabric to reduce erosion between the panels, and a large crane working from the crest of the slope to place the mats at the toe of the slope. The estimated cost to construct the rip rap berm is $170,000 and to construct and place the concrete-mat revetment is $220,000.

6.2 Island Park Drive

The bank at Island Park Drive is about 12 m above water level and is about 400 m long. All five of the houses in this reach will be undermined within 50 years at the current erosion rates.

The estimated cost to move the three houses most at risk, including new basements, driveways and landscaping, is approximately $126,000. Prorating the cost to all five houses, the cost of relocation would be about $210,000.

Protecting 400 m of slope toe with rip rap placed by excavator is approximately $500,000. The cost of placing concrete mat revetment along 400 m is approximately $530,000.

6.3 Bergman Road

The river bank at Bergman Road is about 24 m high at 32° to 40°. The length of bank which is of concern is about 600 m. Houses on Lots 3 and 7 are within 15 m of the crest and a third house, on Lot A, Dargie Place, is within the recommended 20 m setback. The estimated cost of moving the two houses most at risk, including new basements and site cleanup, is about $50,000. Prorating the cost to the third house is in an estimated additional cost of about $40,000. The estimated cost of arresting erosion by rip rap or articulated concrete mat revetment for the noted length is $750,000.

6.4 Cost Summary

TABLE 1

Lot		House Relocation	Rock Rip Rap	Concrete Mats
Aspen Lane	Lot 1**	$38,500	$170,000	$220,000
	Lot 3	$42,000*		
Island Park Drive	Lot 2**	$38,500	$500,000	$530,000
	Lot 3**	$45,000		
	Lot 4	$42,500		
	Lot 5**	$41,500*		
	Lot 6	$41,500*		
Bergman Road	Lot A	$41,500*	$750,000	$750,000
	Lot 3**	$41,500		
	Lot 7**	$10,000		

* Based on average of estimated costs.

** Denotes high risk.

7.0 DISCUSSION AND RECOMMENDATIONS

The mechanism of bank failure at all three sites is one of shallow movement or ravelling of sand and gravel down the slope as the toe is eroded. The rate of erosion is dependent on the river elevation and velocity, and on the state of the natural cobble pavement or other revetment. Given several years of attenuated flows with peaks not exceeding 600 m^3/s it is probable that erosion will not be perceptible on an annual basis. In any event, the slope crest at each location will not regress faster than the toe erosion and will therefore provide ample warning to residents. That is to say, we do not expect sudden, deep seated, catastrophic landslides in these materials. Given this, however, the sustained high flows of 1997 and instances of severe ice jam related velocities are unpredictable events and could recur in any given year.

The estimated erosion rates, based on the previous 50 year period, may not be appropriate for structures intended for more than 50 years. The long-term erosion rate is unknown, and likely fluctuates with changes in climate. The estimated erosion rates could increase if flows on the Nechako River increase.

The homes at Aspen Lane will be at risk in the event of one or two recurrences similar to the ice jam of November, 1996. There is not adequate space to relocate at least one of them beyond the recommended setback. We recommend that the river bank be revetted at this location.

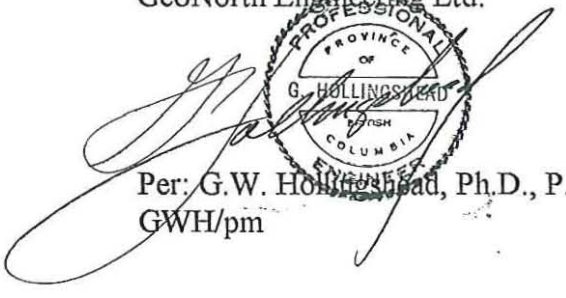
The home owners most at risk along Island Park Drive and Bergman Road do have space in which to relocate. This action is less expensive than revetting the river bank and is therefore recommended.

8.0 CLOSURE

This report was prepared by GeoNorth Engineering Ltd. for the use of Ministry of Environment, Land and Parks. The material in it reflects GeoNorth Engineering's judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. GeoNorth Engineering Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

Please call the writers if any parts of this report require clarification.

Respectfully submitted,
GeoNorth Engineering Ltd.

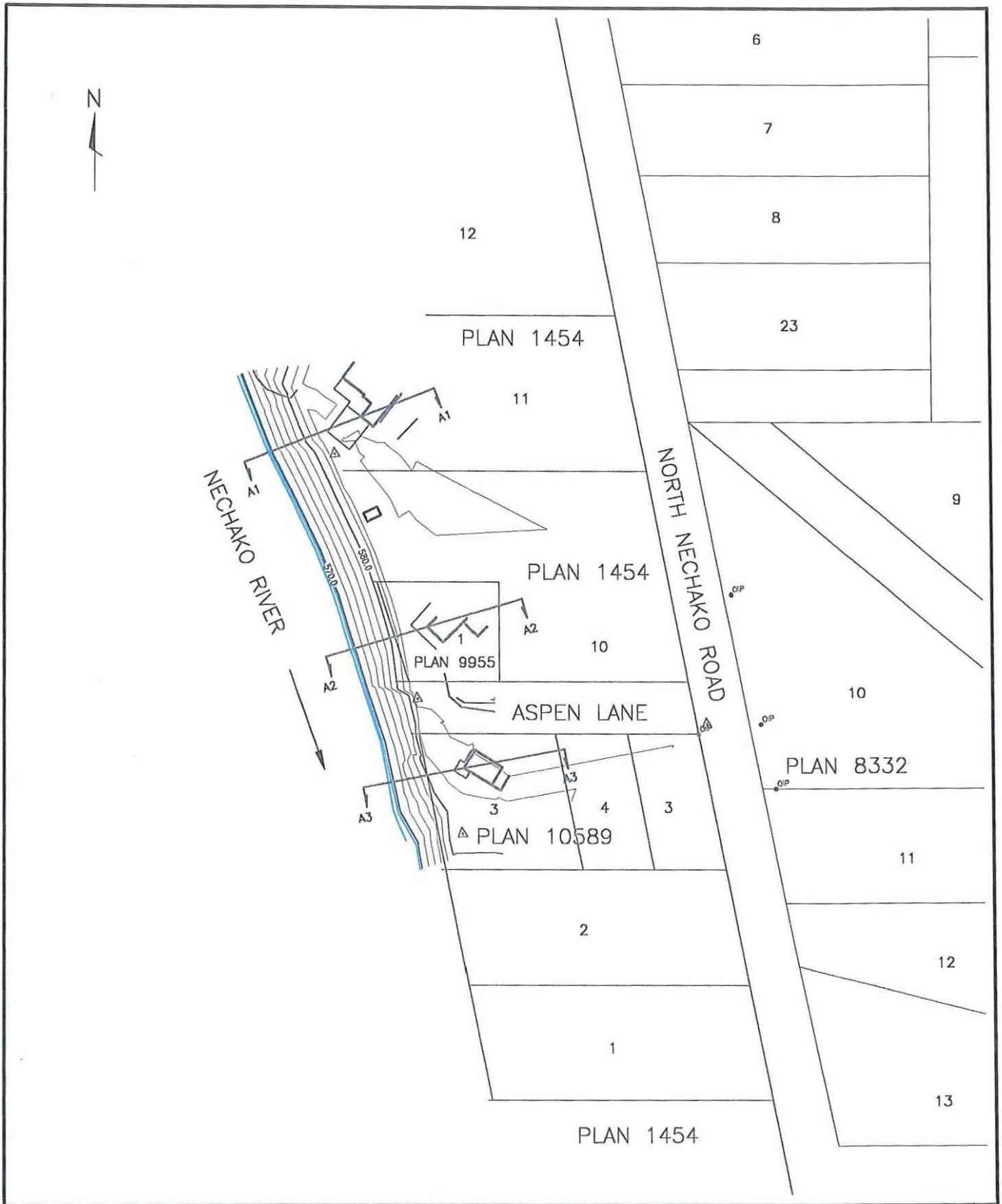


Per: G.W. Hollingshead, Ph.D., P.Eng.
GWH/pm

Reviewed by,
GeoNorth Engineering Ltd.

Per: D.J. McDougall, M.Eng., P.Eng.

APPENDIX A



GeoNorth Engineering Ltd.	B.C. MINISTRY OF ENVIRONMENT
302–1777 THIRD AVENUE PRINCE GEORGE, B.C., V2L 3G7 Tel. (604)564–4304 Fax (604)564–9323	NECHAKO RIVER EROSION STUDY ASPEN LANE SITE PLAN

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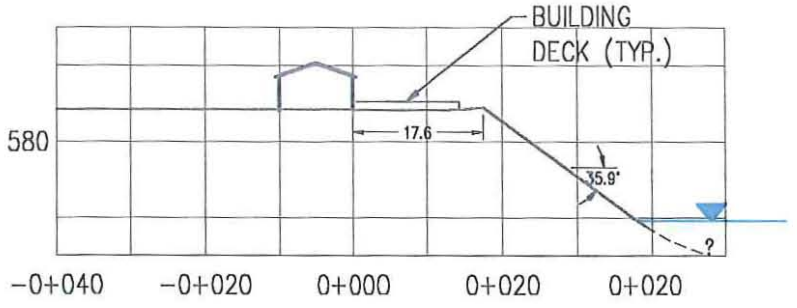
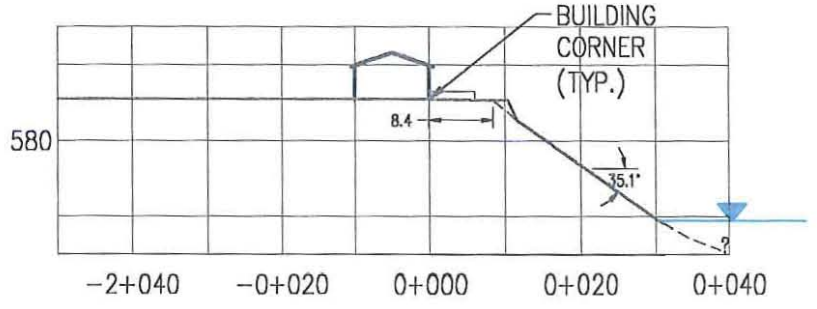


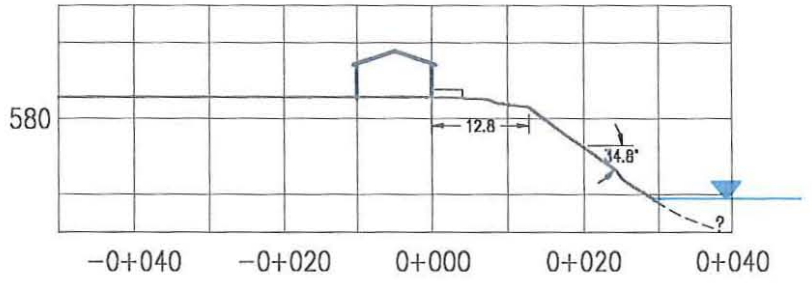
SECTION A1

NORTH NECHAKO ROAD



SECTION A2

NORTH NECHAKO ROAD



SECTION A3

LOT 3, ASPEN LANE

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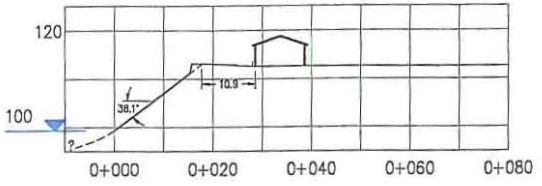
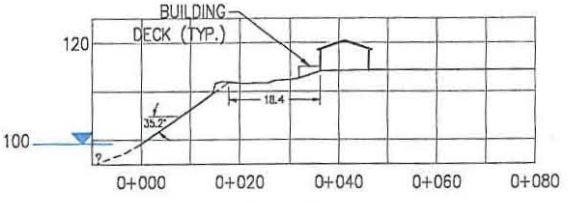
DWG NO. 371–3	REV. 0	PROJECT NO: K–371	



SECTION IP1

LOT 2, ISLAND PARK DRIVE



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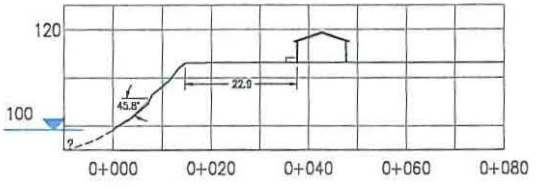

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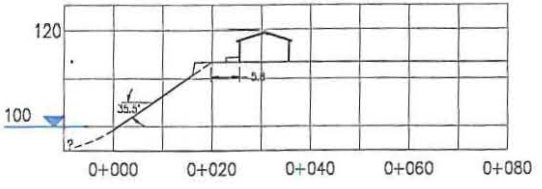
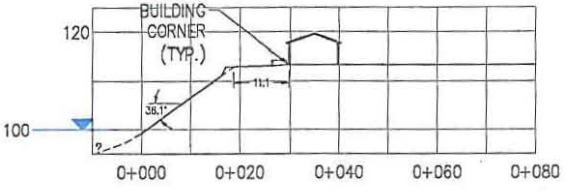
LOT 6, ISLAND PARK DRIVE



SECTION IP2

LOT 3, ISLAND PARK DRIVE



SECTION IP4

LOT 5, ISLAND PARK DRIVE

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Prince George, B.C., V2L 3G7
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B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
ISLAND PARK DRIVE
CROSS SECTIONS

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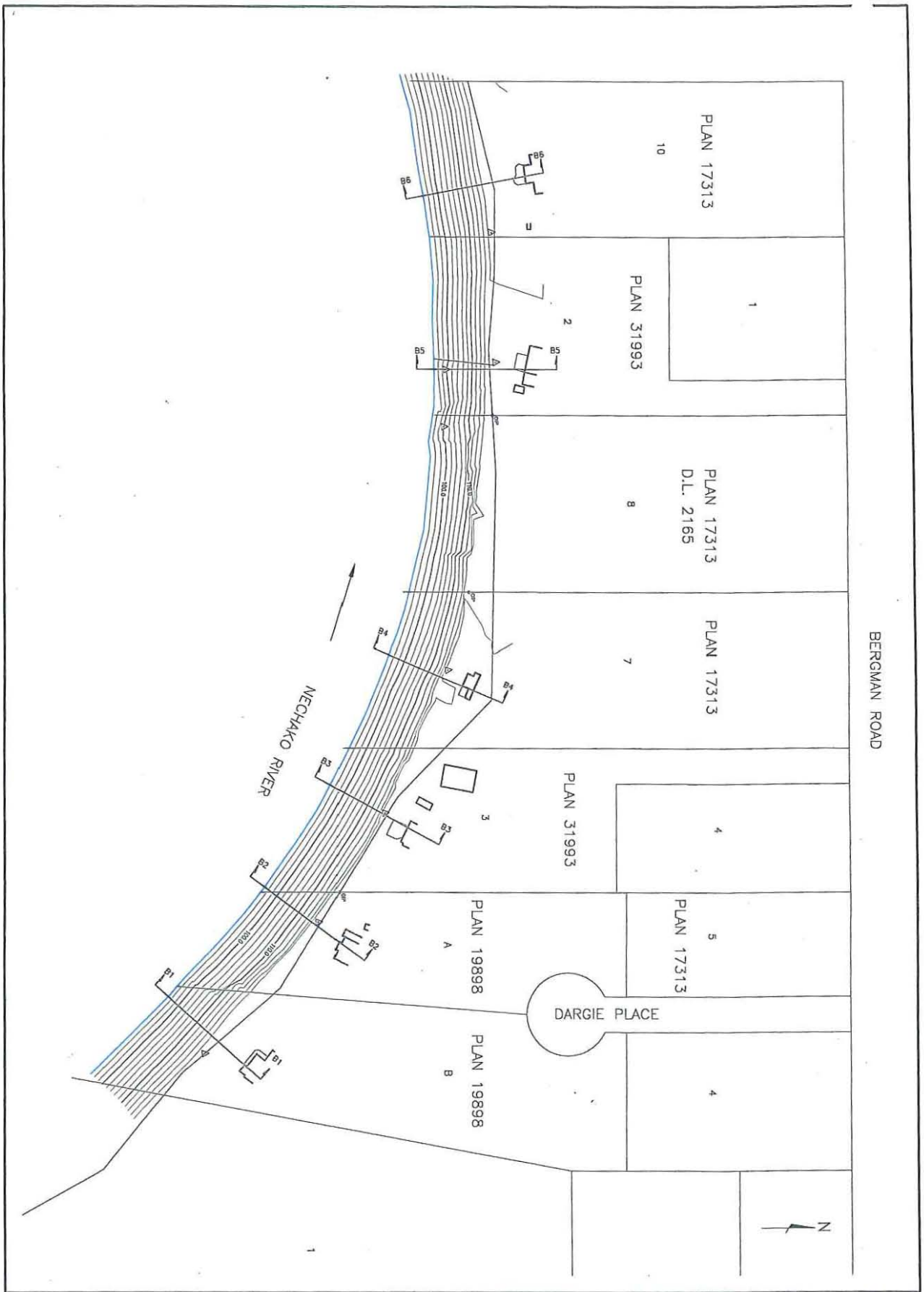
PROJECT NO:	K–371



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DATE: 98/05/28			
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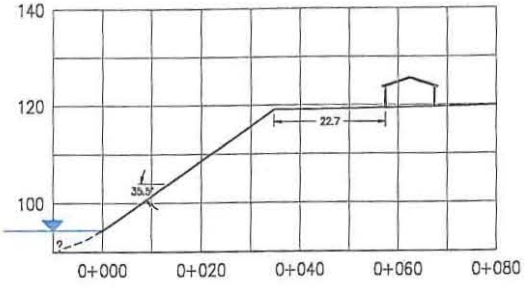

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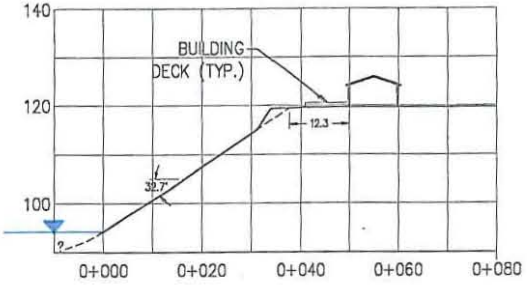
LOT B, DARGIE PLACE



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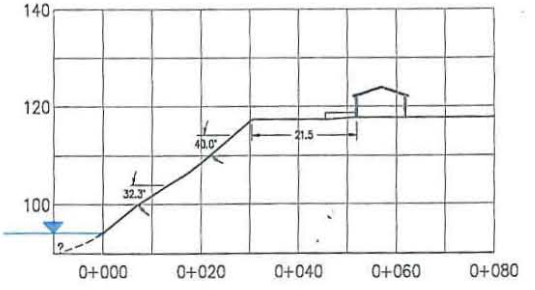
LOT 3, BERGMAN ROAD



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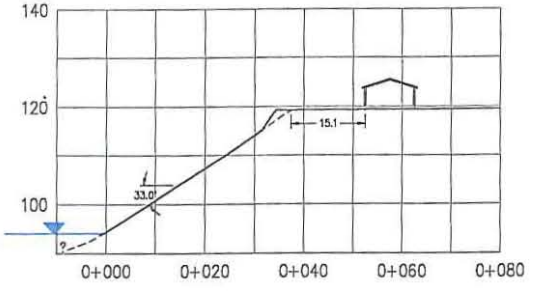
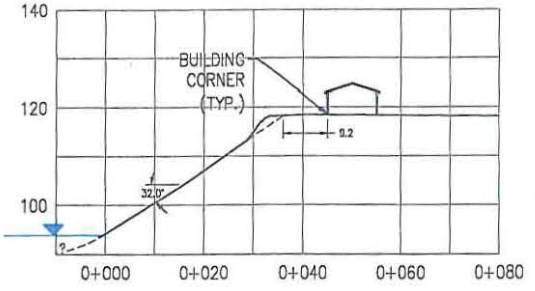


SECTION B2
LOT A, DARGIE PLACE



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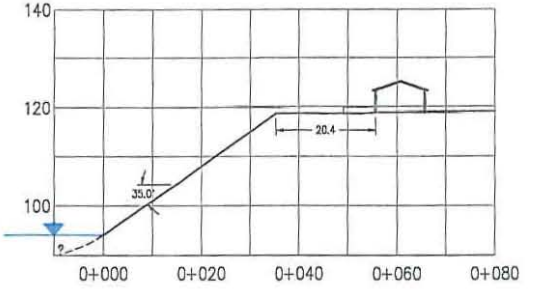
LOT 7, BERGMAN ROAD



SECTION B6
LOT 10, BERGMAN ROAD

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B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
BERGMAN ROAD
CROSS SECTIONS

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DWN BY:	DvM
MAP REF:	
DWG NO.	371-6
APPROVED:	
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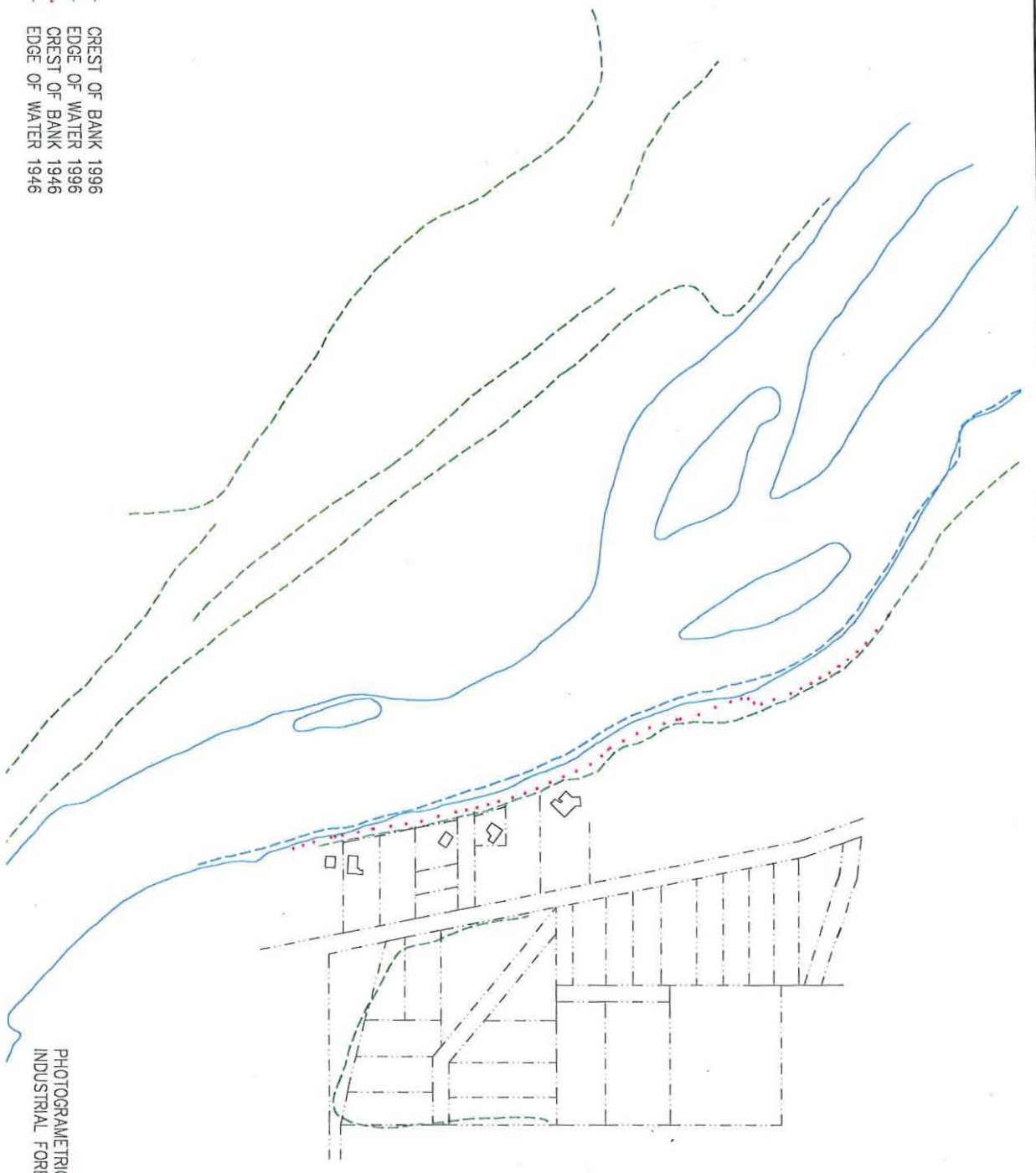
PROJECT NO:	K-371

APPENDIX B



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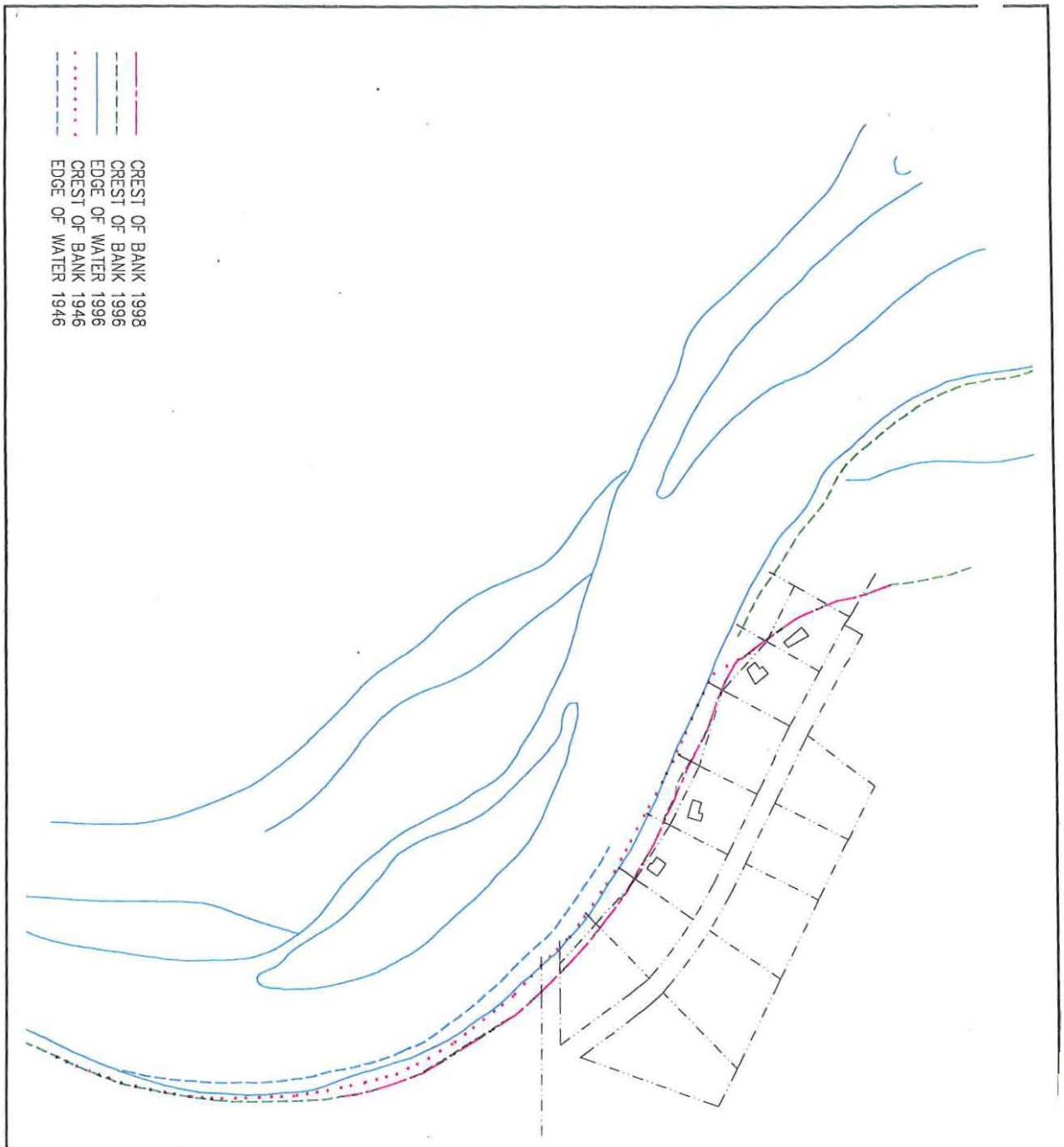
DATE: 98/07/02			
DWN BY: DvM			
MAP REF:			
DWG NO. 371-B1	REV. 0	PROJECT NO: K-371	

B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
PLAN OF RIVER BANK LOCATIONS
FROM AERIAL PHOTOGRAPHS
ASPEN LANE

GEONORTH ENGINEERING LTD.
202-1777 Third Avenue
Prince George, B.C., V2L 3G7
Fax (250) 564-9323



PHOTOGRAMETRIC MAPPING BY
INDUSTRIAL FORESTRY SERVICES LTD.

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DATE: 98/07/02		
DWN BY: DvM		
MAP REF:		
DWG NO. 371-B2	REV. 0	PROJECT NO: K-371

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NECHAKO RIVER EROSION STUDY
PLAN OF RIVER BANK LOCATIONS
FROM AERIAL PHOTOGRAPHS
ISLAND PARK DRIVE

GEONORTH ENGINEERING LTD.
302-1777 Third Avenue
Prince George, B.C., V2L 3G7
Tel (250) 564-4304
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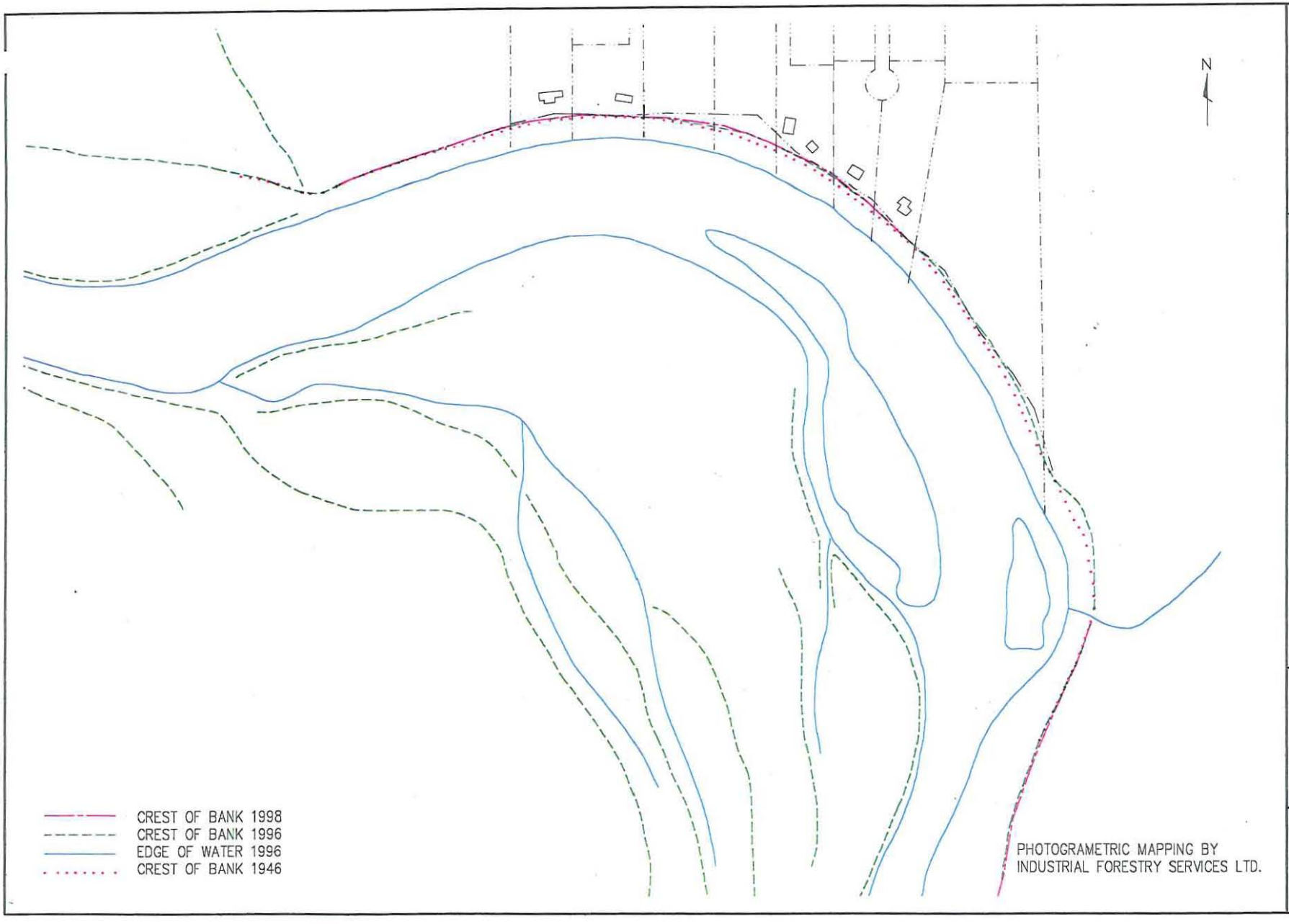

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B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
PLAN OF RIVER BANK LOCATIONS
FROM AERIAL PHOTOGRAPHS
BERGMAN ROAD

SCALE:	1:5000
DATE:	98/07/02
DWN BY:	DvM
M/P REF:	
DWG NO.	371–B3
REV.	0
PROJECT NO:	K–371
APPROVED:	

BILL CASH ENTERPRISES LTD.
8030 Ellis Road
Prince George, BC V2N 6E4

Telephone/Fax: (250) 963-9045

FULLY INSURED

Northern Building Movers

ESTIMATE AND JOB SHEET

Date: June 11/98

Owner's Name: s.22

Address:

Phone: Business Phone:

Contractor's Name: Phone:

Work To Be Done:

House From: To:

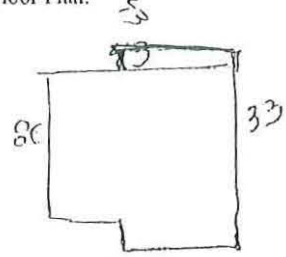
Route To Be Used: 70 - 80 Back

Chimney: [illegible] Fireplace: ✓ ? to be out Crawlspace: Full Bsc

Height: Width: 28 - 33 Length: 43

Appraiser's Remarks: Car Port to be Removed. (Sundeck Removed) Full Basement open on one end. (Split level) By [illegible] Roll Stan Back

Floor Plan:



Materials Needed:
No. Of Blocks:
Needles:
Timbers:
Chimney Blocks:
Fireplace Blocks:

Estimate Of Move And/Or Raise: 18,500.00
Plus GST 1,295.00
Total: $ 19,795

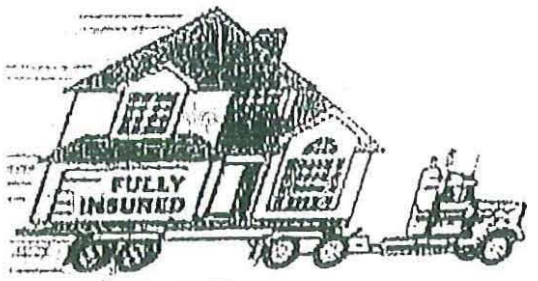
This Estimate Is Valid Until: July 30/98

Dated At [illegible] P.G., British Columbia On June 11 1998

B. C.
BILL CASH ENTERPRISES LTD.

BILL CASH ENTERPRISES LTD.
8030 Ellis Road
Prince George, BC V2N 6E4

Telephone/Fax: (250) 963-9045



Northern Building Movers

ESTIMATE AND JOB SHEET

Date: June 11

Owner's Name: _____

Address: _____ S22 _____

Phone: _____ Business Phone: _____

Contractor's Name: _____ Phone: _____

Work To Be Done: ~~Remove Deck~~ (West side/front).

House From: Roll house away from To: _____

Route To Be Used: River. 75-100 feet

Chimney: 4 Stack Brick Fireplace: ~~Corner~~ 1 Crawlspace: 8' Basement: Ground level.

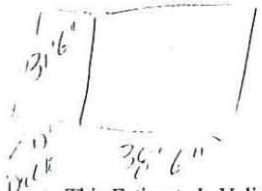
Height: 36 Width: 31'6" Length: 38'6"

Appraiser's Remarks: Owners to Remove Decking (~~Brick Chimney~~)
Chimney?

Floor Plan:

38'6" Long
31'6" Wide

Materials Needed:
No. Of Blocks: _____
Needles: _____
Timbers: _____
Chimney Blocks: _____
Fireplace Blocks: To Come Out



Estimate Of Move And/Or Raise: $ 22,500
Plus GST 1,575
Total: $ 24,075

This Estimate Is Valid Until: July 30/98

Dated At P.G., British Columbia On June 11 19 98

B. S

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Prince George, BC V2N 6E4

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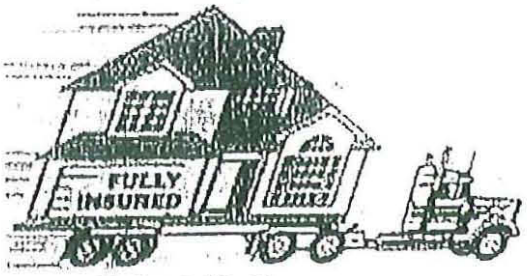


Northern Building Movers

ESTIMATE AND JOB SHEET

Date: June 11/98

Owner's Name: s.22

Address:

Phone: Business Phone:

Contractor's Name: Phone:

Work To Be Done:

House From: Roll sideways approx 80' To:

Route To Be Used:

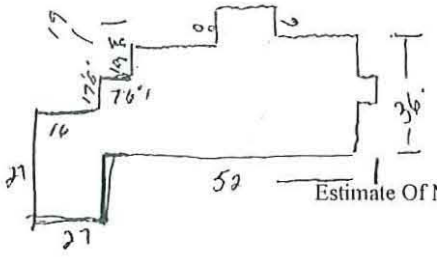
Chimney: Wood stove Fireplace: Crawlspace:

Height: Width: Length:

Appraiser's Remarks:

Deck To Be Removed
Garage To Be Removed (additional $4000.00 To move).
0' Basement.

Floor Plan: 16-14-22



Materials Needed:
No. Of Blocks:
Needles:
Timbers:
Chimney Blocks:
Fireplace Blocks:

Estimate Of Move And/Or Raise: $25,000.00
Plus GST 1750.00
Total: $ 26750.00

This Estimate Is Valid Until: July 30/98

Dated At P.G., British Columbia On June 11 1998

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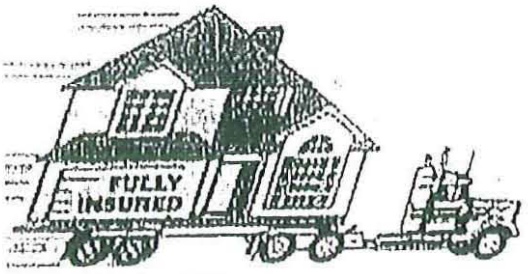
8030 Ellis Road
Prince George, BC V2N 6E4

Telephone/Fax: (250) 963-9045



Northern Building Movers

ESTIMATE AND JOB SHEET

Date: June 11/98.

Owner's Name: s.22

Address:

Phone: Business Phone:

Contractor's Name: Phone:

Work To Be Done:

House From: ROLL OFF FOUNDATION To:

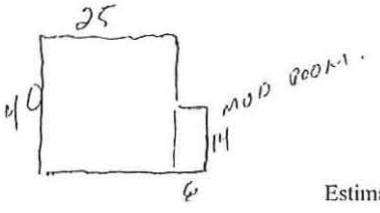
Route To Be Used: 7 WHEEL MOVE BACK APPROX 100'

Chimney: Fireplace: Crawlspace:

Height: Width: Length:

Appraiser's Remarks: 8' BASEMENT (3' ABOVE GROUND)
DECKS TO BE REMOVED.

Floor Plan:



Materials Needed:
No. Of Blocks:
Needles:
Timbers:
Chimney Blocks:
Fireplace Blocks:

Estimate Of Move And/Or Raise: $18,500.00
Plus GST 1,295.00
Total: $ 19,795.00

This Estimate Is Valid Until: July 30/98

Dated At P.G., British Columbia On June 11 19 98

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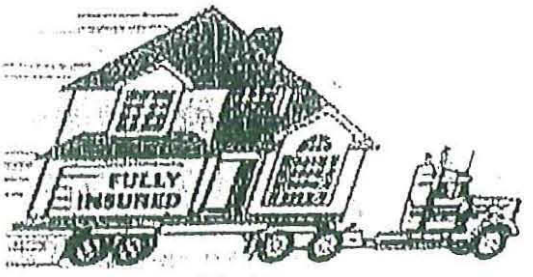
8030 Ellis Road
Prince George, BC V2N 6E4

Telephone/Fax: (250) 963-9045



Northern Building Movers

ESTIMATE AND JOB SHEET

Date: June 11/98

Owner's Name: _____

Address: S22

Phone: _____ Business Phone: _____

Contractor's Name: _____ Phone: _____

Work To Be Done: _____

House From: Rolled Back approx 80' To: _____

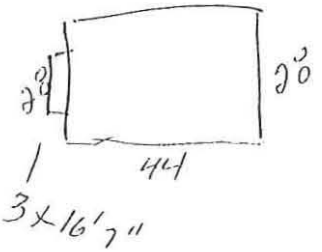
Route To Be Used: _____

Chimney: _____ Fireplace: ✓ ? Crawlspace: _____

Height: _____ Width: _____ Length: _____

Appraiser's Remarks: Full Basement (3' above ground)
Deck To Be Removed.

Floor Plan:



Materials Needed:
No. Of Blocks: _____
Needles: _____
Timbers: _____
Chimney Blocks: _____
Fireplace Blocks: _____

Estimate Of Move And/Or Raise: $ 21,500.00
Plus GST $ 1505.00
Total: $ 23,005.00

This Estimate Is Valid Until: July 30/98

Dated At P.G., British Columbia On June 11 1998

B. S

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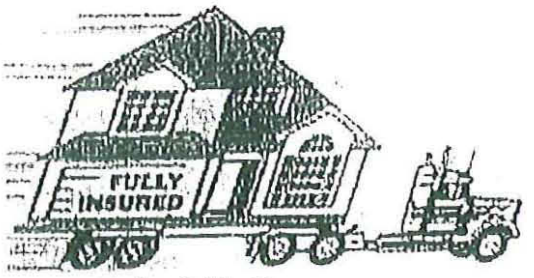
Prince George, BC V2N 6E4

Telephone/Fax: (250) 963-9045



Northern Building Movers

ESTIMATE AND JOB SHEET

Date: June 11/98

Owner's Name: s.22

Address:

Phone: Business Phone:

Contractor's Name: Phone:

Work To Be Done:

House From: Rock Beck (about 80') To:

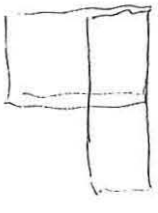
Route To Be Used:

Chimney: / Fireplace: / Crawlspace: 2 feet.

Height: 14 Width: 26. Length: 45.

Appraiser's Remarks: Trailer with addition.

Floor Plan:



Materials Needed:
No. Of Blocks:
Needles:
Timbers:
Chimney Blocks:
Fireplace Blocks:

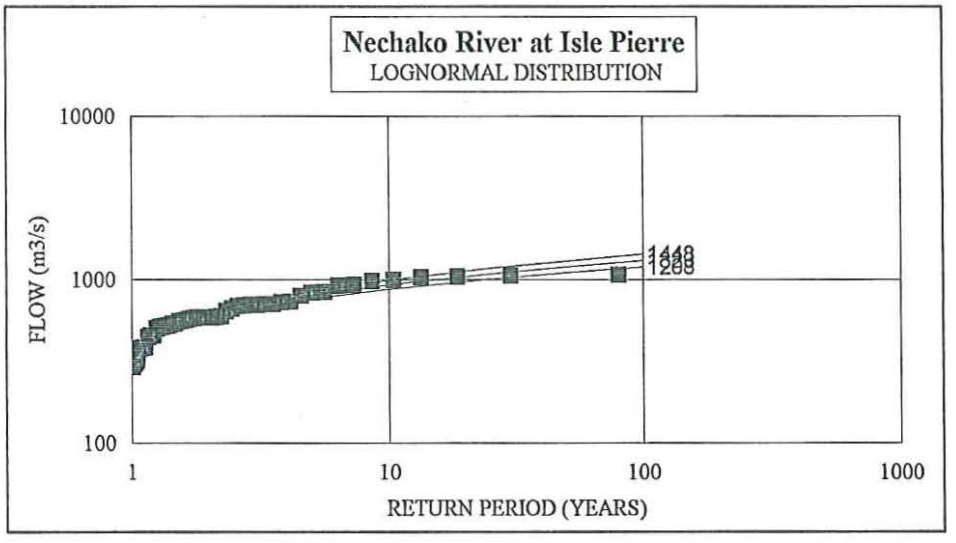
Estimate Of Move And/Or Raise: $9000.00
Plus GST 560.00
Total: $ 9,560.00

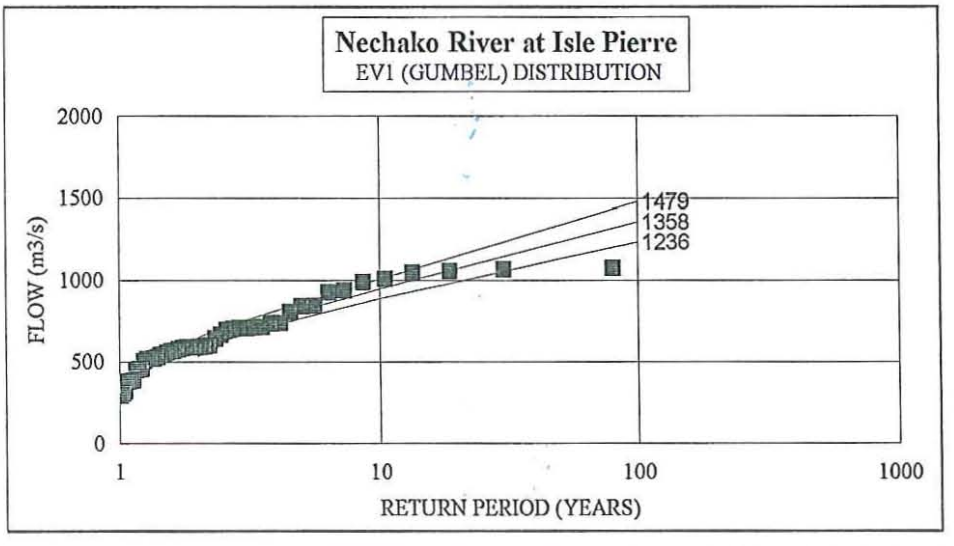
This Estimate Is Valid Until: July 30/98

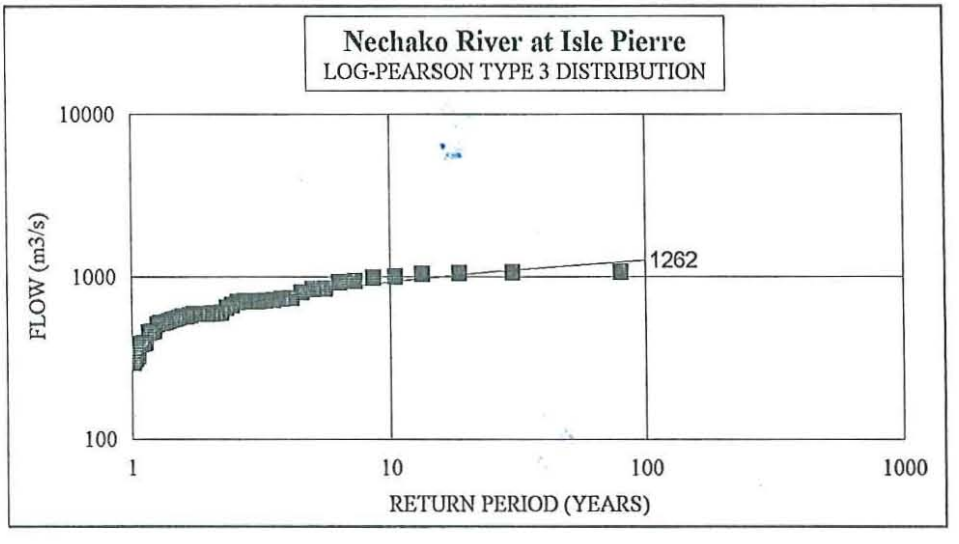
Dated At P.G., British Columbia On June 11 19 98

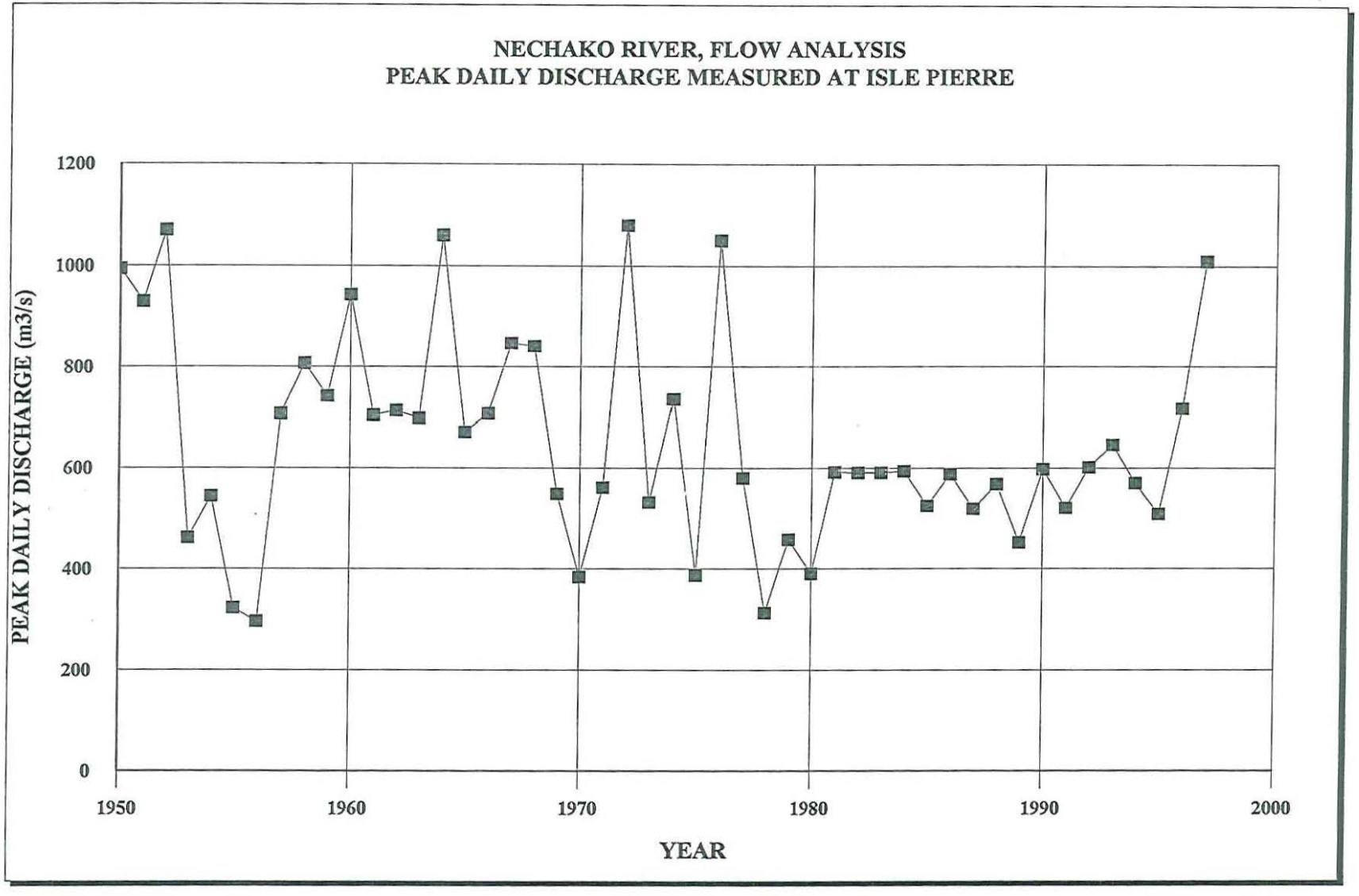
B. C. S.
BILL CASH ENTERPRISES LTD.

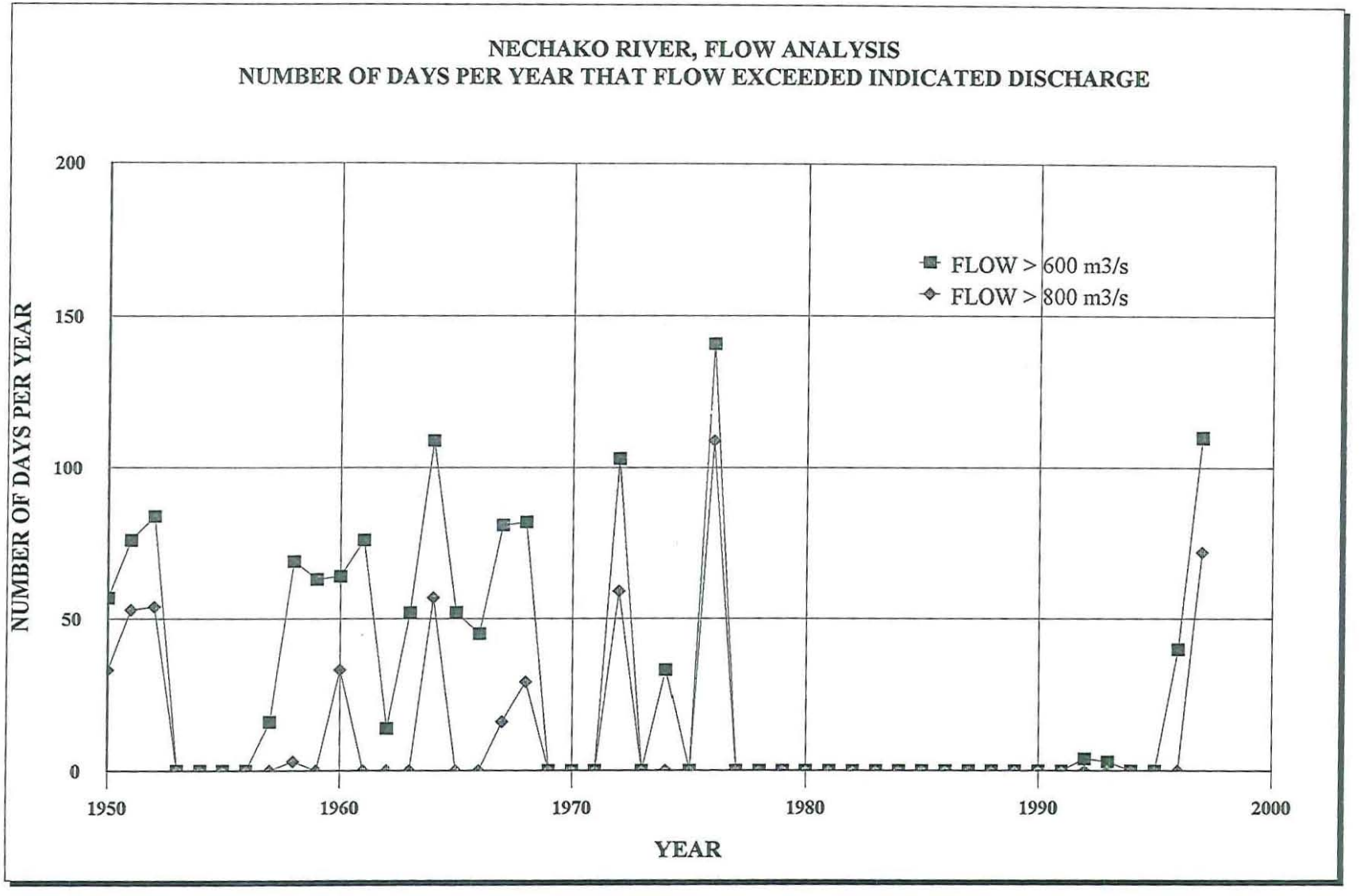
APPENDIX D








NECHAKO RIVER, FLOW ANALYSIS
PEAK DAILY DISCHARGE MEASURED AT ISLE PIERRE
PEAK DAILY DISCHARGE (m3/s)
1200
1000
800
600
400
200
0
1950
1960
1970
1980
1990
2000
YEAR


NECHAKO RIVER, FLOW ANALYSIS
NUMBER OF DAYS PER YEAR THAT FLOW EXCEEDED INDICATED DISCHARGE
NUMBER OF DAYS PER YEAR
200
150
100
50
0
1950
1960
1970
1980
1990
2000
YEAR
FLOW > 600 m3/s
FLOW > 800 m3/s

APPENDIX C

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR / DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
1	—	166	120	54.9	112	224	50.4	70.2	402	204	396	193	85	173	95.7
2	—	164	119	54.9	111	235	51.5	71.4	419	200	391	193	85	170	95.7
3	—	164	117	59.6	110	244	52.4	73.6	433	199	382	193	85	167	95.7
4	—	162	115	54.9	110	249	53	74.2	433	197	374	193	85	164	95.7
5	—	161	113	54.9	110	255	52.7	76.5	402	195	362	193	85	161	95.7
6	—	159	113	54.4	110	253	52.1	79.3	385	194	354	193	85	159	95.7
7	—	157	112	54.4	109	251	51	82.1	379	192	340	193	85	156	95.7
8	—	156	112	54.4	109	249	50.4	85	405	191	331	193	85	153	95.7
9	—	154	110	54.4	109	248	49.6	87.8	385	190	323	193	85	153	95.7
10	—	153	109	54.4	109	246	49.8	92	379	189	311	191	85	150	95.7
11	—	153	108	53.7	110	244	51	96.3	382	189	300	190	85	149	95.7
12	—	151	107	53.8	110	244	53.2	102	391	188	294	190	85	147	95.7
13	—	150	107	53.8	110	242	55.5	108	399	187	289	190	85	147	95.7
14	—	148	106	53.8	110	241	57.5	118	419	187	275	190	85	146	95.7
15	—	147	104	53.8	111	239	60	127	428	187	261	190	85	144	95.7
16	—	146	102	53.2	111	239	62.6	139	430	187	246	190	85	144	95.7
17	—	144	99.7	53.2	111	238	64.6	153	430	187	229	190	85	143	95.7
18	—	142	98.5	53.2	112	236	65.7	178	433	186	218	190	85	143	95.7
19	—	140	97.7	53.2	113	235	64.6	210	442	185	207	190	85	143	95.7
20	—	138	96.8	53.2	113	235	62.9	241	447	183	201	190	75	143	95.7
21	—	136	96.3	52.7	115	234	61.3	263	445	183	181	188	75	142	95.7
22	—	135	96	52.7	116	232	59.7	294	439	182	172	187	75	142	95.7
23	—	133	96.3	52.7	117	231	58.6	317	459	181	166	187	75	142	95.7
24	—	132	96.3	52.7	118	231	56.4	334	459	180	154	185	75	142	95.7
25	—	130	96.3	52.7	119	228	53.8	345	456	179	140	184	75	142	95.7
26	—	129	96.8	52.1	120	225	53	348	453	178	132	181	75	142	95.7
27	—	127	97.1	52.1	121	222	52.1	348	450	178	130	177	75	142	95.7
28	—	125	97.4	52.1	122	219	51.5	334	453	177	129	171	75	142	95.7
29	—	124	98.8	52.1	122	217	51	320	453	176	130	161	75	142	95.7
30	—	122	99.1	52.1	123	214	52.1	306	453	176	132	153	75	142	95.7
31	—	122	99.7	52.1	124	211	53.2	300	450	176	135	147	75	142	95.7
32	—	120	100	51.5	125	206	58	300	450	175	137	142	75	142	90.6
33	—	119	101	51.5	125	204	56.4	300	453	174	139	139	75	142	90.6
34	—	119	102	51.5	126	205	54.9	300	453	174	142	137	75	142	90.6
35	—	118	103	51.5	126	203	53.8	300	445	173	144	136	75	142	90.6
36	—	116	104	51.5	127	201	53.2	300	425	172	144	136	75	142	90.6
37	—	115	105	51	127	199	52.1	300	422	171	147	136	75	142	90.6
38	—	113	107	51	127	197	51	300	413	170	149	136	75	142	90.6
39	—	111	108	51	127	195	52.1	300	416	168	150	136	75	142	90.6
40	—	110	108	51	127	193	53.2	300	402	165	152	137	75	142	90.6
41	—	110	109	51	127	191	52.7	300	391	163	156	137	75	142	90.6
42	—	110	109	50.7	127	189	51.5	300	377	160	157	137	75	142	90.6
43	—	110	109	50.7	127	187	51	300	368	157	159	135	75	142	90.6
44	—	111	108	50.4	126	185	52.1	300	354	155	161	133	75	142	90.6
45	—	110	107	50.4	125	183	53.5	300	328	154	164	130	75	142	90.6
46	—	109	106	50.1	124	181	53.8	300	320	153	167	129	75	142	90.6
47	—	108	105	50.1	123	179	54.7	300	323	152	168	127	75	142	90.6
48	—	108	105	49.8	122	177	56.4	300	331	151	170	127	75	142	90.6
49	—	108	105	49.8	121	175	56.6	300	328	151	173	127	75	142	90.6
50	—	108	105	49.6	119	200	56.6	300	311	150	175	126	75	142	90.6
51	—	109	103	49.6	118	199	55.5	300	317	149	177	126	75	142	90.6
52	—	109	103	49.3	117	213	55.8	300	343	149	178	126	75	142	90.6
53	—	109	102	49.3	116	210	56.1	300	331	149	181	126	75	142	90.6
54	—	109	102	49	115	181	56.6	300	328	149	184	126	75	142	90.6
55	—	109	101	49	113	162	57.8	300	337	149	186	126	75	142	90.6
56	—	109	100	48.7	112	174	58.6	300	340	149	187	126	75	140	90.6
57	—	108	100	48.7	111	170	58.9	300	348	148	190	126	75	140	90.6
58	—	108	100	48.4	110	163	58	300	348	147	195	126	75	140	90.6
59	—	107	100	48.4	109	159	56.6	300	351	147	202	126	75	139	90.6
60	—	106	100	48.1	108	156	55.5	300	354	146	207	126	75	139	86.4
61	—	105	99.7	48.4	108	153	54.7	300	351	145	211	126	75	137	86.4
62	—	103	99.1	48.1	107	151	56.1	300	354	143	214	126	75	136	86.4
63	—	102	98.8	47.9	106	150	56.9	300	360	142	215	126	75	136	86.4
64	—	101	98.5	47.9	105	149	59.5	300	362	141	215	126	75	135	86.4
65	—	100	98	47.6	104	147	60.9	300	360	139	215	126	75	135	86.4
66	—	99.1	98	47.6	103	144	62.3	303	357	138	212	126	75	133	86.4
67	—	98	96.8	47.6	102	143	58.6	303	354	136	210	125	75	133	86.4
68	—	96.8	96.8	47.3	101	142	54.1	303	365	135	209	123	75	132	86.4
69	—	96.6	96.8	47.3	100	141	51	306	368	134	207	122	75	132	86.4
70	—	96.3	96.6	47	99.1	140	49.8	306	371	132	206	123	75	130	86.4
71	—	96.3	95.7	47	98.3	140	50.4	306	374	130	204	122	75	130	86.4
72	—	96.3	94	46.7	97.4	139	51	306	379	129	202	121	75	130	86.4
73	—	96.3	93.4	46.7	96.3	139	51.5	309	388	129	201	122	75	129	86.4
74	—	96	92.9	46.4	95.7	151	51.3	309	394	129	199	119	75	129	86.4
75	—	94.9	91.7	46.4	94.9	151	51.5	311	402	129	198	118	75	129	86.4
76	—	94	91.2	46.2	93.7	167	52.4	311	408	133	197	121	75	129	86.4
77	—	94	90.6	46.2	93.2	164	53	314	413	142	195	121	75	129	86.4
78	—	93.7	90.6	45.9	92.3	156	53.8	317	416	142	195	118	75	127	86.4
79	—	93.4	92.9	45.9	91.5	150	54.1	320	422	134	198	118	75	127	86.4
80	—	93.4	94.6	45.6	90.6	142	55.5	320	419	128	203	119	75	127	86.4
81	—	92.9	96	45.6	89.8	117	55.5	323	416	130	207	121	75	127	86.4
82	—	92	96.3	45.3	88.9	116	55.5	328	436	128	212	123	75	127	86.4
83	—	91.2	97.4	45.3	88.3	113	56.4	334	433	126	218	120	75	127	86.4
84	—	90.6	96.3	45	87.8	112	57.2	337	439	125	224	121	75	127	86.4
85	—	90.3	96.3	45	86.7	112	58	314	436	123	232	125	75	127	86.4
86	—	90.6	96.8	44.7	85.8	112	58.9	297.00	439	128	238	129	75	129	86.4
87	—	91.2	97.7	44.7	85.2	113	59.2	280	439	126	244	130	75	129	86.4
88	—	92	101	44.5	85	120	59.5	261	436	128	255	131	75	129	86.4
89	—	94	105	44.5	84.4	127	59.5	244	439	126	263	133	75	130	86.4
90	—	94.9	110	42.8	83.3	133	59.7	227	439	125	275	134	75	130	86.4
91	—	96.3	114	41.6	82.1	136	60.6	212	442	126	292	140	75	132	86.4
92	—	97.7	116	41.6	81.6	142	60.6	198	439	131	300	154	75	133	86.4
93	—	99.7	119	41.6	80.7	149	61.7	187	442	133	311	154	75	135	86.4
94	—	102	123	41.6	79.9	149	61.7	176	445	132	320	153	75	138	86.4
95	—	103	125	41.6	79.3	141	62.3	164	453	129	331	151	75	138	86.4
96	—	108	129	41.3	78.7	140	62.6	153	459	130	345	152	75	138	86.4
97	—	113	132	41.3	78.7	145	63.1	144	467	135	362	158	75	138	86.4
98	—	118	135	41.3	78.7	148	63.1	138	479	138	357	163	75	138	86.4

YEAR / DAY	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	171	127	184	140	215	245	122	187	211	122	144	169	280	109	113	63.4	115
2	171	127	185	140	215	244	121	187	208	120	144	168	279	109	113	63.1	117
3	171	127	187	141	215	243	119	183	204	119	143	166	278	109	113	62.9	120
4	171	127	183	141	215	244	119	182	202	116	143	164	277	109	113	62.6	125
5	171	127	181	141	215	244	118	181	201	116	143	163	272	109	113	62.3	130
6	171	127	181	141	215	244	117	181	200	115	143	165	258	109	113	62	146
7	171	127	181	141	215	245	116	180	200	114	143	165	275	109	113	61.2	144
8	171	127	182	142	216	246	115	178	201	113	143	165	275	109	113	60.6	143
9	171	127	180	142	215	246	114	176	202	112	143	164	274	109	113	60	142
10	171	127	181	146	215	245	114	173	202	110	142	163	274	109	113	59.5	141
11	170	127	183	148	217	244	114	172	204	109	142	162	273	109	113	59.2	140
12	167	127	182	148	215	244	116	172	204	108	140	162	272	109	113	58.6	138
13	167	127	182	151	215	243	113	172	204	108	140	161	271	109	113	58	137
14	164	127	183	152	214	241	113	172	205	107	139	161	272	109	113	57.2	136
15	164	127	184	153	212	239	114	172	205	106	139	161	272	109	113	56.8	135
16	164	127	186	153	210	238	114	171	205	106	137	161	271	109	113	56.3	135
17	161	127	185	155	212	238	114	170	205	106	136	162	272	109	113	56.1	135
18	161	127	181	153	215	237	115	169	205	106	135	163	273	109	113	55.8	136
19	161	127	181	152	215	237	115	165	205	106	135	163	276	109	112	55.5	137
20	161	127	180	150	218	236	114	164	204	106	135	163	277	109	110	55.2	137
21	161	127	180	148	217	235	114	162	204	106	135	164	276	109	110	54.9	138
22	161	127	182	148	217	235	114	162	204	107	135	165	275	109	110	54.7	139
23	161	127	182	149	217	235	114	161	204	108	133	165	275	109	110	54.4	140
24	161	127	181	147	215	234	113	159	202	108	133	166	276	109	110	54.1	142
25	161	127	180	144	212	233	111	156	198	109	132	166	274	109	109	53.8	145
26	161	127	180	141	210	233	111	156	194	110	132	166	275	109	108	53.8	145
27	161	127	179	138	210	232	111	154	193	112	130	166	276	109	108	53.5	144
28	161	127	180	139	209	232	111	154	191	112	130	166	276	109	108	53.2	142
29	161	127	179	140	207	232	109	153	191	113	129	165	274	109	108	53	140
30	161	127	178	140	207	231	109	153	191	112	129	165	274	109	108	52.7	139
31	161	127	178	141	207	231	108	153	188	110	129	166	273	109	108	52.7	138
32	161	127	177	141	205	232	106	153	187	108	129	165	273	109	106	52.4	136
33	161	127	178	141	204	231	106	152	184	108	127	164	274	109	105	52.1	135
34	163	127	183	141	204	229	105	152	177	107	127	163	273	109	105	51.8	133
35	163	127	184	141	204	228	103	151	171	107	127	163	273	109	105	51.5	132
36	163	127	187	141	204	228	102	150	167	108	127	162	272	109	105	51.3	131
37	163	127	188	140	203	228	102	151	163	109	127	161	272	108	104	51	129
38	163	127	189	140	203	227	100	153	161	110	127	160	272	108	104	51	125
39	163	127	189	139	203	227	99.1	154	159	110	127	159	272	108	104	51	121
40	163	127	183	139	204	228	98.5	157	159	108	127	158	272	108	104	50.7	119
41	163	127	180	139	204	229	99.1	161	156	108	127	157	271	107	103	50.7	117
42	163	127	178	138	204	229	99.7	162	156	108	126	157	269	107	103	50.1	118
43	163	127	177	139	203	232	101	161	156	108	126	159	268	106	103	49.8	119
44	163	127	177	140	201	231	102	159	157	108	126	160	268	106	103	49.8	120
45	163	127	173	141	201	227	103	158	157	108	126	162	268	105	102	49.6	123
46	163	127	172	140	200	226	103	156	159	109	126	164	266	105	102	49.3	126
47	163	127	171	138	199	224	103	155	159	109	126	165	266	105	102	49.3	133
48	163	127	170	139	199	224	102	153	160	109	126	165	266	104	102	49	141
49	163	127	170	141	199	224	102	153	161	109	126	163	266	104	102	48.7	142
50	163	127	170	141	201	224	102	152	161	109	129	160	265	104	102	48.4	143
51	163	127	170	142	204	222	102	151	163	109	130	159	265	104	102	48.4	143
52	163	127	170	142	201	222	102	153	163	109	130	159	264	104	102	48.1	142
53	163	127	171	145	198	221	102	153	163	109	130	157	263	103	102	48.1	141
54	163	127	171	145	197	219	102	155	161	109	130	155	258	103	102	48.1	140
55	163	127	172	146	195	217	102	156	161	109	130	152	255	103	102	48.1	138
56	163	127	167	148	197	215	102	157	160	109	130	151	255	103	102	48.1	136
57	163	127	168	148	195	215	102	159	159	108	130	151	254	103	102	47.9	133
58	163	127	172	147	195	212	102	159	159	108	130	149	264	103	102	47.6	131
59	163	127	177	147	194	210	103	160	159	108	130	148	263	103	102	47.3	128
60	164	127	168	144	193	210	103	159	156	106	130	146	263	102	102	47.9	125
61	164	127	160	144	192	210	104	161	154	105	130	145	261	101	102	48.1	123
62	164	127	159	145	187	210	104	162	154	103	130	145	262	101	102	48.4	122
63	164	127	159	144	187	210	104	161	153	103	130	144	259	101	102	48.7	122
64	164	127	159	144	187	209	105	164	153	102	130	144	259	100	102	49.3	121
65	164	127	158	142	186	210	104	164	151	101	130	144	260	99.4	102	49.6	121
66	164	127	157	137	183	211	103	165	150	101	130	144	259	100	103	50.4	120
67	164	127	157	136	181	210	103	165	149	99.7	130	144	259	99.7	103	50.7	120
68	164	127	155	138	179	207	103	167	147	99.1	130	143	261	99.1	103	51	120
69	164	127	154	138	178	206	103	169	147	97.7	131	143	261	99.1	103	51.3	120
70	163	127	153	139	176	205	103	172	146	97.1	131	143	260	99.1	103	51.5	120
71	163	127	153	141	174	205	103	177	146	96.8	131	142	259	98.8	103	51.8	120
72	161	127	153	141	173	204	104	181	144	96.8	131	142	257	98.8	103	52.4	120
73	161	127	153	142	171	203	104	183	144	96.8	131	142	255	98.5	103	52.7	120
74	161	127	153	142	170	203	104	185	144	96.3	131	142	254	98.5	103	53.2	119
75	161	127	153	142	167	202	104	186	143	96.8	132	141	253	98.3	103	53.5	120
76	161	127	153	142	168	203	104	187	143	99.7	132	141	253	98.3	104	53.8	120
77	160	127	153	143	165	203	103	187	142	103	132	142	252	98.3	104	54.1	120
78	160	127	152	146	164	204	103	187	142	106	133	141	251	98.5	105	54.4	120
79	159	127	151	148	161	204	102	187	142	110	133	141	251	98.5	105	54.7	120
80	159	127	153	149	161	205	102	187	142	116	133	140	252	99.1	105	55.2	120
81	158	127	155	148	161	204	102	188	142	120	134	140	252	99.7	105	56.1	120
82	157	127	156	148	161	204	102	189	142	125	134	140	252	100	105	56.6	119
83	156	127	156	147	160	205	102	191	142	130	135	140	253	101	105	57.2	119
84	156	127	155	147	159	205	103	194	142	137	135	139	254	102	105	58	119
85	154	127	155	147	158	204	103	197	142	144	136	139	255	104	105	59.7	123
86	154	127	155	148	158	203	103	198	142	153	136	140	254	105	105	61.7	126
87	156	127	155	148	157	202	102	199	142	159	136	144	253	106	105	63.1	128
88	157	127	155	150	157	202	101	200	142	170	136	153	252	107	105	65.1	129
89	158	127	155	148	157	203	102	200	142	178	136	170	249	108	105	67.7	128
90	158	132	155	148	158	202	102	201	142	188	136	195	248	109	105	70.5	128
91	159	141	153	147	159	200	103	202	142	201	136	197	249	111	105	73.1	127
92	160	139	153	147	161	199	103	204	142	211	137	200	253	112	105	75.9	127
93	161	141	152	148	164	200	106	205	142	224	139	202	260	112	105	79.6	128
94	164	146	151	150	168	201	108	207	143	235	140	205	294	112	105	84.9	125
95	167	150	152	158	173	202	110	210	144	240	142	210	317	114	105	89.2	127
96	170	159	153	165	185	206	113	214	150	255	142	220	337	118	105	93.4	129
97	176	162	159	168	193	205	118	215	153	263	143	269	343	120	105	95.4	130
98	178	200	163	168	202	202	124	217	159	275	144	326	362	126	105	96.3	131

YEAR / DAY	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	81.4	102	94.8	104	76	103	102	108	108	73.2	128	108	108	97	119	161
2	80.6	102	96.8	104	76	103	102	108	106	73	126	108	107	93.5	117	160
3	80.1	102	98	103	76	104	102	108	104	72.7	123	108	106	90.5	113	160
4	79.7	102	99.9	103	76.5	104	101	108	104	71.9	124	109	105	88	110	161
5	79.2	102	102	103	77.5	104	101	107	103	70.5	126	107	106	86.5	109	161
6	78.7	102	106	103	78	105	101	107	104	70	123	106	107	84.2	108	162
7	78.9	101	107	103	78	105	101	107	105	69.5	116	107	107	83.8	109	163
8	79	101	107	102	78	104	100	107	106	68.5	117	108	106	83.6	110	165
9	79.2	100	106	102	78	104	101	106	106	68	119	108	105	83.2	112	166
10	79.4	99	104	102	78	103	101	106	105	67.7	122	105	106	82.5	116	166
11	79.6	98	102	102	78	104	101	105	104	67.3	121	104	107	82.4	119	167
12	80.6	97.5	98.5	101	78	103	101	105	104	67.3	120	103	106	82	124	169
13	81.9	97.5	97	101	78	106	101	104	103	68	123	103	105	80.4	122	171
14	84.3	97	96.6	101	78.5	106	101	104	102	69.9	125	103	104	79.5	118	172
15	84.5	97	96	101	78.5	106	101	103	102	69.9	124	104	103	78	114	173
16	82.9	96.5	96.8	101	79	105	101	103	101	70	122	105	103	76.6	112	173
17	81.7	96	97.7	100	79	104	101	102	101	70.6	120	106	103	75.8	109	173
18	81.1	96	98	100	78.5	103	101	102	102	71.2	118	107	104	75.2	107	173
19	79.9	96	97.5	100	78	102	101	102	103	72	123	107	105	74.8	108	172
20	78.7	96	96	100	78	102	101	101	104	73	124	106	106	74.8	103	171
21	77.9	96.5	94.5	99.5	78	102	101	100	105	73.2	122	105	107	74.6	101	170
22	76.9	96.5	92	99	78	102	101	99	106	73.5	118	106	108	74.4	99.6	167
23	76.1	96.5	90	98.5	78	101	100	98.5	106	73	120	109	109	74.2	98.5	166
24	75.5	95	89.8	98	78	101	100	98	107	72.8	122	111	109	74	97.6	166
25	75.8	95	88	98	78	99	99.9	97.5	107	72.3	123	113	109	73.8	96.5	165
26	78.3	95	88	98	78	99.8	99.8	97	106	72	124	114	108	73.6	95.2	165
27	77.6	95	88.1	97.5	78	100	99.7	96.5	106	71.8	124	114	108	73.7	94.8	164
28	78.5	95	88	97.5	78	101	99.5	96.2	105	71.3	122	114	108	73.8	98	163
29	79.4	95	88.7	97.5	78	103	99.5	96.1	105	70.9	125	112	108	74	96.5	163
30	80.1	95	89.2	97.5	78	104	99.5	95.5	104	70.2	127	111	107	74.8	90.5	164
31	80.5	95	89.5	97.5	78	104	99.2	93.5	103	70	125	112	106	75.2	101	165
32	80.1	94.5	90.2	96.5	78	103	98.5	92.2	103	70.5	126	113	106	76	110	167
33	79.8	94.5	91	95.5	78	102	98.5	90.4	102	71	123	114	105	76.4	125	169
34	79.5	94	91.7	95	78	100	98.5	89.4	101	71	125	115	105	77	140	170
35	79.5	94	91.9	94.5	78	99	98.5	88	101	71.2	124	115	104	77.6	170	171
36	79.5	94	92	94	78	99.5	99	87.2	102	71.9	124	114	103	78.2	186	172
37	79.3	94	92	94	78	101	99.5	86.5	102	71.9	128	113	101	78.4	183	172
38	79.1	94	91.8	93.5	78	102	99.8	85.9	103	71.5	123	112	101	78.3	180	173
39	78.9	93.5	91.2	93	78	103	99.5	84.2	104	71.5	120	111	102	78.2	175	173
40	78.3	93	90.8	92.5	78	103	99	83.4	104	70.8	116	110	102	78.1	169	171
41	77.7	93	90.5	92	77	104	98.2	83	105	70.1	114	110	103	78	166	171
42	77.1	92	90.6	92	76.5	106	97.8	83.1	105	70	115	110	103	77	167	168
43	76.7	91.5	90.7	91.5	76	106	97	83	106	69.5	119	111	104	76	166	167
44	76.4	97	90.7	91.5	75.5	106	96.5	82.5	106	69.3	123	111	105	75.4	164	166
45	75.7	90.5	90.5	91	75	106	96.2	82.2	105	69.3	125	109	104	74.6	161	165
46	75.2	90	91	91	74.5	107	96	82.4	105	69.5	126	108	104	74.3	158	165
47	75.6	90	91.7	91	74	107	96.2	82.6	104	70	124	107	103	74.3	156	166
48	77	89.5	92.3	90.5	73.5	106	97.5	82.3	104	70.1	121	106	102	74.8	154	167
49	78.9	89	93.7	90.5	73	106	97.5	82	103	70.2	117	106	101	76	152	168
50	81.2	89	94.2	90	72	105	97	81.5	103	70	114	106	100	77.6	150	169
51	81.9	89	95.5	90	72.5	105	96.3	81.4	102	69.8	112	105	99.5	77.8	149	173
52	82.2	88.5	97.6	89.5	73	104	96.5	81.4	102	70	115	104	98.2	78	146	175
53	82.4	88	99.5	89	73.5	104	97	81.4	102	70.1	118	103	98	78.2	146	176
54	81	87.5	99.7	88.5	74	104	97	81.5	102	70.9	122	102	98.2	78.2	141	177
55	79.2	87	98	88	74.5	104	96	81.6	102	71.3	124	102	100	78.2	142	176
56	78.3	86	97	88	75	105	95.8	81.6	102	72	126	103	103	78	244	174
57	77.4	85.5	95	87.5	76	105	94	81.6	102	72.4	129	104	106	77.8	148	172
58	77.1	85	93.8	87	77.5	103	94	81.3	102	72.8	131	105	108	77.7	143	169
59	77.1	84	92.7	86.5	79	102	93.5	80.3	102	73	132	106	110	77.6	141	166
60	77.6	82	91.5	86	80	99.5	90.2	79.8	102	72.5	126	105	113	77.4	139	162
61	78.4	82	91.1	86	80.5	104	90	78.6	102	70.5	127	104	114	77.2	139	158
62	78.6	81.5	90	86	81	113	91	78.5	102	68	127	104	113	77	139	155
63	78.8	81	90	86	81.5	117	91.8	78	102	74.5	125	104	111	76.8	138	154
64	78.7	80	90	86	82	116	91.5	77.9	102	79	127	104	109	76.4	136	155
65	78.9	80	89.5	86	82	111	91	78	103	82	128	104	108	76	132	158
66	79.1	79.5	89	85.5	82	107	90.5	78.1	103	84	128	104	107	75.6	132	161
67	79	79.5	88.1	85.5	82	106	90.2	77.9	102	86	127	104	107	75	134	163
68	80.3	79	87	85	82.5	106	90.2	77.8	102	86.8	128	103	107	75	133	166
69	79.9	79	86.5	85	82.5	109	90.3	77.7	102	87.5	129	102	108	73.3	131	165
70	79.4	79	86.2	84.5	82.5	110	90.5	77.7	101	88.5	130	101	109	76.4	130	162
71	79	78.5	86	84.5	83	108	90.3	77.7	101	89.5	132	100	110	77.5	131	160
72	78.6	78.5	85.8	84.5	83	107	90.2	77.7	101	90	136	98.5	110	79	132	157
73	78.2	78	86	84.5	83	107	90.1	77.8	101	90.5	142	97	110	80.5	133	155
74	77.7	78	86	84.5	83.5	108	90	77.9	101	91	151	95.5	110	82	135	154
75	77.5	78	85.8	84	83.5	109	89.8	77.9	100	91.5	150	96.5	110	83.5	138	154
76	77.1	78	86.3	84	84	108	88.5	78	100	91.8	150	98	110	85.3	142	155
77	77	77.5	87	84	84	107	87	77.9	101	92	151	101	109	87	149	156
78	76.6	77.5	88.2	84	84.5	107	85.9	77.8	101	92.3	154	101	109	90	152	157
79	76.1	77	89.5	84	85	108	84.2	77.2	101	92.3	156	102	108	94	153	157
80	75.9	76.5	91.3	84	85.5	109	83	76.8	102	93.5	159	103	109	97	158	158
81	75.1	76	93.4	84	86	108	81.8	76.2	102	95	164	103	110	96.4	159	158
82	76.2	76	96	84	86	106	80	76.1	102	96.5	169	103	112	95.5	159	160
83	76.2	76.5	101	84	86	103	79	76.2	102	98	172	103	114	94.6	156	160
84	76	77	109	84	86	102	78	76.1	102	100	171	103	115	94	153	160
85	77	77	113	84	86	103	77.6	76	102	102	172	104	117	94	148	161
86	78.3	77.5	116	84	86	105	78	76	102	104	181	105	120	94.6	143	161
87	80.6	77.5	116	84	86.5	106	78.5	76	103	105	184	106	123	96.6	138	162
88	83.1	78	115	84	87	105	79.7	76	103	107	183	107	128	99	132	163
89	86.1	78	115	83.5	87.5	104	80.5	76	104	109	181	108	132	102	127	163
90	90	78	119	83	88	104	81.5	76	105	110	181	110	137	110	124	163
91	90	78	120	82.5	90.5	104	84.2	76	107	112	184	111	143	120	121	164
92	90.4	78	122	84.5	91.5	105	86	75.9	112	114	197	112	150	130	119	164
93	91	78.5	127	86	93	109	87.5	76.1	115	116	223	114	158	143	118	169
94	91.8	78.5	131	90	95	118	91.5	76.8	118	118	242	118	164	155	119	172
95	93.1	79	132	99	98	127	95.5	77.2	121	120	245	120	170	158	121	174
96	92.5	80	132	100	98.5	137	99	79	123	121	241	114	183	157	128	178
97	93	82	133	105	100	145	100	81	126	123	236	113	190	159	129	181
98	93.1	84.5	135	110	102	157	102	85	129	125	234	115	199	162	133	186

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR / DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
99	—	123	141	41.3	78.7	151	66.8	131	496	138	374	165	75	136	86.4
100	—	129	147	41.3	78.7	161	68.6	123	515	140	388	171	75	136	86.4
101	—	136	157	41.1	78.7	154	70.8	117	544	153	396	177	75	139	87.8
102	—	158	165	41.1	78.7	154	73.6	110	564	147	405	188	75	144	90.6
103	—	152	165	41.1	78.7	169	76.5	106	592	143	402	195	75	153	94.9
104	—	153	182	41.1	78.7	165	79.3	101	614	150	405	192	73.3	164	101
105	—	157	182	40.8	78.7	173	82.1	102	623	156	408	185	77.6	182	110
106	—	163	183	40.8	79	182	87.8	110	623	160	408	185	82.1	212	127
107	—	172	192	41.1	79	186	92	113	614	164	408	192	90.6	292	141
108	—	171	196	41.9	79.3	210	96.3	114	617	164	413	193	106	311	145
109	—	168	199	41.9	79.3	215	100	120	617	168	416	193	120	314	154
110	—	167	204	42.8	79.6	217	105	131	617	183	419	199	130	306	159
111	—	162	205	43.6	79.9	227	109	135	614	207	425	189	147	292	159
112	—	162	214	44.2	80.1	238	114	136	614	234	430	191	156	286	162
113	—	162	225	44.5	80.7	251	122	135	612	247	439	193	160	289	162
114	—	165	228	44.5	81.6	254	129	135	612	240	450	197	168	294	161
115	—	170	216	44.7	82.4	243	133	133	606	232	459	202	182	303	175
116	—	176	239	45.9	83.8	229	139	134	609	228	464	209	182	309	190
117	—	183	260	47.6	85.2	222	144	146	609	231	467	215	179	317	195
118	—	192	267	51.5	86.9	217	149	169	617	237	476	219	181	323	201
119	—	202	267	62.9	88.9	215	153	202	634	246	484	223	184	331	213
120	—	217	266	83	90.6	215	157	236	648	274	496	227	183	337	229
121	235	225	277	109	93.4	217	156	272	674	360	507	234	181	340	253
122	269	223	286	118	96.3	225	154	314	694	391	518	260	177	340	283
123	311	220	289	117	101	238	153	343	722	368	527	300	174	340	320
124	334	221	292	118	106	246	151	351	739	345	541	326	176	345	374
125	340	224	292	119	110	252	153	360	753	328	552	337	177	371	430
126	328	229	289	125	118	252	160	371	756	320	566	345	176	405	467
127	314	237	289	132	122	254	167	379	782	317	583	351	176	442	504
128	306	249	292	142	129	255	173	391	793	326	600	354	181	473	541
129	314	262	297	151	142	258	180	408	801	351	614	365	191	498	566
130	328	281	306	152	157	261	192	416	807	374	623	377	204	524	589
131	343	306	323	151	169	261	203	425	807	374	631	391	217	538	606
132	357	334	334	151	182	263	205	438	790	368	643	399	227	544	617
133	377	371	348	152	207	265	206	445	762	360	651	408	241	558	626
134	388	416	362	155	224	268	206	456	725	357	660	413	252	572	640
135	396	479	379	158	229	270	208	464	691	365	660	419	261	592	646
136	402	558	399	162	234	271	207	481	665	379	668	433	273	603	651
137	433	620	433	169	234	278	209	496	640	399	682	447	280	614	657
138	450	665	464	174	236	283	215	501	620	430	705	462	288	623	665
139	470	699	498	181	238	289	217	513	600	479	719	476	297	631	677
140	484	731	538	189	240	294	223	532	589	518	725	490	303	637	683
141	501	756	580	197	244	303	224	547	580	530	748	510	311	646	697
142	513	782	620	205	245	306	226	552	572	532	830	532	317	657	702
143	527	801	657	211	246	309	227	558	566	535	917	555	326	665	711
144	530	824	688	218	249	311	229	564	558	535	892	578	337	671	719
145	530	838	711	228	259	311	229	572	552	544	864	595	348	674	722
146	532	850	733	236	273	309	230	578	547	549	858	614	362	674	722
147	538	861	745	247	283	309	231	583	544	555	867	640	377	680	725
148	538	867	756	254	289	309	234	589	535	558	878	654	391	680	728
149	544	875	767	262	292	309	236	592	535	561	892	646	399	674	733
150	547	886	770	270	294	311	236	586	532	561	906	623	405	671	742
151	552	895	776	278	300	311	237	578	535	561	923	597	405	674	753
152	552	898	782	286	311	314	239	569	538	561	926	583	411	674	756
153	558	900	790	294	320	317	242	558	541	561	920	566	416	680	765
154	561	903	793	303	328	317	245	549	544	555	909	552	430	682	784
155	569	903	799	314	340	323	252	547	544	547	900	541	442	682	807
156	578	900	804	323	351	323	254	544	544	544	898	532	447	691	830
157	589	900	810	334	362	320	258	541	547	544	900	527	450	694	855
158	597	903	813	343	374	317	261	535	549	538	920	524	453	694	872
159	614	906	818	348	385	314	261	530	549	535	932	521	459	694	886
160	626	906	821	357	394	311	264	527	541	530	940	518	459	697	892
161	643	906	833	365	399	311	266	524	547	532	943	515	462	697	900
162	657*	906	850	377	402	311	268	527	547	532	940	515	464	699	906
163	674	909	867	385	408	311	269	530	552	538	934	515	467	699	913
164	694	915	881	391	413	311	269	527	555	541	934	515	470	697	920
165	711	917	898	399	422	311	269	530	558	544	937	515	467	694	926
166	728	920	920	405	433	309	270	538	564	544	937	515	470	694	934
167	745	923	937	408	439	306	272	549	566	544	940	521	470	694	943
168	765	920	951	411	453	303	273	566	572	544	940	535	473	694	954
169	784	917	963	413	459	294	273	580	575	538	920	552	476	694	963
170	801	923	977	419	462	286	276	597	583	538	892	566	479	694	977
171	824	926	985	422	470	283	280	617	589	541	867	583	479	694	985
172	844	926	1010	425	473	283	283	637	597	541	844	595	473	694	991
173	867	929	1020	430	481	283	283	651	603	544	821	600	473	694	997
174	883	929	1030	439	487	283	283	665	609	544	807	609	473	691	1010
175	903	926	1040	442	490	283	286	680	617	544	796	617	473	691	1010
176	923	920	1050	445	493	283	286	694	626	544	787	623	473	688	1020
177	946	917	1050	450	496	289	286	705	637	549	779	629	481	685	1020
178	963	915	1060	453	501	289	289	708	651	555	770	643	498	682	1030
179	977	906	1060	459	510	289	289	691	668	569	762	654	513	680	1040
180	991	900	1060	459	515	289	292	660	685	580	753	663	541	677	1050
181	994	900	1060	456	518	289	292	629	691	589	745	674	555	677	1050
182	994	895	1070	459	524	289	292	600	697	592	739	682	558	674	1060
183	994	895	1070	462	527	289	292	578	702	595	722	685	558	671	1060
184	988	892	1060	462	532	289	292	558	702	603	705	691	561	665	1050
185	983	883	1060	459	532	292	294	538	705	614	688	694	561	646	1050
186	971	881	1060	459	538	292	294	518	705	623	668	694	561	626	1040
187	957	878	1050	456	541	294	294	501	705	634	654	697	558	606	1040
188	946	872	1040	453	544	294	294	484	702	637	640	699	558	589	1040
189	923	867	1040	450	544	297	297	470	702	674	626	705	566	578	1030
190	909	855	1030	445	544	297	297	459	702	680	614	702	578	566	1040
191	906	847	1010	439	544	297	294	447	694	680	600	699	589	558	1030
192	881	838	1000	433	544	297	294	439	691	677	586	697	603	552	1020
193	883	827	983	430	544	297	294	430	685	682	575	694	612	549	1010
194	878	818	974	428	541	297	292	422	682	691	566	691	617	544	985
195	869	804	966	425	538	297	289	416	674	699	558	685	623	538	968
196	867	796	960	422	532	297	286	419	665	705	552	682	620	538	957

YEAR / DAY	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
99	180	205	169	175	209	203	127	219	164	286	144	343	396	127	103
100	189	180	176	195	212	208	131	221	170	303	144	345	433	132	103
101	199	136	181	197	223	214	135	221	176	317	144	351	459	144	106
102	213	136	191	195	235	211	141	222	181	334	145	354	479	140	106
103	232	190	208	180	244	207	143	223	184	351	146	360	515	138	106
104	237	196	208	168	249	205	145	224	190	362	146	362	538	138	107
105	240	186	215	167	260	203	150	225	193	345	147	368	507	136	108
106	241	174	222	165	251	203	152	232	193	337	147	388	467	134	108
107	243	176	233	163	251	205	156	261	199	348	147	419	436	135	108
108	253	180	245	163	252	208	161	292	204	362	147	430	405	135	109
109	260	181	252	163	254	212	164	323	206	374	147	470	377	137	111
110	257	191	257	161	251	217	165	354	209	377	147	544	354	143	119
111	247	211	250	162	245	221	170	382	213	388	148	535	334	151	125
112	248	226	266	163	244	223	171	402	223	396	148	566	320	157	137
113	260	240	294	168	242	225	186	416	231	413	148	583	317	165	155
114	281	231	323	175	246	224	202	430	235	425	149	600	328	173	170
115	317	261	348	182	252	219	197	447	236	442	149	617	348	180	181
116	362	273	382	189	255	215	213	464	239	476	155	634	374	185	199
117	425	276	413	198	257	211	238	490	243	518	163	654	405	191	225
118	510	273	442	213	259	208	259	538	245	561	163	682	430	197	253
119	518	267	473	236	269	206	268	575	244	586	162	722	436	202	277
120	487	265	504	252	281	206	270	578	243	623	160	765	439	207	300
121	462	262	527	258	289	208	269	569	243	736	163	796	439	219	326
122	445	265	558	259	292	210	270	575	244	736	165	824	436	227	334
123	439	275	589	261	294	213	274	603	249	705	173	847	442	231	340
124	436	286	606	267	297	217	283	631	254	682	183	861	450	235	362
125	430	309	623	300	294	221	297	648	267	674	194	878	462	237	411
126	430	337	643	348	286	224	309	663	286	682	197	917	470	238	436
127	433	368	663	377	283	226	311	674	309	697	199	943	479	238	445
128	442	405	705	391	292	227	314	691	320	711	199	957	484	240	442
129	453	447	725	405	294	233	317	708	328	714	198	966	487	241	439
130	467	481	722	428	294	239	323	728	331	714	200	963	484	244	436
131	479	504	714	447	297	245	343	745	326	703	206	957	481	247	433
132	507	524	711	470	303	248	360	756	326	682	216	949	479	248	433
133	524	535	703	496	308	253	377	745	323	651	225	934	473	249	433
134	532	549	702	515	309	257	399	728	326	620	233	912	467	251	430
135	532	558	716	530	309	268	419	714	328	600	238	886	462	257	428
136	541	566	731	541	309	286	425	697	337	578	242	861	456	265	430
137	549	572	733	555	309	314	433	674	345	561	248	850	453	274	433
138	561	578	767	572	309	326	462	631	354	547	255	844	450	280	436
139	566	583	773	589	309	328	490	634	360	535	260	833	447	283	439
140	566	578	776	614	311	326	510	617	362	524	265	821	445	286	439
141	566	572	782	634	311	323	527	606	362	515	266	807	442	286	436
142	569	572	787	665	314	326	521	606	365	510	268	796	436	289	436
143	569	575	796	691	314	326	501	609	368	510	271	787	436	294	433
144	578	575	801	714	317	328	487	606	371	513	277	782	436	297	436
145	578	580	807	728	323	334	479	597	377	513	280	779	433	300	436
146	583	586	807	742	328	340	470	592	379	521	281	770	430	300	442
147	589	597	807	753	334	343	464	586	382	527	281	767	428	300	445
148	592	603	807	756	340	345	456	583	382	535	283	762	425	300	447
149	597	606	813	770	348	345	447	580	382	544	286	753	425	300	447
150	595	609	827	776	351	345	442	580	385	549	292	739	425	300	447
151	597	606	833	782	360	345	433	586	388	555	294	739	425	300	447
152	614	606	841	790	365	345	430	586	394	558	294	770	430	297	447
153	631	606	844	793	371	348	428	586	396	566	297	801	433	294	445
154	637	609	844	793	377	348	422	583	399	572	300	821	433	294	447
155	646	614	847	790	382	351	416	583	402	578	303	835	433	294	447
156	646	620	841	793	385	351	413	583	405	580	309	850	430	294	450
157	648	623	835	793	391	354	411	586	408	583	311	855	430	294	453
158	651	626	833	796	394	357	411	586	416	583	314	852	428	294	453
159	651	626	821	799	396	357	411	589	422	583	317	835	433	289	450
160	651	631	793	799	399	360	413	592	422	580	317	830	447	289	450
161	651	643	770	804	402	365	419	595	425	578	320	847	462	289	450
162	654	634	750	810	405	368	416	606	425	578	323	867	470	289	450
163	654	657	733	821	405	371	419	634	425	580	326	878	479	292	450
164	660	657	719	824	408	371	419	680	428	578	328	892	493	292	450
165	663	663	702	827	413	371	422	722	433	578	331	909	510	294	450
166	663	663	694	827	425	374	425	767	436	578	334	934	530	300	453
167	665	663	685	830	442	377	428	810	439	578	337	968	541	303	453
168	668	668	682	830	459	377	428	855	445	575	343	997	547	306	456
169	671	671	671	833	476	379	428	881	453	572	345	1010	552	309	459
170	671	674	663	838	487	379	430	883	456	572	351	1020	555	309	459
171	668	674	654	838	498	379	430	881	456	569	354	1030	561	309	459
172	668	674	646	824	513	382	433	875	459	566	357	1030	569	309	459
173	665	677	640	799	521	385	433	869	459	566	357	1030	580	311	457
174	663	682	637	782	527	385	433	867	462	561	357	1040	580	314	458
175	654	688	640	762	527	385	436	864	462	558	360	1040	578	314	458
176	643	694	654	748	532	382	439	861	462	555	360	1040	575	314	457
177	634	699	663	736	538	382	445	864	462	552	360	1050	575	314	456
178	631	702	671	728	544	382	447	881	464	549	362	1050	575	314	454
179	623	705	680	722	549	385	450	915	464	547	374	1050	578	314	452
180	623	708	682	722	549	385	450	949	464	544	379	1050	578	311	450
181	620	705	682	716	544	382	450	974	464	544	382	1040	578	311	449
182	620	702	682	714	532	379	456	985	464	541	388	1040	578	311	446
183	617	699	680	705	518	379	462	1010	464	538	388	1040	575	309	446
184	617	697	682	699	507	379	464	1030	470	535	388	1030	575	306	444
185	617	694	682	694	498	379	464	1040	479	535	388	1030	575	306	442
186	614	691	682	685	490	382	467	1060	490	532	385	1020	575	303	441
187	612	688	682	685	481	379	473	1070	501	532	382	1020	575	303	441
188	614	671	682	694	473	379	481	1080	507	530	379	1010	575	300	438
189	623	654	694	716	464	377	490	1060	513	524	377	1010	575	297	436
190	631	634	699	739	456	374	496	1030	515	524	377	1010	575	300	434
191	629	626	705	756	447	371	504	1010	521	521	377	1010	566	306	432
192	629	609	708	773	442	368	521	1010	530	518	377	1000	558	306	434
193	629	597	714	793	436	362	547	1010	532	518	377	1000	558	306	434
194	629	597	714	804	430	360	558	997	532	518	377	1010	555	300	435
195	626	595	714	810	416	354	561	991	532	524	377	1010	549	297	434
196	626	583	714	816	405	351	558	997	532	544	374	1000	541	294	433

YEAR / DAY	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
99	96	134	93.4	87	134	120	104	161	105	89	133	127	230	122	205	168	148	191
100	94.6	134	93.6	90	135	130	106	164	108	93.5	138	131	226	130	212	168	170	194
101	94.9	137	94.5	92	136	150	109	166	113	99	147	137	222	134	220	167	210	204
102	95.7	138	96	95	138	148	112	165	114	105	149	148	222	134	226	166	232	214
103	96.3	136	97	98.5	140	146	115	168	117	113	160	158	221	134	232	167	280	227
104	96.1	139	99	101	142	151	118	176	123	123	183	168	223	133	244	170	273	241
105	100	139	101	105	150	158	121	181	127	130	211	176	225	132	255	175	275	254
106	102	143	103	115	159	158	123	183	136	136	242	182	231	133	264	178	279	268
107	99.8	146	105	118	163	160	126	182	145	141	271	187	244	135	277	179	294	305
108	94.6	149	107	123	165	161	130	180	155	146	300	194	256	137	290	180	312	329
109	94.9	152	108	127	166	159	140	179	160	150	332	203	265	140	308	181	343	341
110	96.6	157	111	131	167	156	164	178	167	155	361	214	274	142	326	185	353	368
111	98.8	164	113	134	171	155	182	178	172	161	386	224	281	144	344	191	350	403
112	95.5	170	116	139	172	154	186	179	175	168	412	234	287	148	369	200	347	420
113	95	179	117	142	173	153	183	181	186	168	436	242	289	156	385	206	348	432
114	94.8	198	119	143	175	154	175	183	211	169	451	251	290	165	393	210	354	449
115	94.5	213	122	146	179	153	170	183	218	171	458	283	291	173	395	218	380	465
116	94	211	126	151	178	155	167	184	210	175	462	327	296	183	391	224	407	487
117	95	207	127	154	176	159	166	185	205	180	463	333	303	193	388	227	405	527
118	94	206	129	156	175	159	167	187	203	183	463	325	318	200	385	231	413	563
119	94	206	133	158	175	159	169	191	206	187	462	321	328	206	383	236	418	577
120	94.3	208	183	161	175	158	168	196	210	191	462	314	342	209	387	242	418	579
121	96.3	213	195	164	175	158	167	209	212	197	462	310	350	214	391	248	420	580
122	99.3	224	213	168	178	159	166	237	210	201	465	309	356	220	397	254	423	582
123	99.3	228	228	171	183	163	165	270	210	206	465	309	360	224	399	258	424	586
124	97.7	232	232	173	188	173	165	293	213	207	451	311	364	228	400	263	425	595
125	103	233	245	176	190	185	165	301	217	209	431	314	367	231	402	270	427	609
126	108	236	269	180	192	194	168	303	220	216	413	317	372	237	402	273	428	624
127	111	238	297	184	194	197	172	304	224	225	396	323	374	243	403	277	429	643
128	114	241	315	189	198	198	178	304	227	232	381	336	376	251	404	279	433	657
129	117	247	325	193	202	199	182	308	231	238	373	352	380	256	408	280	434	680
130	120	250	331	201	209	202	186	312	235	244	364	361	385	261	408	285	435	700
131	121	254	341	205	212	204	190	315	239	249	357	363	391	269	409	293	435	725
132	123	259	353	207	216	205	191	318	244	252	351	366	393	283	410	302	434	750
133	125	263	354	209	218	204	194	321	250	256	347	369	396	294	412	312	434	770
134	125	268	347	211	228	206	195	324	258	261	342	370	400	301	413	320	436	790
135	127	276	350	215	261	207	195	325	264	267	338	368	404	308	413	328	443	805
136	130	285	351	219	303	210	194	325	274	271	335	368	405	311	414	336	452	837
137	132	291	333	223	321	213	197	327	280	274	334	367	406	314	413	342	460	849
138	134	299	365	225	321	217	199	328	286	284	332	369	408	317	418	346	464	863
139	136	306	372	228	315	222	202	327	293	294	332	371	409	318	420	349	471	870
140	139	314	375	230	317	232	211	328	298	298	330	372	409	322	422	351	486	877
141	141	322	376	231	320	239	223	330	304	301	330	372	410	327	423	353	508	882
142	142	331	379	233	318	245	235	331	312	305	330	371	411	334	424	355	520	888
143	147	338	381	234	319	249	241	330	323	307	333	371	411	342	425	357	523	891
144	152	346	387	235	320	253	243	332	331	311	333	372	410	347	427	359	525	891
145	155	356	393	237	321	260	244	333	340	314	335	375	412	350	430	360	525	891
146	158	366	397	237	323	267	247	337	347	318	337	376	414	353	431	359	527	888
147	161	376	397	239	326	274	250	339	355	319	337	377	415	357	432	360	530	889
148	164	387	397	240	327	285	259	341	366	322	339	381	415	358	433	362	532	891
149	168	400	398	242	331	291	265	343	378	325	343	381	415	361	435	364	533	896
150	170	411	399	244	337	295	268	344	389	327	350	382	416	364	438	366	533	905
151	174	422	400	246	342	300	271	348	399	328	353	382	417	368	439	365	539	916
152	177	429	404	247	345	302	274	351	408	328	359	381	420	376	438	364	541	926
153	180	.435	411	252	345	303	276	356	415	329	363	379	423	382	439	365	543	932
154	182	441	416	253	343	305	276	356	423	329	367	381	424	387	440	364	551	936
155	183	447	420	257	348	309	277	360	430	328	375	387	425	394	442	363	554	941
156	185	452	424	259	353	313	278	365	438	328	384	389	426	399	444	367	559	948
157	186	459	427	261	362	316	279	370	447	330	390	390	428	402	448	371	561	954
158	188	465	429	264	375	319	282	375	458	329	397	395	430	406	453	373	563	960
159	190	470	433	268	383	321	284	377	466	328	401	396	432	410	456	370	563	969
160	190	474	436	273	389	323	290	380	468	329	404	394	435	417	457	368	565	978
161	192	477	438	278	392	324	296	381	475	331	411	395	437	422	455	365	568	983
162	195	486	439	280	391	325	302	383	488	331	426	395	439	423	454	363	572	986
163	197	496	442	284	390	327	307	386	503	331	447	394	440	426	454	364	573	991
164	197	503	445	289	389	330	310	388	517	330	465	395	442	426	458	367	576	998
165	199	509	447	290	389	334	315	390	526	332	480	398	443	425	460	366	579	1000
166	200	512	450	294	389	340	325	394	534	332	493	399	444	428	463	365	580	1010
167	203	518	452	296	390	342	335	396	539	333	497	402	446	433	468	363	582	1010
168	205	521	455	299	391	344	345	398	545	331	497	408	447	442	471	361	585	1010
169	208	521	457	302	393	343	356	397	553	330	494	412	448	451	472	358	588	1010
170	209	523	459	305	393	344	366	398	557	329	491	414	448	454	472	359	593	1010
171	210	526	460	309	394	346	374	399	561	331	490	413	450	455	472	360	596	1010
172	209	531	462	310	394	349	380	407	564	331	490	411	451	455	471	359	600	1010
173	208	534	462	308	395	348	384	408	564	329	489	408	452	457	469	357	602	1010
174	208	534	462	308	398	346	391	410	565	326	491	407	452	461	466	354	603	1010
175	209	533	462	310	401	347	396	409	568	324	488	405	452	462	464	351	604	1010
176	210	533	464	312	402	348	404	408	567	323	487	402	452	461	462	349	604	1010
177	211	531	464	314	405	348	409	406	567	322	486	401	451	461	459	345	603	1010
178	213	529	465	317	407	349	413	405	567	321	485	399	452	467	456	342	603	1010
179	214	521	466	318	409	349	415	405	565	323	485	400	463	498	454	339	602	1010
180	214	511	469	320	414	350	417	406	562	321	485	401	473	552	450	335	600	1010
181	214	504	469	323	420	352	421	407	561	320	485	406	477	620	448	332	598	1000
182	214	501	469	323	423	351	424	406	559	316	485	405	480	646	448	329	596	996
183	214	500	471	325	423	351	427	405	558	315	484	403	482	624	449	328	596	991
184	215	499	473	327	424	350	432	403	555	312	486	400	487	595	451	329	604	985
185	217	494	473	329	426	350	434	400	552	311	492	399	494	575	455	326	617	978
186	218	491	473	329	430	351	436	400	549	310	493	398	505	559	458	321	633	971
187	219	487	470	328	432	351	436	397	545	308	494	395	518	545	455	316	645	966
188	221	484	467	330	434	350	437	395	540	305	497	390	535	534	451	310	658	959
189	220	481	468	331	436	355	437	397	534	301	500	385	550	522	446	305	668	951
190	219	476	465	332	434	372	437	394	528	301	503	382	562	514	442	300	678	942
191	219	470	464	332	432	396	436	391	524	300	500	377	572	504	438	301	688	934
192	219	467	462	333	429	418	435	388	521	298	494	372	583	495	433	301	696	929
193	218	462	459	333	427	438	434	384	518	294	492	369	591	483	427	301	701	920
194	216	459	455	335	425	453	436	383	511	292	487	369	595	478	421	303	703	907
195	215	457	457	340	425	468	437	383	508	294	485	372	600	471	418	312	703	894
196	215	454	459	347	433	479	446	399	509	304	492	383	602	470	425	329	706	885

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR / DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
197	861	784	951	416	530	297	283	416	657	711	544	680	589	535	954	623	561	711
198	855	776	940	411	524	294	281	413	651	719	535	674	555	530	943	623	538	705
199	844	773	929	405	524	294	278	408	643	728	530	668	535	527	934	620	521	705
200	835	762	920	399	521	294	276	399	640	736	527	665	532	515	926	617	504	699
201	821	753	912	396	518	292	273	391	631	739	530	665	538	513	915	612	493	671
202	807	745	906	394	513	289	271	382	626	742	532	663	555	504	915	606	481	637
203	790	733	892	391	510	283	268	374	620	742	538	657	547	504	909	603	464	614
204	776	722	878	388	507	283	263	368	617	739	544	654	524	504	903	597	450	609
205	759	708	864	385	501	283	264	362	606	742	547	651	496	501	900	592	439	595
206	745	694	852	382	496	282	261	357	595	739	547	646	473	496	892	586	425	566
207	733	680	841	379	490	283	258	354	589	736	547	640	484	493	875	583	416	541
208	719	668	830	374	493	283	254	348	586	731	547	634	532	493	855	578	408	532
209	705	654	816	368	496	283	252	343	580	728	547	629	578	487	835	572	399	541
210	691	640	799	365	493	283	252	337	575	725	547	626	617	484	818	566	391	549
211	674	626	787	362	490	292	251	334	569	716	544	620	648	479	807	564	382	558
212	660	612	770	362	484	306	247	331	566	708	544	614	665	470	796	555	383	566
213	643	595	759	362	479	311	244	326	558	705	541	612	677	467	790	541	399	569
214	626	580	745	362	470	311	241	323	555	699	538	606	694	462	784	532	416	569
215	612	566	731	360	464	311	240	320	549	694	535	603	711	459	776	524	436	564
216	595	555	716	357	462	306	238	317	549	691	527	597	714	456	773	521	450	566
217	580	541	705	354	456	303	234	317	544	683	510	595	674	453	770	518	459	566
218	572	530	691	348	447	300	231	314	541	682	496	589	617	450	759	515	453	566
219	561	518	680	345	439	294	225	314	535	674	476	586	564	445	748	513	447	564
220	549	504	668	343	433	294	223	309	532	674	464	580	535	445	739	507	445	541
221	538	490	657	337	433	292	221	309	527	668	459	572	524	442	731	504	436	527
222	527	481	640	334	436	286	217	311	521	663	462	569	515	439	722	501	422	515
223	518	473	626	328	442	282	214	314	515	654	464	561	507	436	714	496	405	515
224	510	473	614	323	453	279	211	326	510	646	464	538	507	433	705	490	391	515
225	504	470	606	317	479	278	208	340	510	640	467	515	504	430	699	490	377	513
226	493	462	589	311	493	273	204	357	504	634	470	504	498	428	697	481	368	513
227	490	456	578	306	487	268	203	362	501	626	467	496	493	425	685	476	357	510
228	481	450	566	300	479	266	204	368	496	609	467	490	487	419	682	467	348	507
229	476	442	555	297	473	264	199	385	496	597	467	484	487	416	677	462	340	484
230	467	433	544	292	470	262	196	408	487	600	464	476	484	411	671	456	331	450
231	462	422	532	289	464	261	194	433	484	603	464	470	481	408	665	450	323	430
232	456	413	524	286	459	257	193	459	481	603	470	470	481	408	660	445	317	428
233	450	405	510	283	459	251	190	484	479	600	484	473	479	408	651	445	309	428
234	445	399	498	281	453	246	188	510	473	600	490	479	476	408	646	439	303	430
235	439	394	490	279	445	244	187	532	470	600	498	484	473	402	634	439	297	430
236	433	388	479	274	439	241	186	555	467	595	501	493	467	396	620	430	300	430
237	428	382	473	271	433	241	183	575	464	592	504	504	464	394	614	428	311	430
238	416	377	464	268	425	236	181	586	464	589	507	515	459	391	609	428	326	430
239	405	368	456	260	419	235	178	600	459	575	510	530	453	388	606	425	348	425
240	402	360	456	255	411	233	177	609	456	555	510	541	447	385	597	419	374	408
241	396	354	447	252	405	230	174	617	453	547	510	552	445	382	595	419	394	391
242	388	348	439	249	399	226	172	603	450	544	510	566	439	379	592	413	405	385
243	382	340	425	246	394	224	171	580	450	544	510	583	436	377	586	405	413	382
244	379	334	419	242	391	220	167	561	447	547	510	589	430	374	580	399	428	379
245	371	328	411	238	388	217	165	544	447	547	510	597	428	371	575	396	436	379
246	368	323	408	234	382	215	165	530	445	549	510	606	422	368	569	394	447	374
247	362	314	402	229	379	212	160	513	442	547	507	614	416	368	566	388	453	374
248	360	309	394	221	374	208	158	501	436	555	507	620	413	368	558	382	462	368
249	354	303	385	217	368	205	157	493	436	564	504	626	411	368	538	379	476	362
250	348	300	377	215	365	204	155	479	430	572	501	626	408	365	521	374	481	351
251	345	294	368	213	360	200	153	470	428	578	498	629	405	362	515	371	484	343
252	337	289	362	212	354	196	152	464	425	580	496	629	399	362	510	368	487	337
253	334	286	354	210	348	195	150	456	422	580	493	629	396	362	504	362	487	328
254	328	279	348	208	345	191	149	445	422	583	490	631	394	360	496	357	481	326
255	326	276	345	205	348	191	147	430	419	583	487	631	391	357	496	354	479	320
256	320	270	343	204	362	188	146	419	413	583	484	631	388	357	493	351	481	314
257	317	266	334	200	365	186	144	416	408	583	484	629	382	357	487	348	484	309
258	311	260	328	199	362	184	143	419	408	586	481	629	379	354	481	345	484	306
259	309	255	323	195	360	182	143	425	408	589	479	629	379	348	479	343	484	303
260	306	251	323	194	354	181	142	425	405	589	476	629	377	345	479	340	479	300
261	300	246	320	193	345	178	141	413	408	589	476	629	374	345	473	340	470	294
262	294	244	317	188	340	177	140	399	430	589	470	629	374	340	467	334	476	292
263	292	242	314	187	334	174	140	391	442	586	470	629	371	340	464	326	479	283
264	286	237	309	183	326	173	137	385	447	583	467	626	368	337	464	311	487	277
265	282	232	306	179	320	169	134	374	450	583	467	623	368	337	459	303	490	268
266	277	231	300	179	317	166	131	362	450	580	464	617	365	337	462	292	496	264
267	274	228	297	175	314	164	129	354	453	580	462	614	362	334	470	278	496	256
268	272	227	297	[illegible]	309	162	129	348	456	580	456	614	360	334	490	268	498	250
269	269	223	294	171	309	161	128	343	456	580	453	612	357	328	498	261	498	246
270	268	219	294	168	303	161	127	337	459	580	453	609	354	328	496	253	504	240
271	266	214	292	172	300	160	129	331	459	578	447	606	354	328	493	246	504	234
272	263	211	289	175	303	158	126	323	459	575	445	603	351	326	487	241	504	231
273	258	208	289	175	303	156	125	314	459	572	442	600	345	323	481	237	504	229
274	254	206	289	176	297	153	124	311	459	572	442	597	345	323	476	234	504	224
275	251	204	286	174	294	152	126	306	459	566	439	592	348	323	476	229	504	218
276	247	203	283	172	292	150	123	303	459	555	430	589	354	323	470	225	501	211
277	247	199	286	170	286	148	122	294	459	538	430	586	351	320	467	219	498	206
278	247	199	283	169	282	146	121	294	456	535	428	583	348	306	462	216	496	202
279	247	195	283	169	279	146	119	294	456	535	419	572	348	286	456	213	496	198
280	246	193	283	168	278	143	117	294	456	532	408	552	345	270	453	210	490	195
281	243	190	283	166	276	142	119	294	453	532	382	535	343	260	447	210	490	192
282	238	187	286	160	276	140	116	294	453	535	365	527	340	260	442	210	487	192
283	238	186	250	157	273	138	115	294	450	535	343	510	340	262	436	207	487	193
284	234	185	174	154	273	138	113	297	450	532	328	496	340	267	436	206	479	193
285	233	182	143	154	273	136	112	300	450	530	317	467	337	273	433	202	476	193
286	232	181	134	152	272	135	112	303	445	530	311	439	337	279	430	200	476	191
287	230	179	130	151	271	134	112	303	447	535	300	411	340	281	430	199	473	191
288	230	177	125	150	268	135	108	306	445	538	289	365	340	286	428	200	467	192
289	230	174	122	150	268	132	108	306	445	541	286	328	340	286	425	199	467	197
290	231	172	119	151	268	129	105	306	445	544	280	300	337	289	422	197	467	201
291	229	170	116	152	268	128	103	306	445	549	275	276	337	289	419	194	464	207
292	229	168	113	151	267	128	101	303	445	552	269	252	337	289	413	190	459	211
293	229	168	112	151	267	127	100	303	442	558	264	232	337	289	411	188	450	217
294	228	168	110	150	265	124	97.7	303	442	558	262	219	340	289	411	187	436	220

YEAR / DAY	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
197	824	394	348	553	1010	532	561	374	1000	538	292	430	213	451	462	356	447	490
198	833	382	345	549	1020	530	572	374	997	535	286	429	212	446	459	373	460	498
199	835	371	343	544	1020	527	586	371	991	535	286	428	210	441	457	403	474	503
200	835	360	337	541	1030	527	597	368	983	547	279	426	207	437	454	436	486	509
201	835	351	334	532	1030	524	606	365	977	535	275	425	205	432	454	468	505	513
202	841	343	331	527	1030	521	612	362	977	549	272	422	203	428	471	506	523	517
203	841	334	331	521	1030	518	620	360	974	544	268	420	202	425	506	554	526	520
204	841	323	326	515	1020	513	626	357	968	538	265	417	201	423	535	590	521	524
205	841	317	320	507	1020	507	629	354	966	532	261	414	200	453	543	591	515	524
206	838	311	317	498	1020	504	631	351	957	530	258	409	198	506	541	569	512	525
207	833	306	317	490	1020	504	631	348	951	538	253	405	196	551	537	543	523	523
208	824	300	320	487	1010	498	629	348	946	544	250	403	195	564	532	536	553	521
209	816	294	323	484	1000	493	629	345	943	527	246	404	193	563	527	543	583	518
210	801	289	323	481	991	481	626	345	937	498	242	403	192	561	523	529	594	516
211	782	282	320	481	983	473	623	340	932	473	237	402	194	557	518	509	587	516
212	756	279	317	479	971	464	620	337	926	456	233	402	199	552	521	489	564	513
213	739	273	314	476	963	456	617	334	923	442	229	400	200	546	549	478	540	513
214	722	269	311	476	949	447	612	331	920	442	225	398	197	540	581	489	530	514
215	705	265	309	473	937	442	609	328	920	447	221	396	195	533	591	528	552	516
216	685	261	309	470	929	433	606	326	920	453	219	394	194	511	582	561	573	513
217	665	257	309	467	920	430	600	328	917	456	216	392	192	478	573	567	581	510
218	654	257	311	473	912	425	597	323	920	459	215	389	187	456	563	542	578	507
219	637	257	311	473	900	413	592	323	923	462	210	386	183	446	553	513	572	507
220	623	258	314	473	889	402	583	323	923	462	207	382	180	445	547	487	552	506
221	609	257	311	473	881	394	578	323	926	462	204	378	183	468	541	468	522	506
222	595	258	311	473	872	388	572	320	929	456	202	376	197	509	536	459	491	505
223	578	258	311	473	864	382	566	317	926	445	200	371	214	553	520	455	464	503
224	564	261	314	470	841	377	558	314	923	433	199	364	238	585	500	467	451	499
225	538	261	311	467	818	371	541	311	923	422	197	358	284	592	480	499	456	494
226	515	261	311	467	796	371	513	309	920	415	197	350	335	573	470	531	472	489
227	498	260	309	462	776	368	484	306	917	405	195	344	376	530	458	545	470	487
228	481	260	309	459	759	357	464	303	915	402	193	338	391	484	452	530	453	480
229	467	264	309	456	739	348	447	311	906	402	191	332	391	449	445	501	439	465
230	453	267	309	450	722	345	433	320	895	396	189	326	375	431	431	472	430	450
231	445	273	306	447	708	340	416	328	881	388	187	317	348	437	412	448	420	436
232	447	276	300	442	697	331	402	337	869	377	185	309	320	440	396	426	404	421
233	447	280	300	439	682	328	388	343	858	368	182	300	295	438	379	409	382	396
234	447	281	297	436	677	326	377	348	850	360	178	289	272	426	367	393	362	368
235	447	282	297	436	665	326	365	354	844	357	176	281	253	406	351	379	340	343
236	453	283	294	433	657	320	354	357	835	354	174	274	238	383	340	367	331	323
237	453	286	294	428	648	314	345	357	830	345	174	266	225	362	328	356	320	302
238	453	286	292	425	637	309	337	360	824	340	172	260	213	341	318	345	309	284
239	453	289	289	422	629	303	326	362	818	334	171	255	205	321	307	333	296	268
240	447	289	289	416	620	297	317	365	810	328	170	249	197	304	297	320	289	254
241	445	289	289	413	612	289	311	368	804	326	167	243	190	288	289	310	278	245
242	445	289	286	408	603	283	303	368	799	331	165	238	184	275	283	300	268	237
243	442	292	283	411	595	277	297	371	790	337	164	231	178	264	275	291	260	228
244	439	292	282	408	580	269	292	371	784	337	166	225	175	255	269	283	253	223
245	436	289	280	405	572	262	286	371	765	334	162	219	171	248	264	276	245	220
246	430	300	281	402	566	256	281	371	739	328	159	213	167	240	257	270	237	216
247	428	303	281	399	555	252	276	368	719	326	157	208	163	230	251	265	231	216
248	422	306	283	396	544	247	270	365	699	317	155	206	157	223	246	258	228	215
249	422	303	283	394	532	244	267	351	682	309	152	204	155	217	242	254	227	211
250	422	300	283	391	515	238	263	334	665	303	154	200	153	209	239	247	226	208
251	428	300	283	388	487	234	260	317	648	297	154	198	150	203	238	241	224	204
252	430	300	283	385	470	230	257	303	634	292	151	195	145	200	240	236	223	200
253	433	297	283	382	462	226	256	286	623	282	149	192	142	195	233	231	221	197
254	433	294	282	382	453	222	254	275	606	275	148	190	141	193	236	227	218	195
255	430	294	281	379	450	218	251	267	592	267	148	188	141	188	234	223	216	195
256	433	294	280	377	447	215	247	264	578	261	149	184	138	185	230	222	213	194
257	436	294	279	374	445	210	243	263	564	255	147	180	138	181	227	220	210	193
258	439	292	278	374	445	206	240	265	549	249	146	178	136	178	224	218	206	193
259	442	289	278	368	439	202	236	264	541	243	143	176	134	175	222	218	204	193
260	445	289	278	362	439	199	233	263	530	237	142	174	134	173	218	214	203	192
261	445	292	279	360	433	196	230	263	524	232	138	172	134	170	215	210	201	191
262	445	289	278	357	428	193	227	259	515	227	135	169	134	169	212	208	199	187
263	442	292	276	357	425	190	225	256	507	226	132	166	134	167	209	205	196	185
264	442	292	275	354	425	188	221	255	498	224	129	164	133	165	207	203	195	184
265	445	292	277	351	425	186	219	253	493	218	129	163	134	161	204	202	192	183
266	447	294	276	348	419	184	215	252	487	213	128	161	134	159	201	199	190	183
267	447	294	279	348	416	182	213	250	481	210	126	158	133	158	198	197	187	179
268	445	294	277	348	416	180	211	248	479	208	125	154	132	156	197	195	184	176
269	445	292	274	345	413	180	210	246	473	206	123	152	131	152	195	192	182	175
270	442	294	271	343	411	179	211	243	470	205	121	152	130	150	193	190	178	173
271	442	294	270	345	411	178	206	244	467	206	120	151	129	146	192	190	175	170
272	439	294	268	343	411	179	202	242	464	205	119	150	128	144	191	186	174	167
273	433	294	266	340	408	177	197	240	462	204	118	148	127	143	186	182	172	165
274	433	297	265	340	405	174	193	237	456	204	120	148	128	141	182	180	170	164
275	430	297	264	340	403	172	190	238	453	205	120	145	127	138	181	179	169	163
276	425	300	263	337	402	169	188	249	453	205	120	145	126	138	180	178	169	162
277	425	300	261	334	402	168	187	261	456	204	117	142	125	137	177	176	167	162
278	422	297	260	334	399	167	185	272	459	204	116	140	125	134	173	174	165	160
279	422	300	260	334	396	168	183	283	464	205	114	140	124	132	169	172	165	158
280	419	297	257	334	391	166	180	292	470	205	114	139	123	130	169	170	165	155
281	419	297	256	331	394	163	182	286	470	204	113	138	124	129	168	168	167	154
282	416	297	259	331	391	161	192	275	473	204	113	137	123	129	168	166	165	153
283	416	300	258	328	388	159	207	262	476	204	112	134	125	129	166	165	165	153
284	419	300	258	328	385	158	223	249	479	202	111	132	121	128	163	165	164	154
285	419	294	257	328	382	157	236	236	479	200	112	132	120	128	162	163	162	155
286	416	294	256	328	379	156	248	224	479	198	112	132	121	125	161	160	161	155
287	413	294	253	326	377	153	260	216	479	198	110	131	122	124	159	159	159	154
288	413	294	251	326	371	151	267	222	479	196	106	131	122	122	158	157	161	156
289	413	294	249	323	368	148	275	231	476	193	106	130	121	121	158	155	160	157
290	416	294	247	323	368	147	283	244	473	191	106	128	119	120	157	153	156	158
291	413	292	247	323	368	148	292	255	473	190	106	128	118	119	157	153	153	158
292	416	292	244	328	368	148	297	266	470	187	106	127	118	117	155	152	152	157
293	413	297	242	331	368	145	303	276	470	185	105	125	119	116	151	149	151	156
294	413	297	240	331	371	143	306	283	467	185	106	125	118	117	149	147	149	155

YEAR / DAY	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
197	461	437	520	321	504	399	602	481	438	345	706	876
198	474	439	530	345	517	414	600	494	453	358	706	869
199	485	452	539	389	527	427	599	502	474	370	708	859
200	495	449	545	433	535	436	597	510	507	387	713	849
201	504	470	552	443	542	442	596	515	523	421	715	842
202	511	501	554	444	542	445	593	513	509	461	718	834
203	527	518	553	443	545	445	592	511	502	493	718	827
204	558	519	551	421	556	456	587	508	525	506	713	819
205	588	517	547	399	580	466	583	503	551	509	708	811
206	587	514	543	386	585	476	580	502	567	509	705	802
207	560	514	540	381	584	507	577	501	570	506	701	793
208	532	513	535	380	595	521	575	495	556	489	697	785
209	508	510	530	379	598	512	569	493	527	457	693	[illegible]
210	500	507	526	379	594	483	565	495	495	425	689	[illegible]
211	496	504	523	379	591	454	561	498	472	394	683	[illegible]
212	489	501	518	375	590	430	556	505	475	380	664	[illegible]
213	484	496	514	385	588	414	551	507	503	373	636	[illegible]
214	480	492	509	398	588	410	548	505	525	370	610	[illegible]
215	476	484	502	406	584	406	543	501	530	366	587	[illegible]
216	472	481	497	432	566	402	538	500	531	363	578	[illegible]
217	479	478	492	433	530	401	534	510	518	361	574	713
218	495	474	487	409	496	399	529	540	492	357	572	709
219	504	469	482	403	470	395	513	568	479	353	567	702
220	505	467	476	428	463	390	483	565	495	350	560	695
221	485	463	475	449	489	388	450	538	493	348	554	686
222	463	459	472	453	511	399	423	509	467	344	549	676
223	447	455	466	437	504	409	407	480	437	342	543	669
224	449	453	459	408	499	393	403	461	415	341	540	662
225	460	451	454	377	508	377	414	450	406	340	536	658
226	447	448	451	353	507	374	445	446	418	341	532	655
227	430	445	446	344	495	382	468	442	451	336	526	649
228	420	444	443	342	471	412	473	438	461	335	524	639
229	409	442	441	341	442	440	459	434	439	332	520	631
230	397	440	437	337	418	452	430	431	410	331	516	623
231	384	433	427	334	401	435	399	428	388	322	511	617
232	373	417	417	345	381	455	372	427	378	303	509	611
233	364	392	394	354	363	441	343	418	369	286	503	606
234	357	364	371	339	347	410	317	403	353	271	498	602
235	347	346	358	320	332	377	296	388	332	259	488	580
236	329	320	343	297	314	349	279	378	313	248	468	512
237	317	302	330	277	299	324	264	371	295	237	449	503
238	304	285	318	257	286	301	253	357	277	228	430	470
239	291	269	308	240	274	279	242	346	263	219	412	450
240	278	258	300	227	263	263	232	336	252	211	397	425
241	267	249	292	216	255	250	223	327	242	203	383	402
242	256	239	287	205	247	240	213	318	234	196	370	382
243	248	231	279	197	241	228	204	309	228	190	359	364
244	241	227	268	189	234	221	199	300	221	184	351	348
245	236	225	260	184	225	214	194	294	214	178	344	336
246	229	223	255	179	221	207	188	286	207	173	336	324
247	226	221	249	175	217	199	182	277	203	169	321	314
248	220	218	244	169	211	192	176	269	198	165	312	306
249	214	212	240	168	208	188	169	262	193	162	304	303
250	208	210	237	163	203	185	164	257	190	159	297	299
251	203	206	233	159	200	181	162	253	187	157	292	295
252	199	203	228	155	197	176	160	248	184	155	288	291
253	196	201	219	151	192	170	158	244	183	153	285	288
254	193	199	215	148	190	166	154	242	180	151	281	285
255	190	197	209	146	186	164	151	239	178	149	276	282
256	185	194	206	144	184	163	148	234	177	148	272	278
257	182	193	202	142	181	159	146	232	173	146	269	276
258	178	190	200	140	178	157	144	229	170	143	268	274
259	175	187	197	138	176	153	142	224	167	142	267	273
260	172	185	195	136	173	150	140	221	164	139	265	272
261	170	183	190	133	171	148	141	218	162	137	263	269
262	168	179	187	132	168	145	138	216	161	135	261	265
263	165	177	182	131	167	144	136	213	159	134	260	262
264	161	176	180	129	162	143	135	209	157	132	260	260
265	161	173	178	127	160	143	135	205	155	131	258	258
266	162	171	176	125	157	140	133	203	152	130	255	255
267	164	170	173	123	154	138	137	200	151	129	253	253
268	164	168	170	122	151	137	135	200	149	128	253	251
269	163	166	166	120	150	136	135	198	147	127	253	249
270	163	165	164	119	148	134	133	195	147	129	259	250
271	161	163	162	118	145	133	132	193	143	129	262	250
272	159	160	161	116	142	132	128	190	142	127	267	246
273	157	159	159	116	140	133	127	188	142	126	271	248
274	156	158	159	116	141	130	127	188	143	125	273	248
275	154	157	156	114	140	130	128	185	143	126	273	246
276	153	156	154	111	140	130	128	182	143	124	274	245
277	152	154	152	110	139	128	127	179	139	123	275	245
278	151	154	151	110	137	125	127	178	137	122	278	242
279	150	152	149	109	137	122	125	177	137	121	278	239
280	149	150	148	108	136	121	124	175	135	120	278	236
281	148	150	146	105	135	121	123	173	133	121	278	232
282	146	149	145	105	134	120	122	171	132	119	278	231
283	143	147	143	105	134	118	122	169	131	119	279	231
284	141	145	142	104	135	118	119	166	131	118	280	231
285	139	144	140	103	134	118	121	164	129	117	283	229
286	137	143	140	101	130	119	119	162	127	115	295	229
287	135	143	140	99.5	130	119	119	160	127	114	308	227
288	134	142	139	98.5	129	118	119	157	128	114	318	227
289	132	141	138	97.7	126	121	117	156	128	115	329	228
290	131	139	136	96.2	125	118	115	154	126	116	338	228
291	130	139	135	95.1	124	117	116	153	124	115	344	229
292	130	137	134	94.2	121	116	117	151	125	115	349	229
293	131	134	131	93.7	123	116	120	151	123	116	353	228
294	131	131	132	92.1	123	123	119	147	122	114	359	228

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR / DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
295	228	167	108	149	262	125	97.1	297	439	364	262	208
296	228	167	105	150	260	125	94.3	297	436	364	263	198
297	228	165	104	149	259	122	94.3	294	416	366	263	187
298	227	157	103	152	256	120	95.7	294	402	372	264	179
299	224	152	103	151	253	119	94.3	294	399	375	267	171
300	223	152	102	149	253	117	94.3	294	402	375	268	167
301	221	152	98.5	150	252	117	90.6	294	408	378	270	162
302	219	153	97.4	151	249	117	87.8	292	408	378	270	158
303	219	153	96.8	153	246	119	86.7	297	411	378	273	152
304	217	151	95.1	154	246	119	87.2	303	413	386	276	150
305	214	160	94	155	244	119	95.4	306	413	606	281	147
306	209	166	92.9	156	243	114	88.1	306	419	631	286	148
307	209	168	91.7	157	243	111	84.1	303	419	634	292	141
308	209	170	90	155	246	110	84.7	300	425	626	294	114
309	209	172	90.3	156	249	110	87.5	300	425	617	300	130
310	211	176	92	157	257	111	89.5	297	428	609	303	136
311	208	178	88.1	157	263	113	89.5	297	428	606	306	138
312	209	179	86.7	157	263	113	88.3	294	428	612	309	139
313	204	183	86.1	158	262	114	87.8	292	428	614	309	140
314	197	184	83.8	159	262	113	85.8	294	428	617	311	139
315	214	185	83	160	261	100	85.5	292	428	623	314	139
316	230	187	82.1	160	260	101	86.1	297	425	612	314	139
317	237	187	81	160	258	101	85.5	297	425	592	314	138
318	233	187	81.3	161	261	99.1	84.1	300	425	575	317	137
319	195	187	81.3	162	272	99.1	82.7	300	425	524	317	136
320	144	184	81	163	278	97.7	77.6	297	419	436	314	133
321	140	182	81	164	279	97.1	78.2	300	411	433	314	125
322	148	181	80.4	163	278	96.3	76.5	303	416	459	317	116
323	213	180	80.4	161	279	96.3	75.6	306	416	487	317	108
324	237	179	78.4	161	281	96	74.8	306	419	487	317	101
325	251	177	79.6	161	286	94.9	74.5	306	413	447	317	96.3
326	269	176	80.7	162	294	94.3	73.6	306	419	453	314	93.4
327	269	173	78.4	161	297	94	72.5	311	416	419	314	92
328	270	170	75	162	294	92	71.9	320	419	402	314	89.2
329	261	168	71.9	166	294	85	71.1	326	416	388	314	86.4
330	249	167	71.1	165	294	79	71.4	328	413	379	306	85.5
331	241	165	70.2	168	294	77.9	70.8	331	408	368	309	85
332	235	164	69.1	179	294	77.3	70.8	331	413	371	306	85
333	229	163	67.7	192	294	76.5	70.8	331	413	396	303	85
334	225	161	67.1	193	294	72.2	70.8	328	422	388	300	85
335	218	161	67.1	190	292	68	70.2	326	425	394	300	85
336	214	161	67.1	190	286	67.4	69.4	323	425	394	297	85
337	211	161	67.1	187	289	67.1	69.1	317	428	391	294	85
338	210	160	66.8	183	286	66.8	68	314	419	391	292	85
339	209	158	66.8	176	286	66.5	66.8	326	396	396	289	85
340	206	156	66.5	169	289	67.1	67.1	317	326	396	292	85
341	204	153	66.5	173	294	67.7	66.8	314	317	394	294	85
342	202	152	66.3	177	294	67.6	66.8	345	331	396	297	85
343	201	150	65.1	157	292	66	66.5	365	340	396	303	85
344	199	150	63.1	148	289	65.1	66.5	368	328	402	303	85
345	198	150	60.3	144	279	66	66.5	368	326	413	297	85
346	194	151	58	140	292	66.3	66	379	334	425	292	85
347	193	151	56.4	137	286	64.6	66.5	391	334	422	279	85
348	190	150	57.5	135	289	63.4	67.1	396	334	419	263	85
349	189	148	58.6	132	283	63.1	66.5	396	328	419	241	85
350	187	146	59.7	130	282	62.9	66.3	391	317	425	224	85
351	185	144	60.9	127	281	61.9	66	408	317	413	214	85
352	183	142	58	126	283	60.3	65.7	419	282	425	208	85
353	181	144	57.8	125	289	59.5	65.4	422	263	481	204	85
354	181	146	57.5	123	300	58.9	65.1	428	267	496	200	85
355	178	144	60	122	289	57.8	65.1	419	258	467	198	85
356	176	142	56.9	120	282	56.6	65.1	413	247	450	198	85
357	175	141	56.6	119	275	56.4	65.1	422	236	487	198	85
358	173	136	56.6	118	266	55.5	65.1	430	235	501	198	85
359	172	135	56.6	117	230	54.9	65.1	439	240	487	198	85
360	172	133	56.4	116	213	53.8	65.4	430	230	481	198	85
361	171	131	56.1	116	219	53	65.7	425	221	484	198	85
362	170	128	55.8	114	247	51.8	66	419	219	498	197	85
363	170	125	55.5	113	237	51.3	66.5	428	216	479	197	85
364	170	122	55.2	113	227	51	67.7	385	212	479	195	85
365	168	121	54.9	112	215	51	69.4	374	208	459	194	85

YEAR / DAY	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
295	340	289	408	191	425	225	413	300	240	334	374	143	311
296	343	289	399	192	413	229	413	300	237	334	371	141	311
297	345	292	396	191	391	231	413	297	236	334	371	140	311
298	345	292	396	190	385	235	419	297	237	343	371	139	314
299	345	289	394	188	391	237	422	297	236	348	368	139	314
300	345	289	394	186	385	241	422	297	235	348	368	139	317
301	345	289	394	187	379	242	425	297	234	345	365	138	317
302	343	286	396	187	374	242	436	297	234	343	365	138	320
303	343	286	399	187	371	249	459	297	233	343	348	138	320
304	345	286	402	186	368	253	476	297	232	345	340	140	320
305	345	283	405	186	365	255	481	297	232	345	326	139	323
306	345	282	408	185	362	255	481	297	232	345	317	134	323
307	345	282	405	186	360	255	479	297	231	345	303	118	323
308	345	282	402	186	348	255	479	300	229	345	294	94.3	320
309	345	282	399	185	328	254	476	303	229	343	289	77.9	320
310	345	281	399	182	314	252	473	303	227	343	283	96.8	320
311	343	281	396	178	300	249	470	294	225	343	278	92.9	320
312	345	281	394	176	286	243	470	289	222	334	274	114	320
313	351	278	388	175	278	241	470	283	218	317	270	123	320
314	348	268	383	173	268	236	470	278	212	306	267	127	317
315	348	257	382	170	261	232	467	275	206	294	263	127	309
316	348	257	382	168	257	227	470	271	202	286	260	127	297
317	348	257	382	163	251	225	473	268	198	278	257	127	283
318	348	261	379	162	247	224	470	265	195	270	255	127	273
319	348	261	377	159	229	222	464	263	191	263	252	127	262
320	348	261	374	150	210	219	445	261	187	257	249	127	253
321	348	262	374	161	223	216	416	258	185	252	246	126	246
322	348	256	374	159	239	215	399	256	182	248	243	126	241
323	354	206	374	136	257	212	405	259	181	244	241	126	235
324	362	201	374	134	247	210	391	263	177	242	238	126	229
325	368	195	371	153	228	211	377	270	176	242	236	127	229
326	368	193	368	154	213	211	368	270	172	238	234	127	228
327	365	198	345	145	181	213	360	271	170	234	233	127	227
328	362	224	328	109	201	210	351	269	167	232	232	127	227
329	362	228	317	97.7	199	207	345	268	164	229	231	127	225
330	362	227	294	99.4	197	202	340	265	161	227	230	126	222
331	362	221	196	147	195	182	334	264	158	225	227	126	219
332	357	212	191	161	185	184	328	266	156	222	209	126	219
333	354	204	190	154	120	201	328	269	154	220	210	125	214
334	354	198	187	139	163	195	323	271	152	217	210	125	212
335	348	190	186	130	179	186	320	270	150	214	201	124	210
336	351	184	181	128	187	175	320	272	149	210	194	123	207
337	331	176	178	127	186	189	306	275	148	198	126	123	205
338	314	168	176	127	186	191	279	277	147	191	127	123	202
339	303	161	173	127	187	188	245	276	147	177	130	123	200
340	292	154	173	127	187	165	244	274	146	165	135	123	197
341	281	150	171	127	186	164	241	272	146	135	139	123	195
342	270	144	171	127	185	161	241	272	144	152	142	124	194
343	259	136	171	127	186	159	238	269	144	177	146	124	191
344	250	133	171	127	186	159	238	264	143	193	148	125	190
345	245	129	171	127	186	159	237	259	142	194	157	125	185
346	238	124	171	127	187	158	231	257	142	194	159	125	184
347	234	121	171	127	190	155	228	255	141	194	163	125	180
348	227	118	171	127	193	153	227	255	140	194	168	126	177
349	225	115	171	127	198	150	227	249	139	194	170	126	173
350	222	112	171	127	199	145	227	244	137	194	175	126	170
351	218	109	171	127	193	143	225	241	136	195	180	126	167
352	214	108	171	127	191	142	224	226	135	195	182	126	164
353	210	106	171	127	191	141	222	226	134	194	187	126	164
354	209	105	171	127	194	141	221	226	133	194	189	126	159
355	207	103	171	127	195	141	221	227	132	194	195	126	156
356	201	101	171	127	195	141	221	227	131	193	198	126	154
357	198	99.1	171	127	194	142	221	227	130	193	199	126	153
358	193	97.7	171	127	193	142	221	229	129	191	203	126	151
359	190	97.7	171	127	195	142	219	232	129	191	209	126	150
360	187	97.1	171	127	194	142	218	234	127	191	210	127	150
361	184	96.3	171	127	193	142	219	238	127	191	214	126	149
362	181	96.3	171	127	192	142	220	239	125	190	215	125	147
363	178	96.3	171	127	190	142	221	243	125	190	213	123	146
364	177	96.3	171	127	188	142	221	244	124	188	215	122	144
365	176	96.3	171	127	184	142	222	245	123	187	215	122	144

YEAR / DAY	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
295	292	467	182	108	124	119	114	146	147	149	153	131
296	297	464	182	110	122	118	112	145	146	148	153	129
297	303	462	184	108	120	116	111	144	145	148	152	128
298	306	462	185	111	122	114	112	144	144	152	151	128
299	309	462	182	109	122	114	112	146	143	150	149	128
300	311	459	182	108	122	115	111	148	142	149	148	127
301	314	459	180	108	122	115	109	148	141	146	145	127
302	314	459	180	107	122	113	110	146	139	134	144	126
303	314	456	179	107	121	115	109	146	138	109	144	125
304	317	456	179	106	121	116	108	145	138	114	143	124
305	326	456	178	104	120	115	106	143	138	111	144	124
306	328	453	179	104	118	115	107	143	137	138	144	125
307	328	450	178	104	116	116	109	142	136	139	143	127
308	334	450	176	106	115	118	110	140	136	140	141	128
309	345	447	174	105	113	118	111	138	136	140	140	128
310	348	447	172	106	110	119	109	138	135	140	137	129
311	345	445	172	105	105	121	108	138	135	142	135	129
312	343	445	172	108	106	122	108	137	134	143	134	126
313	343	445	171	110	104	122	110	136	134	141	125	97.1
314	340	442	167	110	103	124	109	136	133	141	70.7	100
315	337	442	167	99.1	103	124	108	135	133	137	69.7	107
316	334	439	166	92.9	104	123	108	134	132	137	89.4	120
317	334	439	164	97.7	105	122	108	131	131	134	98	121
318	340	436	162	116	102	123	107	131	131	132	97.5	120
319	345	436	161	119	101	124	108	130	132	130	97	121
320	345	433	161	118	99.9	125	108	130	132	131	96.2	122
321	345	436	160	108	100	125	109	129	131	132	96	119
322	343	439	145	92	97.5	125	110	127	131	133	96	112
323	337	439	117	94	96.1	125	109	112	131	135	95.8	111
324	326	436	97.7	91.7	93.3	127	109	101	131	135	94.2	104
325	306	433	92.9	113	92.3	127	108	90.7	131	133	94	108
326	303	433	133	115	90.8	128	108	123	122	132	93	113
327	300	433	156	115	89.8	129	108	123	118	131	92	119
328	283	433	147	115	89.9	119	108	124	117	131	91.5	121
329	273	433	144	114	90	127	108	124	116	130	90	121
330	266	430	142	114	89.1	126	108	123	115	130	90	123
331	252	419	140	114	87.8	120	106	122	115	130	89	123
332	241	402	140	114	83.5	116	98.6	121	115	129	88.5	123
333	203	394	139	114	58	114	94.5	121	115	128	88	118
334	221	379	139	114	68	99	85.5	121	114	127	88	122
335	215	371	139	114	73.6	90	96.9	120	113	128	87.8	122
336	211	362	139	114	76.5	72	86.4	120	112	129	87	119
337	207	351	139	114	74.2	90	85.5	119	112	131	86	120
338	204	328	139	114	71.9	110	86	118	111	132	85	120
339	200	320	137	114	69.4	108	85.8	118	110	133	84.5	119
340	196	334	136	114	66.5	107	84.1	117	109	133	84	117
341	193	331	135	114	64.8	107	84.4	115	108	133	83.5	117
342	189	343	135	114	62.3	106	83.8	114	106	132	82.5	118
343	187	328	135	114	60.9	105	83.3	114	105	131	82	117
344	187	311	133	114	59.7	106	83	113	103	130	81.7	117
345	187	328	130	114	58.3	110	82.6	112	102	129	81.4	117
346	184	337	128	114	56.9	120	81.6	112	102	127	81	117
347	183	331	126	114	56.4	137	81	111	101	126	80.5	116
348	181	323	125	114	55.8	150	80.7	111	99	125	80.2	115
349	181	320	123	114	55.5	158	81	110	99.5	123	80	114
350	181	317	122	114	55.2	164	80.4	110	99	122	80	114
351	180	320	120	114	55.2	159	81.3	110	98	120	80	114
352	178	323	119	114	55.5	154	81.6	110	98	119	80	114
353	177	306	118	114	56.1	149	82.4	110	97.5	118	80	114
354	176	297	118	114	56.6	140	84.4	110	96.5	116	80	114
355	172	297	116	113	57.2	137	83.8	108	96	115	79.5	114
356	172	294	116	113	58	132	83	107	95	114	79	113
357	171	294	115	113	59.5	125	82.7	106	95	113	78.8	113
358	171	292	115	113	60	121	83.8	106	94.5	112	78.5	112
359	171	292	113	113	60.9	114	83.8	106	94.5	110	78	112
360	171	289	113	113	61.7	108	83.5	106	94.5	109	77.8	113
361	170	289	112	113	62	107	83	106	94.5	108	77.6	113
362	170	289	112	113	62.3	107	83.3	106	94.5	107	77.4	113
363	170	289	112	113	62.6	115	82.7	104	94.5	106	77	112
364	170	289	110	113	62.9	120	82.1	103	94.5	105	76.8	112
365	168	286	109	113	63.7	118	81.6	102	94.5	104	76.3	111

YEAR / DAY	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
295	128	131	91.5	120	126	120	145	123	113	361	229
296	126	130	91.8	120	125	120	145	122	112	364	229
297	123	128	91.8	117	123	121	145	120	110	365	229
298	120	128	92.2	114	122	121	145	119	110	374	231
299	118	127	91.9	116	121	122	146	119	112	374	229
300	118	127	90.5	115	116	122	142	119	112	377	228
301	115	126	90.2	115	111	122	141	120	112	380	230
302	114	125	90.8	116	111	120	141	119	111	383	230
303	114	126	88.4	114	117	120	140	119	110	385	231
304	114	123	87.9	112	120	119	139	117	108	385	231
305	114	124	88.2	111	121	121	138	118	107	385	231
306	113	124	88.1	111	118	121	139	118	104	387	232
307	111	124	88.2	109	117	122	140	117	101	389	232
308	110	123	88.4	108	118	123	140	116	99.5	390	231
309	111	124	89.4	107	120	123	140	113	98	392	231
310	109	126	89.8	107	121	126	141	113	96.8	397	229
311	107	126	89	106	122	131	140	113	95	397	229
312	108	127	88.6	102	123	135	140	113	88	394	228
313	108	124	89.5	105	124	136	140	113	80	394	225
314	109	124	91	100	125	135	139	112	74	395	223
315	108	123	91.9	97	126	133	138	113	72	400	222
316	108	122	90.8	72	126	132	137	112	74	406	221
317	107	122	88.4	86.6	127	132	136	113	78	406	220
318	107	121	85.5	91.5	126	129	135	112	95	406	219
319	107	120	77.2	94.2	125	130	134	112	106	406	217
320	108	121	79.5	94	124	131	133	113	107	409	215
321	107	119	84	90	126	131	132	111	109	409	214
322	104	119	89	86.8	128	131	130	97	112	396	213
323	104	119	91	84.8	128	131	128	97	107	351	212
324	109	118	90.8	82.6	127	131	126	97.1	104	299	212
325	112	117	89.4	79.2	126	129	111	99.9	102	230	212
326	111	115	88.9	74.4	125	129	119	102	104	212	211
327	111	116	88.8	73.8	122	121	68	104	105	204	210
328	111	111	89	81	124	103	76	106	107	196	211
329	111	104	89	86	128	108	90	104	106	192	210
330	111	96	88.7	88.5	120	115	105	107	105	190	209
331	111	97	88.4	89.1	118	118	113	110	100	188	209
332	110	99	88.6	86.5	119	115	119	113	88	189	209
333	110	105	88.8	87	122	116	122	114	74	191	208
334	109	112	89	85.8	125	117	123	116	70.5	193	208
335	110	120	90	82.8	124	114	123	112	74	196	208
336	109	118	91	81.5	123	111	122	112	82	198	206
337	109	115	91	80.2	123	107	122	109	90	202	190
338	106	113	90.8	80	126	105	123	105	92	204	180
339	104	113	90.4	81.1	133	107	120	106	91	206	177
340	105	112	90	83.8	132	111	117	108	87	207	175
341	107	108	90	84	131	116	116	109	82	206	174
342	107	103	89.9	82.8	130	119	117	111	70	202	174
343	106	104	89.2	81.7	129	120	118	108	65	198	175
344	105	107	88.4	80.4	127	118	119	110	75	194	175
345	101	110	88.5	80.2	126	117	120	113	85	192	176
346	98.1	116	89	80	125	120	118	112	96	189	177
347	98	119	90	80.1	123	121	117	110	108	186	179
348	97.5	118	90.5	80	124	120	118	109	115	183	178
349	98	117	90	80.2	125	122	117	108	121	180	177
350	99	116	89	80.1	125	124	116	108	123	178	175
351	100	115	87.5	79.2	126	123	116	107	124	176	171
352	101	114	86.5	76.5	127	118	117	105	122	174	169
353	101	114	85.8	74.8	128	98	117	105	120	173	167
354	101	113	84	73.1	129	99.5	117	104	119	172	165
355	101	113	81	73	128	105	110	103	117	172	162
356	102	112	80	73.2	127	110	111	104	116	172	161
357	102	112	81	74.1	126	114	112	105	115	172	160
358	102	111	85	75.3	126	119	113	107	113	172	161
359	102	111	91.8	76	126	122	112	107	111	171	163
360	102	110	98	76.1	127	123	111	108	111	170	165
361	102	110	105	75.8	128	125	110	107	113	168	167
362	102	109	114	74.7	130	123	109	109	116	166	168
363	102	109	112	73.2	131	121	108	105	118	164	169
364	102	109	111	72.1	130	115	108	102	119	163	167
365	102	108	111	72	129	109	109	99.7	120	162	165

NUMBER OF DAYS THAT FLOW EXCEEDED NOTED DISCHARGE

YEAR / FLOW	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
100	245	337	258	244	312	317	185	354	365	365	365	324	258	356	262	363	365	365	365	365	365	361	365	361
200	218	158	174	116	233	183	98	320	365	257	310	181	227	225	213	186	219	218	248	317	315	222	256	176
300	139	120	137	75	124	35	0	281	351	245	236	168	200	167	207	151	186	147	213	94	97	189	199	113
400	105	100	111	34	80	0	0	116	296	213	179	155	102	110	176	127	146	124	194	36	0	112	166	66
500	85	85	94	0	28	0	0	65	128	181	112	133	44	76	127	93	77	109	93	13	0	19	133	21
600	57	76	84	0	0	0	0	16	69	63	64	76	14	52	109	52	45	81	82	0	0	0	103	0
700	45	66	73	0	0	0	0	2	20	18	47	2	2	0	83	0	5	47	67	0	0	0	74	0
800	33	53	54	0	0	0	0	0	3	0	33	0	0	0	57	0	0	16	29	0	0	0	59	0
900	17	29	37	0	0	0	0	0	0	0	20	0	0	0	45	0	0	0	0	0	0	0	41	0
1000	17	0	21	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	24	0

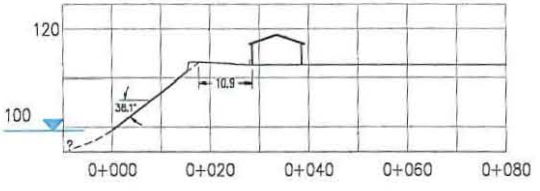
YEAR / FLOW	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
100	355	365	365	363	343	320	239	331	260	253	290	238	268	355	290	211	312	282	363	356	356	251	356	365
200	239	210	274	285	105	134	58	138	145	136	133	123	113	133	145	121	147	138	151	151	149	130	234	236
300	166	130	256	156	35	114	7	102	112	74	103	87	77	113	100	91	129	123	118	111	128	101	179	143
400	120	0	226	122	0	89	0	87	81	35	58	41	54	51	81	15	88	45	97	78	107	10	131	131
500	110	0	154	48	0	0	0	37	22	19	21	25	12	11	53	0	28	3	34	32	15	4	93	121
600	33	0	141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	0	40	110
700	7	0	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	90
800	0	0	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72
900	0	0	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
1000	0	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17

MAXIMUM DAILY FLOW m3/s

1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
994	929	1070	462	544	323	297	708	807	742	943	705	714	699	1060	671	708	847	841	549	385	561	1080	532

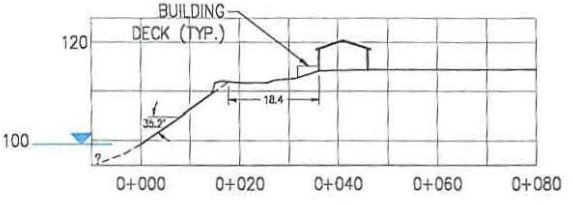
1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
736	388	1050	580	314	459	391	592	591	591	594	525	588	519	568	453	598	521	602	646	570	509	718	1010

SCALE: 1:2000	APPROVED:	B.C. MINISTRY OF ENVIRONMENT NECHAKO RIVER EROSION STUDY ISLAND PARK DRIVE SITE PLAN	GEONORTH ENGINEERING LTD. 302–1777 Third Avenue Prince George, B.C., V2L 3G7 Tel (250) 564–4304 Fax (250) 564–9323
DATE: 98/05/28			
DWN BY: DvM			
MAP REF:			
DWG NO. 371–3	REV. 0	PROJECT NO: K–371	



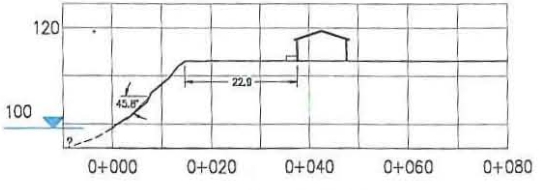
SECTION IP1

LOT 2, ISLAND PARK DRIVE



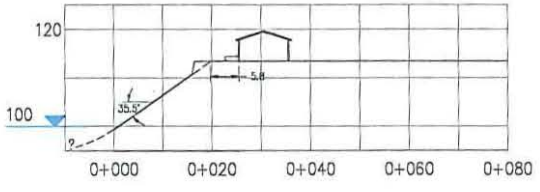
SECTION IP3

LOT 4, ISLAND PARK DRIVE



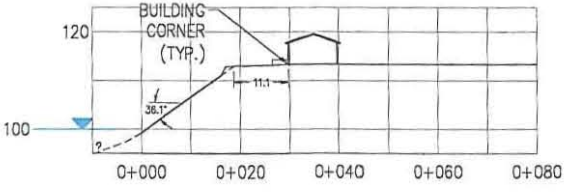
SECTION IP5

LOT 6, ISLAND PARK DRIVE



SECTION IP2

LOT 3, ISLAND PARK DRIVE



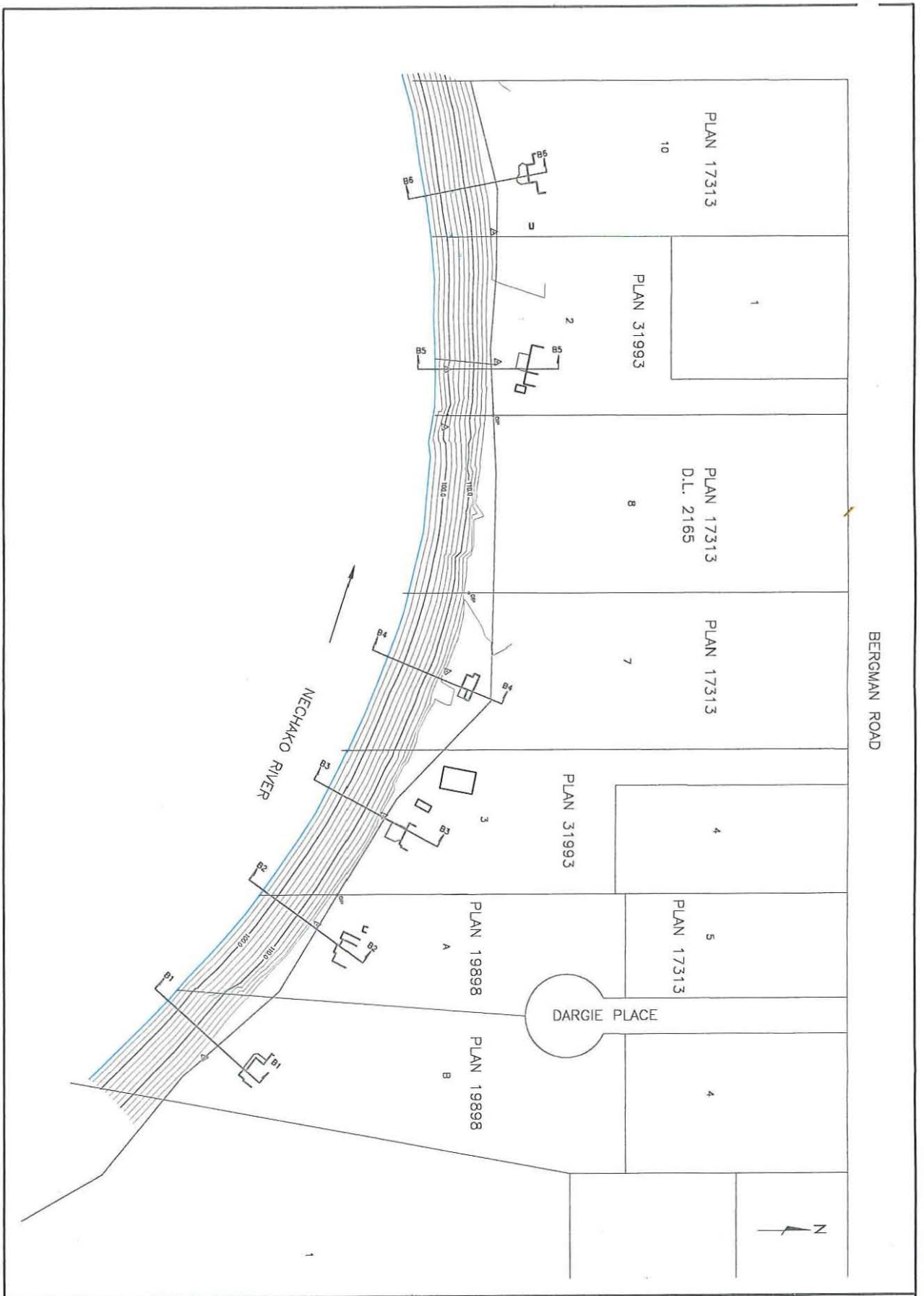
SECTION IP4

LOT 5, ISLAND PARK DRIVE

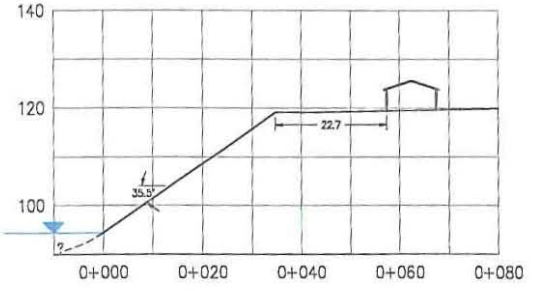
GeoNorth Engineering Ltd.
302-1777 Third Avenue
Prince George, B.C., V2L 3G7
Tel (250) 564-4304
Fax (250) 564-9323

B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
ISLAND PARK DRIVE
CROSS SECTIONS

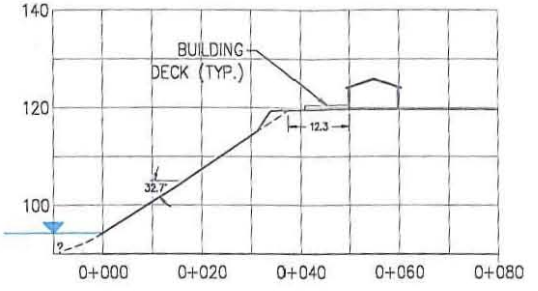
APPROVED:	
SCALE:	1:1000
DATE:	98/05/28
DWN BY:	DvM
MAP REF:	
DWG NO.	371-4
REV.	0
PROJECT NO:	K-371



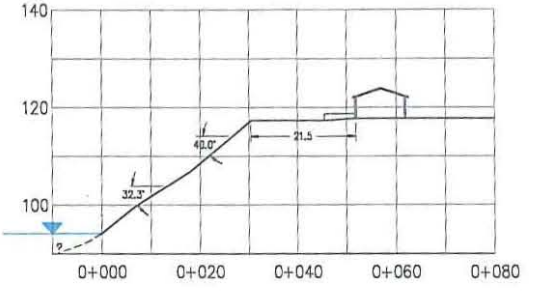
SCALE: 1:2000	APPROVED:	B.C. MINISTRY OF ENVIRONMENT NECHAKO RIVER EROSION STUDY BERGMAN ROAD SITE PLAN	GeoNorth Engineering Ltd. 1777 Third Avenue Prince George, B.C., V2L 3G7 Fax (250) 564-9323
DATE: 98/05/28			
DWN BY: DvM			
MAP REF:			
DWG NO. 371-5	REV. 0	PROJECT NO: K-371	



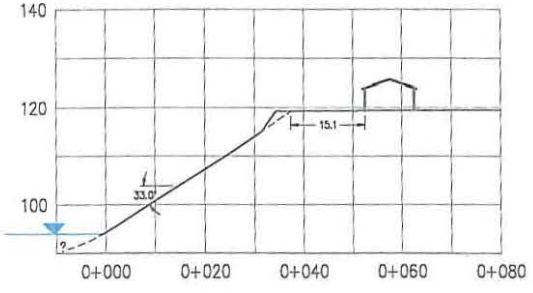
SECTION B1
LOT B, DARGIE PLACE



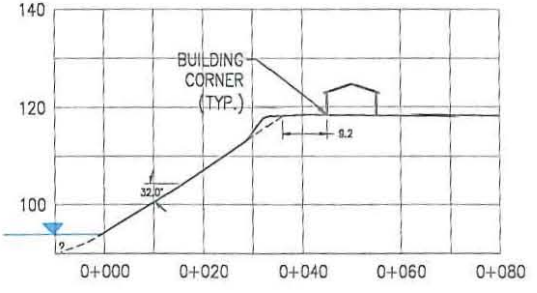
SECTION B3
LOT 3, BERGMAN ROAD



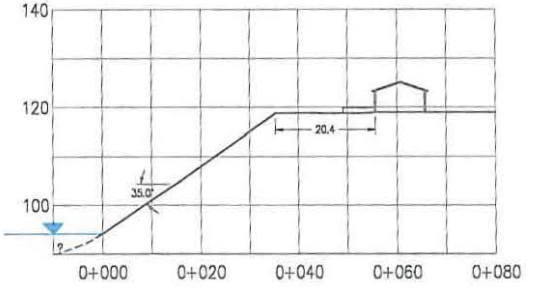
SECTION B5
LOT 2, BERGMAN ROAD



SECTION B2
LOT A, DARGIE PLACE



SECTION B4
LOT 7, BERGMAN ROAD

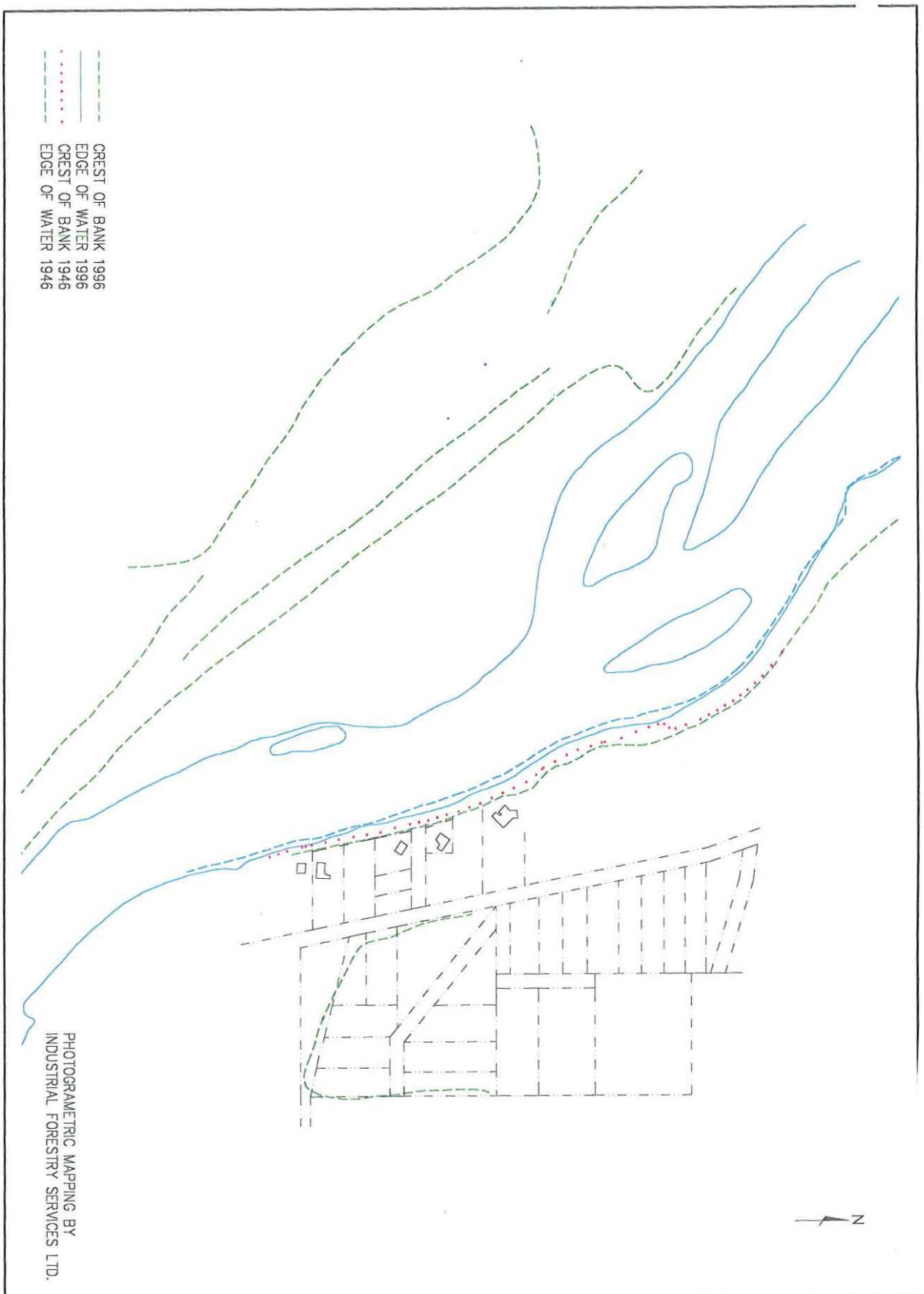


SECTION B6
LOT 10, BERGMAN ROAD

GeoNorth Engineering Ltd.
302-1777 Third Avenue
Prince George, B.C., V2L 3G7
Tel (250) 564-4304
Fax (250) 564-9323

B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
BERGMAN ROAD
CROSS SECTIONS

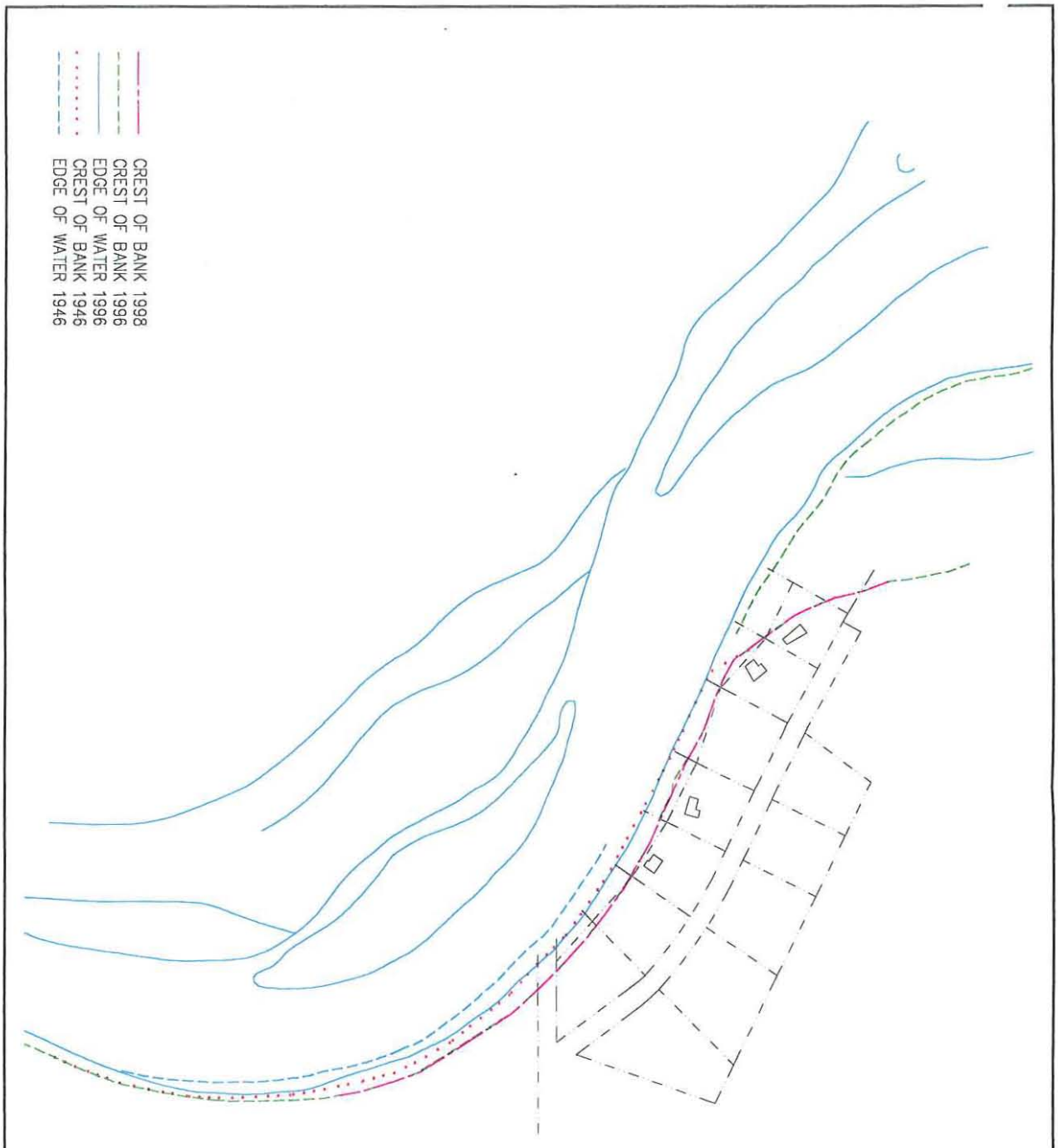
SCALE:	1:1000
DATE:	98/05/28
DAN BY:	DvM
MAP REF:	
DWG NO.	371-6
REV.	0
PROJECT NO:	K-371
APPROVED:	



SCALE: 1:5000	APPROVED:		
DATE: 98/07/02			
DWN BY: DvM			
MAP REF:			
DWG NO. 371-B1	REV. 0	PROJECT NO: K-371	

B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
PLAN OF RIVER BANK LOCATIONS
FROM AERIAL PHOTOGRAPHS
ASPEN LANE

GeoNorth Engineering Ltd.
202-1777 Third Avenue
Prince George, B.C., V2L 3G7
Tel (250) 564-4304
Fax (250) 564-9323

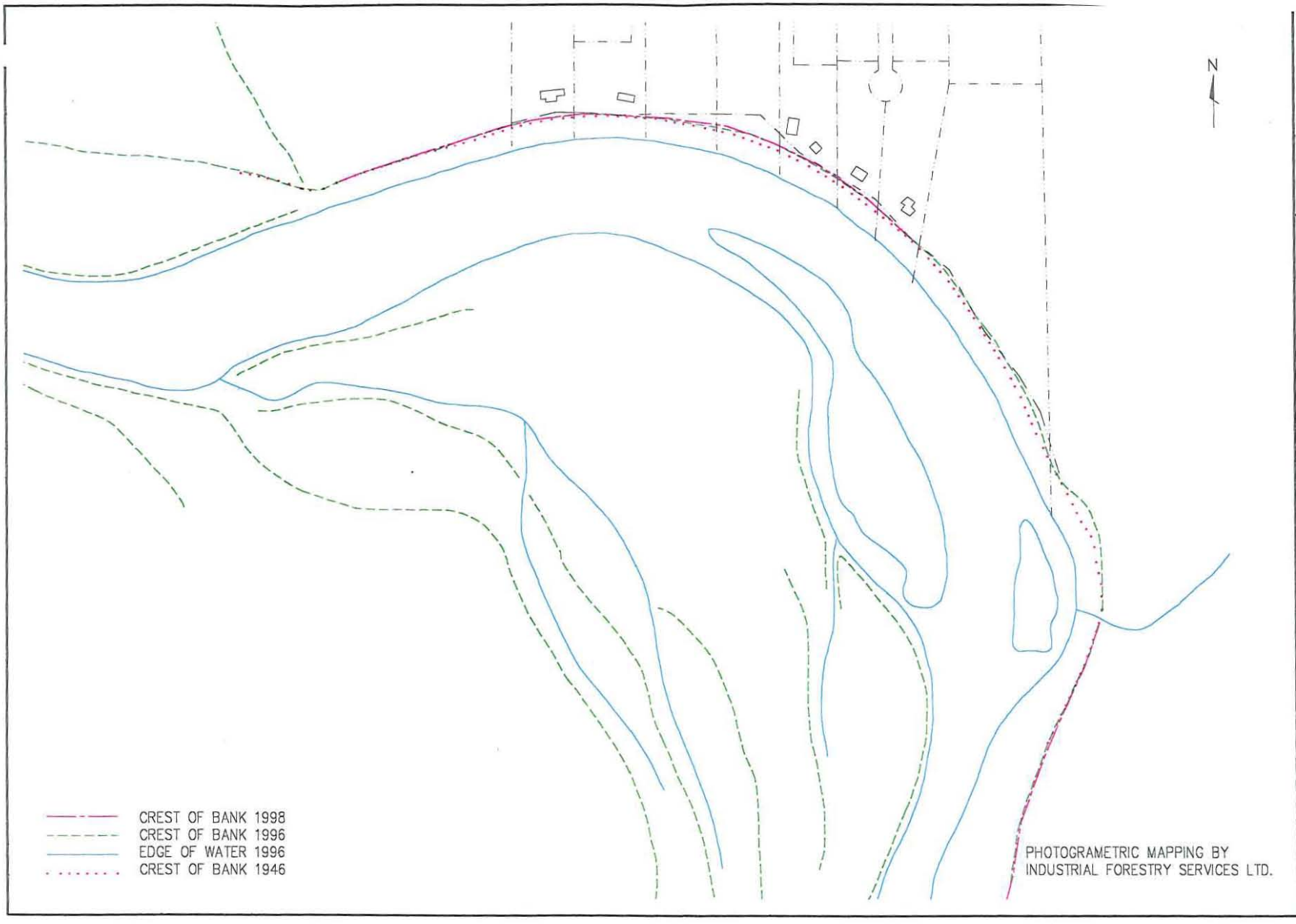


PHOTOGRAMETRIC MAPPING BY
INDUSTRIAL FORESTRY SERVICES LTD.

SCALE:	1:5000
DATE:	98/07/02
DWN BY:	DvM
MAP REF:	
APPROVED:	
DWG NO.	
REV.	0
PROJECT NO:	V-371

B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
PLAN OF RIVER BANK LOCATIONS
FROM AERIAL PHOTOGRAPHS
ISLAND PARK DRIVE

GEONORTH ENGINEERING LTD.
Prince George, B.C., V2L 3G7
Tel (250) 564-4304
Fax (250) 564-9323



GeoNorth Engineering Ltd.
302–1777 Third Avenue
Prince George, B.C., V2L 3G7
Tel (250) 564-4304
Fax (250) 564-4323

B.C. MINISTRY OF ENVIRONMENT
NECHAKO RIVER EROSION STUDY
PLAN OF RIVER BANK LOCATIONS
FROM AERIAL PHOTOGRAPHS
BERGMAN ROAD

SCALE: 1:5000
DATE: 98/07/02
DWN BY: DvM
MAP REF:
DWG NO.
APPROVED:
REV.
PROJECT NO: K-371

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	—	166	120	54.9	112	224	50.4	70.2	402	204	396	193	85	173	95.7	171	127	184	140	215	245	122	187	211	122	144	169	280	109	113	63.4	115	81.4	102	94.8	104	76	103	102	108	108	73.2	128	108	108	97	119	161
2	—	164	119	54.9	111	235	51.5	71.4	419	200	391	193	85	170	95.7	171	127	185	140	215	244	121	187	208	120	144	168	279	109	113	63.1	117	80.6	102	96.8	104	76	103	102	108	106	73	126	108	107	93.5	117	160
3	—	164	117	59.6	110	244	52.4	73.6	433	199	382	193	85	167	95.7	171	127	187	141	215	243	119	183	204	119	143	166	278	109	113	62.9	120	80.1	102	98	103	76	104	102	108	104	72.7	123	108	106	90.5	113	160
4	—	162	115	54.9	110	249	53	74.2	433	197	374	193	85	164	95.7	171	127	183	141	215	244	119	182	202	116	143	164	277	109	113	62.6	125	79.7	102	99.9	103	76.5	104	101	108	104	71.9	124	109	105	88	110	161
5	—	161	113	54.9	110	255	52.7	76.5	402	195	362	193	85	161	95.7	171	127	181	141	215	244	118	181	201	116	143	163	272	109	113	62.3	130	79.2	102	102	103	77.5	104	101	107	103	70.5	126	107	106	86.5	109	161
6	—	159	113	54.4	110	253	52.1	79.3	385	194	354	193	85	159	95.7	171	127	181	141	215	244	117	181	200	115	143	165	258	109	113	62	146	78.7	102	106	103	78	103	101	107	104	70	123	106	107	84.2	108	162
7	—	157	112	54.4	109	251	51	82.1	379	192	340	193	85	156	95.7	171	127	181	141	215	245	116	180	200	114	143	165	275	109	113	61.2	144	78.9	101	107	103	78	105	101	107	105	69.5	116	107	107	83.8	109	163
8	—	156	112	54.4	109	249	50.4	85	405	191	331	193	85	153	95.7	171	127	182	142	216	246	115	178	201	113	143	165	275	109	113	60.6	143	79	101	107	102	78	104	100	107	106	68.5	117	108	106	83.6	110	165
9	—	154	110	54.4	109	248	49.6	87.8	385	190	323	193	85	153	95.7	171	127	180	142	215	246	114	176	202	112	143	164	274	109	113	60	142	79.2	100	106	102	78	104	101	106	106	68	119	108	105	83.2	112	166
10	—	153	109	54.4	109	246	49.8	92	379	189	311	191	85	150	95.7	171	127	181	146	215	245	114	173	202	110	142	163	274	109	113	59.5	141	79.4	99	104	102	78	103	101	106	105	67.7	122	105	106	82.5	116	166
11	—	153	108	53.7	110	244	51	96.3	382	189	300	190	85	149	95.7	170	127	183	148	217	244	114	172	204	109	142	162	273	109	113	59.2	140	79.6	98	102	102	78	104	101	105	104	67.3	121	104	107	82.4	119	167
12	—	151	107	53.8	110	244	53.2	102	391	188	294	190	85	147	95.7	167	127	182	148	215	244	114	172	204	108	140	162	272	109	113	58.6	138	80.6	97.5	98.5	101	78	105	101	105	104	67.5	120	103	106	82	124	169
13	—	150	107	53.8	110	242	55.5	108	399	187	289	190	85	147	95.7	167	127	182	151	215	243	113	172	204	108	140	161	271	109	113	58	137	81.9	97.5	97	101	78	106	101	104	103	68	123	103	105	80.4	122	171
14	—	148	106	53.8	110	241	57.5	118	419	187	275	190	85	146	95.7	164	127	183	152	214	241	113	172	205	107	139	161	272	109	113	57.2	136	84.3	97	96.6	101	78.5	106	101	104	102	69.9	125	103	104	79.5	118	172
15	—	147	104	53.8	111	239	60	127	428	187	261	190	85	144	95.7	164	127	184	153	212	239	114	172	205	106	139	161	272	109	113	56.6	135	84.5	97	96	101	78.5	106	101	103	102	69.9	124	104	103	78	114	173
16	—	146	102	53.2	111	239	62.6	139	430	187	246	190	85	144	95.7	164	127	186	153	210	238	114	171	205	106	137	161	271	109	113	56.3	135	82.9	96.5	96.8	101	79	105	101	103	101	70	122	105	103	76.6	112	173
17	—	144	99.7	53.2	111	238	64.6	153	430	187	229	190	85	143	95.7	161	127	185	153	212	238	114	170	205	106	136	162	272	109	113	56.1	135	81.7	96	97.7	100	79	104	101	102	101	70.6	120	106	103	75.8	109	173
18	—	142	98.5	53.2	112	236	65.7	178	433	186	218	190	85	143	95.7	161	127	181	153	215	237	115	169	205	106	135	163	273	109	113	55.8	136	81.1	96	98	100	78.5	103	101	102	102	71.2	118	107	104	75.2	107	173
19	—	140	97.7	53.2	113	235	64.6	210	442	185	207	190	85	143	95.7	161	127	181	152	215	237	115	165	205	106	135	163	276	109	112	55.5	137	79.9	96	97.5	100	78	102	101	102	103	72	123	107	105	74.8	108	172
20	—	138	96.8	53.2	113	235	62.9	241	447	183	201	190	75	143	95.7	161	127	180	150	218	236	114	164	204	106	135	163	277	109	110	55.2	137	78.7	96	96	100	78	102	101	101	104	73	124	106	106	74.8	103	171
21	—	136	96.3	52.7	115	234	61.3	263	445	183	181	188	75	142	95.7	161	127	180	148	217	235	114	162	204	106	135	164	276	109	110	54.9	138	77.9	96.5	94.5	99.5	78	102	101	100	105	73.2	122	105	107	74.6	101	170
22	—	135	96	52.7	116	232	59.7	294	439	182	172	187	75	142	95.7	161	127	182	148	217	235	114	162	204	107	135	165	275	109	110	54.7	139	76.9	96.5	92	99	78	102	101	99	106	73.5	118	106	108	74.4	99.6	167
23	—	133	96.3	52.7	117	231	58.6	317	459	181	166	187	75	142	95.7	161	127	182	148	217	235	114	161	204	108	133	165	275	109	110	54.4	140	76.1	96.5	90	98.5	78	101	100	98.5	106	73	120	109	109	74.2	98.5	166
24	—	132	96.3	52.7	118	231	56.4	334	459	180	154	185	75	142	95.7	161	127	181	147	215	234	113	159	202	108	133	166	276	109	110	54.1	142	75.5	95	89.8	98	78	101	100	98	107	72.8	122	111	109	74	97.6	166
25	—	130	96.3	52.7	119	228	53.8	345	456	179	140	184	75	142	95.7	161	127	180	144	212	233	111	156	198	109	132	166	274	109	109	53.8	145	75.8	95	88	98	78	99	99.9	97.5	107	72.3	123	113	109	73.8	96.5	165
26	—	129	96.8	52.1	120	225	53	348	453	178	132	181	75	142	95.7	161	127	180	141	210	233	111	156	194	110	132	166	275	109	108	53.8	145	78.3	95	88	98	78	99.8	99.8	97	106	72	124	114	108	73.6	95.2	165
27	—	127	97.1	52.1	121	222	52.1	348	450	178	130	177	75	142	95.7	161	127	179	138	210	232	111	154	193	112	130	166	276	109	108	53.5	144	77.6	95	88.1	97.5	78	100	99.7	96.5	106	71.8	124	114	108	73.7	94.8	164
28	—	125	97.4	52.1	122	219	51.3	334	453	177	129	171	75	142	95.7	161	127	180	139	209	232	111	154	191	112	130	166	276	109	108	53.2	142	78.3	95	88	97.5	78	101	99.5	96.2	105	71.3	122	114	108	73.8	98	163
29	—	124	98.8	52.1	122	217	51	320	453	176	130	161	75	142	95.7	161	127	179	140	207	232	109	153	191	113	129	165	274	109	108	53	140	79.4	95	88.7	97.5	78	103	99.5	96.1	105	70.9	125	112	108	74	96.5	163
30	—	122	99.1	52.1	123	214	52.1	306	453	176	132	153	75	142	95.7	161	127	178	140	207	231	109	153	191	112	129	165	274	109	108	52.7	139	80.1	95	89.2	97.5	78	104	99.5	95.5	104	70.2	127	111	107	74.8	90.5	164
31	—	122	99.7	52.1	124	211	55.2	300	450	176	135	147	75	142	95.7	161	127	178	141	207	231	108	153	188	110	129	166	273	109	108	52.7	138	80.5	95	89.5	97.5	78	104	99.2	93.5	103	70	125	112	106	75.2	101	165
32	—	120	100	51.5	125	206	58	300	450	175	137	142	75	142	90.6	161	127	177	141	205	232	106	153	187	108	129	165	273	109	106	52.4	136	80.1	94.5	90.2	96.5	78	103	98.5	92.2	103	70.5	126	113	106	76	110	167
33	—	119	101	51.5	125	204	56.4	300	453	174	139	139	75	142	90.6	161	127	178	141	204	231	106	152	184	108	127	164	274	109	105	52.1	135	79.8	94.5	91	95.5	78	102	98.5	90.4	102	71	123	114	105	76.4	125	169
34	—	119	102	51.5	126	205	54.9	300	453	174	142	137	75	142	90.6	163	127	183	141	204	229	105	152	177	107	127	163	273	109	105	51.8	133	79.5	94	91.7	95	78	100	98.5	89.4	101	71	125	115	105	77	140	170
35	—	118	103	51.5	126	203	53.8	300	445	173	144	136	75	142	90.6	163	127	184	141	204	228	103	151	171	107	127	163	273	109	105	51.5	132	79.5	94	91.9	94.5	78	99	98.5	88	101	71.2	124	115	104	77.6	170	171
36	—	116	104	51.5	127	201	53.2	300	425	172	144	136	75	142	90.6	163	127	187	141	204	228	102	150	167	108	127	162	272	109	105	51.3	131	79.5	94	92	94	78	99.5	99	87.2	102	71.9	124	114	103	78.2	186	172
37	—	115	105	51	127	199	52.1	300	422	171	147	136	75	142	90.6	163	127	188	140	203	228	102	151	163	109	127	161	272	108	104	51	129	79.5	94	92	94	78	101	99.5	86.5	102	71.9	128	113	101	78.4	183	172
38	—	113	107	51	127	197	51	300	413	170	149	136	75	142	90.6	163	127	189	140	203	227	100	153	161	110	127	160	272	108	104	51	125	79.1	94	91.8	93.5	78	102	99.8	85.9	103	71.5	123	112	101	78.3	180	173
39	—	111	108	51	127	195	52.1	300	416	168	150	136	75	142	90.6	163	127	189	139	203	227	99.1	154	159	110	127	159	272	108	104	51	121	78.9	93.5	91.2	93	78	103	99.5	84.2	104	71.3	120	111	102	78.2	175	173
40	—	110	108	51	127	193	53.2	300	402	165	152	137	75	142	90.6	163	127	183	139	204	228	98.5	157	159	108	127	158	272	108	104	50.7	119	78.3	93	90.8	92.5	78	103	99	83.4	104	70.8	116	110	102	78.1	169	171
41	—	110	109	51	127	191	52.7	300	391	163	156	137	75	142	90.6	163	127	180	139	204	229	99.1	161	156	108	127	157	271	107	103	50.7	117	77.7	93	90.5	92	77	104	98.2	83	105	70.1	114	110	103	78	166	171
42	—	110	109	50.7	127	189	51.5	300	377	160	157	137	75	142	90.6	163	127	178	138	204	229	99.7	162	156	108	126	157	269	107	103	50.1	118	77.1	92	90.6	92	76.5	106	97.8	83.1	105	70	115	110	103	77	167	168
43	—	110	109	50.7	127	187	51	300	368	157	159	135	75	142	90.6	163	127	177	139	203	232	101	161	156	108	126	159	268	106	103	49.8	119	76.7	91.5	90.7	91.5	76	106	97	83	106	69.5	119	111	104	76	166	167
44	—	111	108	50.4	126	185	52.1	300	354	155	161	133	75	142	90.6	163	127	177	140	201	231	102	159	157	108	126	160	268	106	103	49.8	120	76.4	97	90.7	91.5	75.5	106	96.5	82.5	106	69.3	123	111	105	75.4	164	166
45	—	110	107	50.4	125	183	53.5	300	328	154	164	130	75	142	90.6	163	127	173	141	201	227	103	158	157	108	126	162	268	105	102	49.6	123	75.7	90.5	90.5	91	75	106	96.2	82.2	105	69.3	125	109	104	74.6	161	165
46	—	109	106	50.1	124	181	53.8	300	320	153	167	129	75	142	90.6	163	127	172	140	200	226	103	156	159	109	126	164	266	105	102	49.3	126	75.2	90	91	91	74.5	107	96	82.4	105	69.5	126	108	104	74.3	158	165
47	—	108	105	50.1	123	179	54.7	300	323	152	168	127	75	142	90.6	163	127	171	138	199	224	103	155	159	109	126	165	266	105	102	49.3	133	75.6	90	91.7	91	74	107	96.2	82.6	104	70	124	107	103	74.3	156	166
48	—	108	105	49.8	122	177	56.4	300	331	151	170	127	75	142	90.6	163	127	170	139	199	224	102	153	160	109	126	165	266	104	102	49	141	77	89.5	92.3	90.5	73.5	106	97.5	82.3	104	70.1	121	106	102	74.8	154	167
49	—	108	105	49.8	121	175	56.6	300	328	151	173	127	75	142	90.6	163	127	170	141	199	224	102	153	161	109	126	163	266	104	102	48.7	142	78.9	89	93.7	90.5	73	106	97.5	82	103	70.2	117	106	101	76	152	168
50	—	108	105	49.6	119	200	56.6	300	311	150	175	126	75	142	90.6	163	127	170	141	201	224	102	152	161	109	129	160	265	104	102	48.4	143	81.2	89	94.2	90	72	105	97	81.5	103	70	114	106	100	77.6	150	169
51	—	109	103	49.6	118	199	55.5	300	317	149	177	126	75	142	90.6	163	127	170	142	204	222	102	151	163	109	130	159	265	104	102	48.4	143	81.9	89	95.5	90	72.5	105	96.3	81.4	102	69.8	112	105	99.5	77.8	149	173
52	—	109	103	49.3	117	213	55.8	300	343	149	178	126	75	142	90.6	163	127	170	142	201	222	102	153	163	109	130	159	264	104	102	48.1	142	82.2	88.5	97.6	89.5	73	104	96.5	81.4	102	70	115	104	98.2	78	146	175
53	—	109	102	49.3	116	210	56.1	300	331	149	181	126	75	142	90.6	163	127	171	145	198	221	102	153	163	109	130	157	263	103	102	48.1	141	82.4	88	99.5	89	73.5	104	97	81.4	102	70.1	118	103	98	78.2	146	176
54	—	109	102	49	115	181	56.6	300	328	149	184	126	75	142	90.6	163	127	171	145	197	219	102	155	161	109	130	155	258	103	102	48.1	140	81	87.5	99.7	88.5	74	104	97	81.5	102	70.9	122	102	98.2	78.2	141	177
55	—	109	101	49	113	162	57.8	300	337	149	186	126	75	142	90.6	163	127	172	146	195	217	102	156	161	109	130	152	255	103	102	48.1	138	79.2	87	98	88	74.5	104	96	81.6	102	71.5	124	102	100	78.2	142	176
56	—	109	100	48.7	112	174	58.6	300	340	149	187	126	75	142	90.6	163	127	167	148	197	215	102	157	160	109	130	151	255	103	102	48.1	136	78.3	86	97	88	75	105	95.8	81.6	102	72	126	103	103	78	244	174
57	—	108	100	48.7	111	170	58.9	300	348	148	190	126	75	140	90.6	163	127	168	148	195	215	102	159	159	108	130	151	254	103	102	47.9	133	77.4	85.5	95	87.5	76	105	94	81.6	102	72.4	129	104	106	77.8	148	172
58	—	108	100	48.4	110	163	58	300	348	147	195	126	75	140	90.6	163	127	172	147	195	212	102	159	159	108	130	149	264	103	102	47.6	131	77.1	85	93.8	87	77.5	103	94	81.3	102	72.8	131	105	108	77.7	143	169
59	—	107	100	48.4	109	159	56.6	300	351	147	202	126	75	139	90.6	163	127	177	147	194	210	103	160	159	108	130	148	263	103	102	47.3	128	77.1	84	92.7	86.5	79	102	93.5	80.3	102	73	132	106	110	77.6	141	166
60	—	106	100	48.1	108	156	55.5	300	354	146	207	126	75	139	86.4	164	127	168	144	193	210	103	159	156	106	130	146	263	102	102	47.9	125	77.6	82	91.5	86	80	99.5	90.2	79.8	102	72.5	126	105	113	77.4	139	162
61	—	105	99.7	48.4	108	153	54.7	300	351	145	211	126	75	137	86.4	164	127	160	144	192	210	104	161	154	105	130	145	261	101	102	48.1	123	78.4	82	91.1	86	80.5	104	90	78.6	102	70.5	127	104	114	77.2	139	158
62	—	103	99.1	48.1	107	151	56.1	300	354	143	214	126	75	136	86.4	164	127	159	145	187	210	104	162	154	103	130	145	262	101	102	48.4	122	78.6	81.5	90	86	81	113	91	78.3	102	68	127	104	113	77	139	155
63	—	102	98.8	47.9	106	150	56.9	300	360	142	215	126	75	136	86.4	164	127	159	144	187	210	104	161	153	103	130	144	259	101	102	48.7	122	78.8	81	90	86	81.5	117	91.8	78	102	74.5	125	104	111	76.8	138	154
64	—	101	98.5	47.9	105	149	59.5	300	362	141	215	126	75	135	86.4	164	127	159	144	187	209	105	164	153	102	130	144	259	100	102	49.3	121	78.7	80	90	86	82	116	91.5	77.9	102	79	127	104	109	76.4	136	155
65	—	100	98	47.6	104	147	60.9	300	360	139	215	126	75	135	86.4	164	127	158	142	186	210	104	164	151	101	130	144	260	99.4	102	49.6	121	78.9	80	89.5	86	82	111	91	78	103	82	128	104	108	76	132	158
66	—	99.1	98	47.6	103	144	62.3	303	357	138	212	126	75	133	86.4	164	127	157	137	183	211	103	165	150	101	130	144	259	100	103	50.4	120	79.1	79.5	89	85.5	82	107	90.5	78.1	103	84	128	104	107	75.6	132	161
67	—	98	96.8	47.6	102	143	58.6	303	354	136	210	125	75	133	86.4	164	127	157	136	181	210	103	165	149	99.7	130	144	259	99.7	103	50.7	120	79	79.5	88.1	85.5	82	106	90.2	77.9	102	86	127	104	107	75	134	163
68	—	96.8	96.8	47.3	101	142	54.1	303	365	135	209	123	75	132	86.4	164	127	155	138	179	207	103	167	147	99.1	130	143	261	99.1	103	51	120	80.3	79	87	85	82.5	106	90.2	77.8	102	86.8	128	103	107	75	133	166
69	—	96.6	96.8	47.3	100	141	51	306	368	134	207	122	75	132	86.4	164	127	154	138	178	206	103	169	147	97.7	131	143	261	99.1	103	51.3	120	79.9	79	86.5	85	82.5	109	90.3	77.7	102	87.5	129	102	108	75.3	131	165
70	—	96.3	96.6	47	99.1	140	49.8	306	371	132	206	123	75	130	86.4	163	127	153	139	176	205	103	172	146	97.1	131	143	260	99.1	103	51.5	120	79.4	79	86.2	84.5	82.5	110	90.5	77.7	101	88.5	130	101	109	76.4	130	162
71	—	96.3	95.7	47	98.3	140	50.4	306	374	130	204	122	75	130	86.4	163	127	153	141	174	205	103	177	146	96.8	131	142	259	98.8	103	51.8	120	79	78.5	86	84.5	83	108	90.3	77.7	101	89.5	132	100	110	77.5	131	160
72	—	96.3	94	46.7	97.4	139	51	306	379	129	202	121	75	130	86.4	161	127	153	141	173	204	104	181	144	96.8	131	142	257	98.8	103	52.4	120	78.6	78.5	85.8	84.3	83	107	90.2	77.7	101	90	136	98.5	110	79	132	157
73	—	96.3	93.4	46.7	96.3	139	51.5	309	388	129	201	122	75	129	86.4	161	127	153	142	171	203	104	183	144	96.8	131	142	255	98.5	103	52.7	120	78.2	78	86	84.5	83	107	90.1	77.8	101	90.5	142	97	110	80.5	133	155
74	—	96	92.9	46.4	95.7	151	51.3	309	394	129	199	119	75	129	86.4	161	127	153	142	170	203	104	185	144	96.3	131	142	254	98.5	103	53.2	119	77.7	78	86	84.5	83.5	108	90	77.9	101	91	151	95.5	110	82	135	154
75	—	94.9	91.7	46.4	94.9	151	51.5	311	402	129	198	118	75	129	86.4	161	127	153	142	167	202	104	186	143	96.8	132	141	253	98.3	103	53.5	120	77.5	78	85.8	84	83.5	109	89.8	77.9	100	91.5	150	96.5	110	83.5	138	154
76	—	94	91.2	46.2	93.7	167	52.4	311	408	133	197	121	75	129	86.4	161	127	153	142	168	203	104	187	143	99.7	132	141	253	98.3	104	53.8	120	77.1	78	86.3	84	84	108	88.5	78	100	91.8	150	98	110	85.3	142	155
77	—	94	90.6	46.2	93.2	164	53	314	413	142	195	121	75	129	86.4	160	127	153	143	165	203	103	187	142	103	132	142	252	98.3	104	54.1	120	77	77.5	87	84	84	107	87	77.9	101	92	151	101	109	87	149	156
78	—	93.7	90.6	45.9	92.3	156	53.8	317	416	142	195	118	75	127	86.4	160	127	152	146	164	204	103	187	142	106	133	141	251	98.5	105	54.4	120	76.6	77.5	88.2	84	84.5	107	85.9	77.8	101	92.3	154	101	109	90	152	157
79	—	93.4	92.9	45.9	91.5	150	54.1	320	422	134	198	118	75	127	86.4	159	127	151	148	161	204	102	187	142	110	133	141	251	98.5	105	54.7	120	76.1	77	89.5	84	85	108	84.2	77.2	101	92.5	156	102	108	94	153	157
80	—	93.4	94.6	45.6	90.6	142	55.5	320	419	128	203	119	75	127	86.4	159	127	153	149	161	205	102	187	142	116	133	140	252	99.1	105	55.2	120	75.9	76.5	91.3	84	85.5	109	83	76.8	102	93.5	159	103	109	97	158	158
81	—	92.9	96	45.6	89.8	117	55.5	323	416	130	207	121	75	127	86.4	158	127	155	148	161	204	102	188	142	120	134	140	252	99.7	105	56.1	120	75.1	76	93.4	84	86	108	81.8	76.2	102	95	164	103	110	96.4	159	158
82	—	92	96.3	45.3	88.9	116	55.5	328	436	128	212	123	75	127	86.4	157	127	156	148	161	204	102	189	142	125	134	140	252	100	105	56.6	119	76.2	76	96	84	86	106	80	76.1	102	96.5	169	103	112	95.5	159	160
83	—	91.2	97.4	45.3	88.3	113	56.4	334	433	126	218	120	75	127	86.4	156	127	156	147	160	205	102	191	142	130	135	140	253	101	105	57.2	119	76.2	76.5	101	84	86	103	79	76.2	102	98	172	103	114	94.6	156	160
84	—	90.6	96.3	45	87.8	112	57.2	337	439	125	224	121	75	127	86.4	156	127	155	147	159	205	103	194	142	137	135	139	254	102	105	58	119	76	77	109	84	86	102	78	76.1	102	100	171	103	115	94	153	160
85	—	90.3	96.3	45	86.7	112	58	314	436	123	232	125	75	127	86.4	154	127	155	147	158	204	103	197	142	144	136	139	255	104	105	59.7	123	77	77	113	84	86	103	77.6	76	102	102	172	104	117	94	148	161
86	—	90.6	96.8	44.7	85.8	112	58.9	297.00	439	128	238	129	75	129	86.4	154	127	155	148	158	203	103	198	142	153	136	140	254	105	105	61.7	126	78.3	77.5	116	84	86	105	78	76	102	104	181	105	120	94.6	143	161
87	—	91.2	97.7	44.7	85.2	113	59.2	280	439	126	244	130	75	129	86.4	156	127	155	148	157	202	102	199	142	159	136	144	253	106	105	63.1	128	80.6	77.5	116	84	86.5	106	78.5	76	103	105	184	106	123	96.6	138	162
88	—	92	101	44.5	85	120	59.5	261	436	128	255	131	75	129	86.4	157	127	155	150	157	202	101	200	142	170	136	153	252	107	105	65.1	129	83.1	78	115	84	87	103	79.7	76	103	107	183	107	128	99	132	163
89	—	94	105	44.5	84.4	127	59.5	244	439	126	263	133	75	130	86.4	158	127	155	148	157	203	102	200	142	178	136	170	249	108	105	67.7	128	86.1	78	115	83.5	87.5	104	80.5	76	104	109	181	108	132	102	127	163
90	—	94.9	110	42.8	83.3	133	59.7	227	439	125	275	134	75	130	86.4	158	132	155	148	158	202	102	201	142	188	136	195	248	109	105	70.5	128	90	78	119	83	88	104	81.5	76	105	110	181	110	137	110	124	163
91	—	96.3	114	41.6	82.1	136	60.6	212	442	126	292	140	75	132	86.4	159	141	153	147	159	200	103	202	142	201	136	197	249	111	105	73.1	127	90	78	120	82.5	90.5	104	84.2	76	107	112	184	111	143	120	121	164
92	—	97.7	116	41.6	81.6	142	60.6	198	439	131	300	154	75	133	86.4	160	139	153	147	161	199	103	204	142	211	137	200	253	112	105	75.9	127	90.4	78	122	84.5	91.5	105	86	75.9	112	114	197	112	150	130	119	164
93	—	99.7	119	41.6	80.7	149	61.7	187	442	133	311	154	75	135	86.4	161	141	152	148	164	200	106	205	142	224	139	202	260	112	105	79.6	128	91	78.5	127	86	93	109	87.5	76.1	115	116	223	114	158	143	118	169
94	—	102	123	41.6	79.9	149	61.7	176	445	132	320	153	75	136	86.4	164	146	151	148	168	201	108	207	142	235	140	205	294	112	105	84.9	125	91.8	78.5	131	90	93	118	91.3	76.8	118	118	242	118	164	155	119	172
95	—	105	125	41.6	79.3	141	62.3	164	453	129	331	151	75	138	86.4	167	150	152	150	173	202	110	210	143	246	140	210	317	114	105	89.2	127	93.1	79	131	98	95	127	95	77.2	121	120	245	120	170	158	121	174
96	—	108	129	41.3	78.7	140	62.6	153	459	130	345	152	75	138	86.4	170	159	153	158	185	206	113	214	150	255	142	220	337	118	105	93.4	129	92.5	80	132	100	98	137	99	79	125	121	241	114	183	157	128	178
97	—	113	132	41.3	78.7	145	63.1	144	467	135	362	158	75	138	86.4	176	182	159	165	193	205	118	215	153	263	143	269	343	120	105	95.4	130	93	82	133	105	100	145	100	81	128	123	236	113	190	159	129	181
98	—	118	135	41.3	78.7	148	65.1	136	479	138	357	163	75	138	86.4	178	200	163	168	202	202	124	217	159	275	144	326	362	126	105	96.3	131	93.1	84.3	135	110	102	157	102	83	129	125	234	115	199	162	133	186

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B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR / DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
99	—	123	141	41.3	78.7	151	66.8	131	496	138	374	165	75	136	86.4	180	205
100	—	129	147	41.3	78.7	161	68.6	123	515	140	388	171	75	136	86.4	189	189
101	—	136	157	41.1	78.7	154	70.8	117	544	153	396	177	75	139	87.8	199	156
102	—	158	165	41.1	78.7	154	73.6	110	564	147	405	188	75	144	90.6	213	136
103	—	152	165	41.1	78.7	169	76.5	106	592	143	402	195	75	153	94.9	232	190
104	—	153	182	41.1	78.7	165	79.3	101	614	150	405	192	75.3	164	101	237	196
105	—	157	182	40.8	78.7	173	82.1	102	623	156	408	185	77.6	182	110	240	186
106	—	163	183	40.8	79	182	87.8	110	623	160	408	185	82.1	212	127	241	174
107	—	172	192	41.1	79	186	92	113	614	164	408	192	90.6	292	141	243	176
108	—	171	196	41.9	79.3	210	96.3	114	617	164	413	193	106	311	145	253	180
109	—	168	199	41.9	79.3	215	100	120	617	168	416	193	120	314	154	260	181
110	—	167	204	42.8	79.6	217	105	131	617	185	419	190	130	306	159	257	191
111	—	162	205	43.6	79.9	227	109	135	614	207	425	189	147	292	159	247	211
112	—	162	214	44.2	80.1	238	114	136	614	234	430	191	156	286	162	248	226
113	—	162	225	44.5	80.7	251	122	135	612	247	439	193	160	289	162	260	240
114	—	165	228	44.5	81.6	254	129	135	612	240	450	197	168	294	161	281	251
115	—	170	216	44.7	82.4	243	133	133	606	232	459	202	182	303	175	317	261
116	—	176	239	45.9	83.8	229	139	134	609	228	464	209	182	309	190	362	273
117	—	183	260	47.6	85.2	222	144	146	609	231	467	215	179	317	195	425	276
118	—	192	267	51.5	86.9	217	149	169	617	237	476	219	181	323	201	510	273
119	—	202	267	62.9	88.9	215	153	202	634	246	484	223	184	331	213	518	267
120	—	217	266	83	90.6	215	157	236	648	274	496	227	183	337	229	487	265
121	235	225	277	109	93.4	217	156	272	674	360	507	234	181	340	253	402	262
122	269	223	286	118	96.3	225	154	314	694	391	518	260	177	340	283	445	265
123	311	220	289	117	101	238	153	343	722	368	527	300	174	340	320	439	275
124	334	221	292	118	106	246	151	351	739	345	541	326	176	345	374	436	286
125	340	224	292	119	110	252	153	360	753	328	552	337	177	371	430	430	309
126	328	229	289	125	118	252	160	371	756	320	566	345	176	405	467	430	337
127	314	237	289	132	122	254	167	379	782	317	583	351	176	442	504	433	368
128	306	249	292	142	129	255	173	391	793	326	600	354	181	473	541	442	405
129	314	262	297	151	142	258	180	408	801	351	614	365	191	498	566	453	447
130	328	281	306	152	157	261	192	416	807	374	623	377	204	524	589	467	481
131	343	306	323	151	169	261	203	425	807	374	631	391	217	538	606	479	504
132	357	334	334	151	182	263	205	436	790	368	643	399	227	544	617	507	524
133	377	371	348	152	207	265	206	445	762	360	651	408	241	558	626	524	535
134	388	416	362	155	224	268	206	456	725	357	660	413	252	572	640	532	549
135	396	479	379	158	229	270	208	464	691	365	660	419	261	592	646	532	558
136	402	558	399	162	234	271	207	481	665	379	668	433	273	603	651	541	566
137	433	620	433	169	234	276	209	496	640	399	682	447	280	614	657	549	572
138	450	665	464	174	236	283	215	501	620	430	705	462	286	623	663	561	578
139	470	699	498	181	238	289	217	513	600	479	719	476	297	631	677	566	583
140	484	731	538	189	240	294	223	532	589	518	725	490	303	637	685	566	578
141	501	756	580	197	244	303	224	547	580	530	748	510	311	640	697	566	572
142	513	782	620	205	245	306	226	552	572	532	830	532	317	657	702	569	572
143	527	801	657	211	246	309	227	558	566	535	917	555	326	665	711	569	575
144	530	824	688	218	249	311	229	564	558	555	892	578	337	671	719	578	575
145	530	838	711	228	259	311	229	572	552	544	864	595	348	674	722	578	580
146	532	850	733	236	273	309	230	578	547	549	858	614	362	674	722	583	586
147	538	861	745	247	283	309	231	583	544	555	867	640	377	680	725	589	597
148	530	867	756	254	289	309	234	589	535	558	878	654	391	680	728	592	603
149	544	875	767	262	292	309	236	592	535	561	892	646	399	674	733	597	606
150	547	886	770	270	294	311	236	586	532	561	906	623	405	671	742	595	609
151	552	895	776	278	300	311	237	578	535	561	923	597	405	674	753	597	606
152	552	898	782	286	311	314	239	569	538	561	926	583	411	674	756	614	606
153	558	900	790	294	320	317	242	558	541	561	920	566	416	680	765	631	606
154	561	903	793	303	328	317	245	549	544	555	909	552	430	682	784	637	609
155	569	903	799	314	340	323	252	547	544	547	900	541	442	682	807	646	614
156	578	900	804	323	351	323	254	544	544	544	898	532	447	691	830	646	620
157	589	900	810	334	362	320	258	541	547	544	900	527	450	694	855	648	623
158	597	903	813	343	374	317	261	535	549	538	920	524	453	694	872	651	626
159	614	906	818	348	385	314	261	530	549	535	932	521	459	694	886	651	626
160	626	906	821	357	394	311	264	527	541	530	940	518	459	697	892	651	631
161	643	906	833	365	399	311	266	524	547	532	943	515	462	697	900	651	643
162	657	906	850	377	402	311	268	527	547	532	940	515	464	699	906	654	654
163	674	909	867	385	408	311	269	530	552	538	934	515	467	699	915	654	657
164	694	915	881	391	413	311	269	527	555	541	934	515	470	697	920	660	657
165	711	917	898	399	422	311	269	530	558	544	937	515	467	694	926	663	663
166	728	920	920	405	433	309	270	538	564	544	937	515	470	694	934	663	663
167	745	923	937	408	439	306	272	549	566	544	940	521	470	694	943	665	663
168	765	920	951	411	453	303	273	566	572	544	940	535	473	694	954	668	668
169	784	917	963	413	459	294	273	580	575	538	920	552	476	694	963	671	671
170	801	923	977	419	462	286	276	597	583	538	892	566	479	694	977	671	674
171	824	926	985	422	470	283	280	617	589	541	867	583	479	694	985	668	674
172	844	926	1010	425	473	283	283	637	597	541	844	595	473	694	991	668	674
173	867	929	1020	430	481	283	283	651	603	544	821	600	473	694	997	665	677
174	883	929	1030	439	487	283	283	665	609	544	807	609	473	691	1010	665	682
175	903	926	1040	442	490	283	286	680	617	544	796	617	473	691	1010	654	688
176	923	920	1050	445	493	283	286	694	626	544	787	623	473	688	1020	643	694
177	946	917	1050	450	496	289	286	705	637	549	779	629	481	685	1020	634	699
178	963	913	1060	453	501	289	289	708	651	555	770	643	498	682	1030	631	702
179	977	906	1060	459	510	289	289	691	668	569	762	654	515	680	1040	623	705
180	991	900	1060	459	515	289	292	660	683	580	753	663	541	677	1050	623	708
181	994	900	1060	456	518	289	292	629	691	589	745	674	555	677	1050	620	705
182	994	895	1070	459	524	289	292	600	697	592	739	682	558	674	1060	620	702
183	994	895	1070	462	527	289	292	578	702	595	722	685	558	671	1060	617	699
184	988	892	1060	462	532	289	292	558	702	603	705	691	561	665	1050	617	697
185	983	883	1060	459	532	292	294	538	705	614	688	694	561	646	1050	617	694
186	971	881	1060	459	538	292	294	518	705	623	668	694	561	626	1040	614	691
187	957	878	1050	456	541	294	294	501	705	634	654	697	558	606	1040	612	688
188	946	872	1040	453	544	294	294	484	702	657	640	699	558	589	1040	614	671
189	923	867	1040	450	544	297	297	470	702	674	626	705	566	578	1030	623	654
190	909	855	1030	445	544	297	297	459	702	680	614	702	578	566	1040	631	634
191	906	847	1010	439	544	297	294	447	694	680	600	699	589	558	1030	629	626
192	881	838	1000	433	544	297	294	439	691	677	586	697	603	552	1020	629	609
193	883	827	985	430	544	297	294	430	683	682	575	694	612	549	1010	629	597
194	878	818	974	428	541	297	292	422	682	691	566	691	617	544	985	629	597
195	869	804	966	425	538	297	289	416	674	699	558	685	623	538	968	626	595
196	867	796	960	422	532	297	286	419	665	705	552	682	620	538	957	626	583

YEAR / DAY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
99	169	173	209	203	127	219	164	286	144	343	396	127	105	96	134	93.4	87
100	176	193	212	208	131	221	170	303	144	345	433	132	105	94.6	134	93.6	90
101	181	197	223	214	135	221	176	317	144	351	459	144	106	94.9	137	94.5	92
102	191	195	235	211	141	222	181	334	145	354	479	140	106	95.7	138	96	95
103	208	180	244	207	143	223	184	351	146	360	515	138	106	96.3	136	97	98.5
104	208	168	249	205	145	224	190	362	146	362	538	138	107	96.1	139	99	101
105	215	167	260	203	150	225	193	345	147	368	507	136	108	100	139	101	105
106	222	165	251	203	152	232	193	337	147	388	467	134	108	102	143	103	115
107	233	163	251	205	156	261	199	348	147	419	436	135	108	99.8	146	105	118
108	245	163	252	208	161	292	204	362	147	430	405	135	109	94.6	149	107	123
109	252	163	254	212	164	323	206	374	147	470	377	137	111	94.9	152	108	127
110	257	161	251	217	165	354	209	377	147	544	354	143	119	96.6	157	111	131
111	250	162	245	221	170	382	213	388	148	555	334	151	125	96.8	164	113	134
112	266	163	244	225	171	402	223	396	148	566	320	157	137	95.5	170	116	139
113	294	168	242	225	186	416	231	413	148	583	317	165	155	95	179	117	142
114	323	175	246	224	202	430	235	425	149	600	328	173	170	94.8	188	119	143
115	348	182	252	219	197	447	236	442	149	617	348	180	181	94.5	213	122	146
116	382	189	255	215	213	464	239	476	155	634	374	185	199	94	211	126	151
117	413	198	257	211	238	490	243	518	163	654	405	191	225	95	207	127	154
118	442	213	259	208	259	538	245	561	163	682	430	197	255	94	206	129	156
119	473	236	269	206	268	575	244	586	162	722	436	202	277	94	206	133	158
120	504	252	281	206	270	578	243	623	160	765	439	207	300	94.3	208	185	161
121	527	258	289	208	269	569	243	736	163	796	439	219	326	96.3	213	195	164
122	558	259	292	210	270	575	244	736	165	824	436	227	334	99.3	224	213	168
123	589	261	294	213	274	603	249	705	173	847	442	231	340	99.3	228	228	171
124	606	267	297	217	283	631	254	682	183	861	450	235	362	97.7	232	232	173
125	623	300	294	221	297	648	267	674	194	878	462	237	411	103	233	245	176
126	643	348	286	224	309	663	286	682	197	917	470	238	436	108	236	269	180
127	665	377	283	226	311	674	309	697	199	943	479	238	445	111	238	297	184
128	705	391	292	227	314	691	320	711	199	957	484	240	442	114	241	315	189
129	725	405	294	233	317	708	328	714	198	966	487	241	439	117	247	325	195
130	722	428	294	239	323	728	331	714	200	963	484	244	436	120	250	331	201
131	714	447	297	245	343	745	326	705	206	957	481	247	433	121	254	341	205
132	711	470	303	248	360	756	326	682	216	949	479	248	433	123	259	353	207
133	705	496	306	253	377	745	323	651	225	934	473	249	433	125	263	354	209
134	702	515	309	257	399	728	326	620	233	912	467	251	430	125	268	347	211
135	716	530	309	268	419	714	328	600	238	886	462	257	428	127	276	350	215
136	731	541	309	286	425	697	337	578	242	861	456	265	430	130	285	351	219
137	753	555	309	314	433	674	345	561	248	850	453	274	433	132	291	353	223
138	767	572	309	326	462	631	354	547	255	844	450	280	436	134	299	365	225
139	773	589	309	328	490	634	360	535	260	833	447	283	439	136	306	372	228
140	776	614	311	328	510	617	362	524	265	821	445	286	439	139	314	375	230
141	782	634	311	323	527	606	362	515	266	807	442	288	436	141	322	376	231
142	787	665	314	326	521	606	365	510	268	796	436	289	436	142	331	379	233
143	796	691	314	326	501	609	368	510	271	787	436	294	433	147	338	381	234
144	801	714	317	328	487	606	371	513	277	782	436	297	436	152	346	387	235
145	807	728	323	334	479	597	377	513	280	779	433	300	436	155	356	393	237
146	807	742	328	340	470	592	379	521	281	770	430	300	442	158	366	397	237
147	807	753	334	343	464	586	382	527	281	767	428	300	445	161	376	397	239
148	807	756	340	345	456	583	382	535	283	762	425	300	447	164	387	397	240
149	813	770	348	345	447	580	382	544	286	753	425	300	447	168	400	398	242
150	827	776	351	345	442	580	385	549	292	739	425	300	447	170	411	399	244
151	833	782	360	345	433	586	388	555	294	739	425	300	447	174	422	400	246
152	841	790	365	345	430	586	394	558	294	770	430	297	447	177	429	404	247
153	844	793	371	348	428	586	396	566	297	801	433	294	445	180	435	411	252
154	844	793	377	348	422	583	399	572	300	821	433	294	447	182	441	416	255
155	847	790	382	351	416	583	402	578	303	835	433	294	447	183	447	420	257
156	841	793	385	351	413	583	405	580	309	850	430	294	450	185	452	424	259
157	835	793	391	354	411	586	408	583	311	855	430	294	453	186	459	427	261
158	833	796	394	357	411	586	416	583	314	852	428	294	453	188	465	429	264
159	821	799	396	357	411	589	422	583	317	835	433	289	450	190	470	433	268
160	793	799	399	360	413	592	422	580	317	830	447	289	450	190	474	436	273
161	770	804	402	365	419	595	425	578	320	847	462	289	450	192	477	438	278
162	750	810	405	368	416	606	425	578	323	867	470	289	450	195	486	439	280
163	733	821	405	371	419	634	425	580	326	878	479	292	450	197	496	442	284
164	719	824	408	371	419	680	428	578	328	892	493	292	450	197	503	445	289
165	702	827	413	371	422	722	433	578	331	909	510	294	450	199	509	447	290
166	694	827	425	374	425	767	436	578	334	934	530	300	453	200	512	450	294
167	685	830	442	377	428	810	439	578	337	968	541	303	453	203	518	452	296
168	682	830	459	377	428	855	445	575	343	997	547	306	456	205	521	455	299
169	671	833	476	379	428	881	453	572	345	1010	552	309	459	208	521	457	302
170	663	838	487	379	430	883	456	572	351	1020	555	309	459	209	523	459	305
171	654	838	498	379	430	881	456	569	354	1030	561	309	459	210	526	460	309
172	646	824	513	382	433	875	459	566	357	1030	569	309	459	209	531	462	310
173	640	799	521	385	433	869	459	566	357	1030	580	311	457	208	534	462	308
174	637	782	527	385	433	867	462	561	357	1040	580	314	458	208	534	462	308
175	640	762	527	385	436	864	462	558	360	1040	578	314	458	209	533	462	310
176	654	748	532	382	439	861	462	555	360	1040	575	314	457	210	533	464	312
177	663	736	538	382	445	864	462	552	360	1050	575	314	456	211	531	464	314
178	671	728	544	382	447	881	464	549	362	1050	575	314	454	213	529	465	317
179	680	722	549	385	450	915	464	547	374	1050	578	314	452	214	521	466	318
180	682	722	549	385	450	949	464	544	379	1050	578	311	450	214	511	469	320
181	682	716	544	382	450	974	464	544	382	1040	578	311	449	214	504	469	323
182	682	714	532	379	456	985	464	541	388	1040	578	311	446	214	501	469	323
183	680	705	518	379	462	1010	464	538	388	1040	575	309	446	214	500	471	325
184	682	699	507	379	464	1030	470	535	388	1030	575	306	444	215	499	473	327
185	682	694	498	379	464	1040	479	535	388	1030	575	306	442	217	494	473	329
186	682	685	490	382	467	1060	490	532	385	1020	575	303	441	218	491	473	329
187	682	685	481	379	473	1070	501	532	382	1020	575	303	441	219	487	470	328
188	682	694	473	379	481	1080	507	530	379	1010	575	300	438	221	484	467	330
189	694	716	464	377	490	1060	513	524	377	1010	575	297	436	220	481	468	331
190	699	739	456	374	496	1030	515	524	377	1010	575	300	434	219	476	465	332
191	705	756	447	371	504	1010	521	521	377	1010	566	306	432	219	470	464	332
192	708	773	442	368	521	1010	530	518	377	1000	558	306	434	219	467	462	333
193	714	793	436	362	547	1010	532	518	377	1000	558	306	434	218	462	459	333
194	714	804	430	360	558	997	532	518	377	1010	555	300	435	216	459	455	335
195	714	810	416	354	561	991	532	524	377	1010	549	297	434	215	457	457	340
196	714	816	405	351	558	997	532	544	374	1000	541	294	433	215	454	459	347

YEAR / DAY	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
99	134	120	104	161	105	89	133	127	230	122	205	168	148	191
100	135	130	106	164	108	93.5	138	131	226	130	212	168	170	194
101	136	150	109	166	113	90	147	137	222	134	220	167	210	204
102	138	148	112	165	114	105	149	148	222	134	226	166	232	214
103	140	146	115	168	117	113	160	158	221	134	232	167	280	227
104	142	151	118	176	123	123	183	168	223	133	244	170	273	241
105	150	158	121	181	127	130	211	176	225	132	255	175	275	254
106	159	158	123	183	136	136	242	182	231	133	264	178	279	268
107	163	160	126	182	145	141	271	187	244	135	277	179	294	305
108	165	161	130	180	155	146	300	194	256	137	290	180	312	329
109	166	159	140	179	160	150	332	203	265	140	308	181	343	341
110	167	156	164	178	167	155	361	214	274	142	326	185	353	368
111	171	155	182	178	172	161	386	224	281	144	344	191	350	405
112	172	154	186	179	175	168	412	234	287	148	369	200	347	420
113	173	153	183	181	186	168	436	242	289	156	385	206	348	432
114	175	154	175	183	211	169	451	251	290	165	393	210	354	449
115	179	153	170	183	218	171	458	283	291	173	395	218	380	465
116	178	155	167	184	210	175	462	327	296	183	391	224	407	487
117	176	159	166	185	205	180	463	333	305	193	388	227	405	527
118	175	159	167	187	203	183	463	325	318	200	385	231	413	563
119	175	159	169	191	206	187	462	321	328	206	383	236	418	577
120	175	158	168	196	210	191	462	314	342	209	387	242	418	579
121	175	158	167	209	212	197	462	310	350	214	391	248	420	580
122	178	159	166	237	210	201	465	309	356	220	397	254	423	582
123	183	163	165	270	219	206	465	309	360	224	399	258	424	586
124	188	173	165	293	213	207	451	311	364	228	400	263	425	595
125	190	185	165	301	217	209	431	314	367	231	402	270	427	609
126	192	194	168	303	220	216	413	317	372	237	402	275	428	624
127	194	197	172	304	224	225	396	323	374	243	403	277	429	643
128	198	198	178	304	227	232	381	336	376	251	404	279	433	657
129	202	199	182	308	231	238	373	352	380	256	408	280	434	680
130	209	202	186	312	235	244	364	361	383	261	408	285	435	700
131	212	204	190	315	239	249	357	363	391	269	409	293	435	725
132	216	205	191	318	244	252	351	366	393	283	410	302	434	750
133	218	204	194	321	250	256	347	369	396	294	412	312	434	770
134	228	206	195	324	258	261	342	370	400	301	413	320	436	790
135	261	207	195	325	264	267	338	368	404	308	413	328	443	805
136	303	210	194	325	274	271	335	368	405	311	414	336	452	837
137	321	213	197	327	280	274	334	367	406	314	415	342	460	849
138	321	217	199	328	286	284	332	369	408	317	418	346	464	863
139	315	222	202	327	293	294	332	371	409	318	420	349	471	870
140	317	232	211	328	298	298	330	372	409	322	422	351	486	877
141	320	239	223	330	304	301	330	372	410	327	423	353	508	882
142	318	245	235	331	312	305	330	371	411	334	424	355	520	888
143	319	249	241	336	323	307	333	371	411	342	425	357	523	891
144	320	255	243	332	331	311	333	372	410	347	427	359	525	891
145	321	260	244	333	340	314	335	375	412	350	430	360	525	891
146	323	267	247	337	347	318	337	376	414	353	431	359	527	888
147	326	274	250	339	355	319	337	377	415	357	432	360	530	889
148	327	285	259	341	366	322	339	381	415	358	433	362	532	891
149	331	291	265	343	378	325	343	381	415	361	435	364	533	896
150	337	295	268	344	389	327	350	382	416	364	438	366	535	905
151	342	300	271	348	399	328	353	382	417	368	439	365	539	916
152	345	302	274	351	408	328	359	381	420	376	438	364	541	926
153	345	303	276	356	415	329	363	379	423	382	439	365	543	932
154	343	305	276	356	423	329	367	381	424	387	440	364	551	936
155	348	309	277	360	430	328	375	387	425	394	442	363	554	941
156	353	313	278	365	438	328	384	389	426	399	444	367	559	948
157	362	316	279	370	447	330	390	390	428	402	448	371	561	954
158	375	319	282	373	458	329	397	395	430	406	453	373	563	960
159	383	321	284	377	466	328	401	396	432	410	456	370	563	969
160	389	323	290	380	468	329	404	394	435	417	457	368	565	978
161	392	324	296	381	475	331	411	395	437	422	455	365	568	983
162	391	325	302	383	488	331	426	395	439	423	454	363	572	986
163	390	327	307	386	505	331	447	394	440	426	454	364	573	991
164	389	336	310	388	517	330	463	395	442	426	458	367	576	998
165	389	334	315	390	526	332	480	398	443	425	460	366	579	1000
166	389	340	325	394	534	332	493	399	444	428	463	365	580	1010
167	390	342	335	396	539	333	497	402	446	433	468	363	582	1010
168	391	344	345	396	545	331	497	408	447	442	471	361	585	1010
169	393	343	356	397	553	330	494	412	448	451	472	358	588	1010
170	393	344	366	398	557	329	491	414	448	454	472	359	593	1010
171	394	346	374	399	561	331	490	413	450	455	472	360	596	1010
172	394	349	380	407	564	331	490	411	451	455	471	359	600	1010
173	395	348	384	408	564	329	489	408	452	457	469	357	602	1010
174	398	346	391	416	565	326	491	407	452	461	466	354	603	1010
175	401	347	396	409	568	324	488	405	452	462	464	351	604	1010
176	402	348	404	408	567	323	487	402	452	461	462	349	604	1010
177	405	348	409	406	567	322	486	401	451	461	459	345	603	1010
178	407	349	413	405	567	321	485	399	452	467	456	342	603	1010
179	409	349	415	403	565	323	485	400	463	498	454	339	602	1010
180	414	350	417	406	562	321	485	401	473	552	450	335	600	1010
181	420	352	421	407	561	320	485	406	477	620	448	332	598	1000
182	423	351	424	406	559	316	485	405	480	646	448	329	596	996
183	423	351	427	405	558	315	484	403	482	624	449	328	596	991
184	424	350	432	403	555	312	486	400	487	595	451	329	604	985
185	426	350	434	400	552	311	492	399	494	575	455	326	617	978
186	430	351	436	400	549	310	493	398	505	559	458	321	633	971
187	432	351	436	397	545	308	494	395	518	545	455	316	645	966
188	434	350	437	395	540	305	497	390	535	534	451	310	658	959
189	436	355	437	397	534	301	500	385	550	522	446	305	668	951
190	434	372	437	394	528	301	503	382	562	514	442	300	678	942
191	432	396	436	391	524	300	500	377	572	504	438	301	688	934
192	429	418	438	388	521	298	494	372	583	495	433	301	696	929
193	427	438	434	384	518	294	492	369	591	488	427	301	701	920
194	425	453	436	383	511	292	487	369	595	478	421	303	703	907
195	425	468	437	383	508	294	485	372	600	471	418	312	703	894
196	433	479	446	399	509	304	492	383	602	470	425	329	706	885

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR DAY	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
197	680	589	535	954	623	561	711	824	394	348	555	1010	532	561	374
198	674	555	530	943	623	538	705	833	382	345	549	1020	530	572	374
199	668	535	527	934	620	521	705	835	371	343	544	1020	527	586	371
200	665	532	515	926	617	504	699	835	360	337	541	1030	527	597	368
201	665	538	513	915	612	493	671	835	351	334	532	1030	524	606	365
202	663	555	504	915	606	481	637	841	343	331	527	1030	521	612	362
203	657	547	504	909	603	464	614	841	334	331	521	1030	518	620	360
204	654	524	504	903	597	450	609	841	323	326	513	1020	513	626	357
205	651	496	501	900	592	439	595	841	317	320	507	1020	507	629	354
206	646	473	496	892	586	425	566	838	311	317	498	1020	504	631	351
207	640	484	493	875	583	416	541	833	306	317	490	1020	504	631	348
208	634	532	493	855	578	408	532	824	300	320	487	1010	498	629	348
209	629	578	487	835	572	399	541	816	294	323	484	1000	493	629	345
210	626	617	484	818	566	391	549	801	289	323	481	991	481	626	345
211	620	648	479	807	564	382	558	782	282	320	481	983	473	623	340
212	614	665	470	796	555	385	566	756	279	317	479	971	464	620	337
213	612	677	467	790	541	399	569	739	273	314	476	963	456	617	334
214	606	694	462	784	532	416	569	722	269	311	476	949	447	612	331
215	603	711	459	776	524	436	564	705	265	309	473	937	442	609	328
216	597	714	456	773	521	450	566	685	261	309	470	929	433	606	326
217	595	674	453	770	518	459	566	665	257	309	467	920	430	600	328
218	589	617	450	759	515	453	566	654	257	311	473	912	425	597	323
219	586	564	445	748	513	447	564	637	257	311	473	900	413	592	323
220	580	535	445	739	507	445	541	623	258	314	473	889	402	583	323
221	572	524	442	731	504	436	527	609	257	311	473	881	394	578	323
222	569	515	439	722	501	422	515	595	258	311	473	872	388	572	320
223	561	507	436	714	496	405	515	578	258	311	473	864	382	566	317
224	538	507	433	705	490	391	515	564	261	314	470	841	377	558	314
225	515	504	430	699	490	377	513	538	261	311	467	818	371	541	311
226	504	498	428	697	481	368	513	515	261	311	467	796	371	513	309
227	496	493	425	685	476	357	510	498	260	309	462	776	368	484	306
228	490	487	419	682	467	348	507	481	260	309	459	759	357	464	303
229	484	487	416	677	462	340	484	467	264	309	456	739	348	447	311
230	476	484	411	671	456	331	450	453	267	309	450	722	345	433	320
231	470	481	408	665	450	323	430	445	273	306	447	708	340	416	328
232	470	481	408	660	445	317	428	447	276	300	442	697	331	402	337
233	473	479	408	651	445	309	428	447	280	300	439	682	328	388	343
234	479	476	408	646	439	303	430	447	281	297	436	677	326	377	348
235	484	473	402	634	439	297	430	447	282	297	436	665	326	365	354
236	493	467	396	620	430	300	430	453	283	294	433	657	320	354	357
237	504	464	394	614	428	311	430	453	286	294	428	648	314	345	357
238	515	459	391	609	428	326	430	453	286	292	425	637	309	337	360
239	530	453	388	606	425	348	425	453	289	289	422	629	303	326	362
240	541	447	385	597	419	374	408	447	289	289	416	620	297	317	365
241	552	445	382	595	419	394	391	445	289	289	413	612	289	311	368
242	566	439	379	592	413	405	385	445	289	286	408	603	283	303	368
243	583	436	377	586	405	413	382	442	292	283	411	595	277	297	371
244	589	430	374	580	399	428	379	439	292	282	408	580	269	292	371
245	597	428	371	575	396	436	379	436	289	280	405	572	262	286	371
246	606	422	368	569	394	447	374	430	300	281	402	566	256	281	371
247	614	416	368	566	388	453	374	428	303	281	399	555	252	276	368
248	620	413	368	558	382	462	368	422	306	283	396	544	247	270	365
249	626	411	368	538	379	476	362	422	303	283	394	532	244	267	351
250	626	408	365	521	374	481	351	422	300	283	391	515	238	263	334
251	629	405	362	515	371	484	343	428	300	283	388	487	234	260	317
252	629	399	362	510	368	487	337	430	300	283	385	470	230	257	303
253	629	396	362	504	362	487	328	433	297	283	382	462	226	256	286
254	631	394	360	496	357	481	326	433	294	282	382	453	222	254	275
255	631	391	357	496	354	479	320	430	294	281	379	450	218	251	267
256	631	388	357	493	351	481	314	433	294	280	377	447	215	247	264
257	629	382	357	487	348	484	309	436	294	279	374	445	210	243	263
258	629	379	354	481	345	484	306	439	292	278	374	445	206	240	263
259	629	379	348	479	343	484	303	442	289	278	368	439	202	236	264
260	629	377	345	479	340	479	300	445	289	278	362	439	199	233	263
261	629	374	345	473	340	470	294	445	292	279	360	433	196	230	263
262	629	374	340	467	334	476	292	445	289	278	357	428	193	227	259
263	629	371	340	464	326	479	283	442	292	276	357	425	190	225	256
264	626	368	337	464	311	487	277	442	292	275	354	425	188	221	255
265	623	368	337	459	303	490	268	445	292	277	351	425	186	219	253
266	617	365	337	462	292	496	264	447	294	276	348	419	184	215	252
267	614	362	334	470	278	496	256	447	294	279	348	416	182	213	250
268	614	360	334	490	268	498	250	445	294	277	348	416	180	211	248
269	612	357	328	498	261	498	246	445	292	274	345	413	180	210	246
270	609	354	328	496	253	504	240	442	294	271	343	411	179	211	243
271	606	354	328	493	246	504	234	442	294	270	345	411	178	206	244
272	603	351	326	487	241	504	231	439	294	268	343	411	179	202	242
273	600	345	323	481	237	504	229	433	294	266	340	408	177	197	240
274	597	345	323	476	234	504	224	433	297	265	340	405	174	193	237
275	592	348	323	476	229	504	218	430	297	264	340	405	172	190	238
276	589	354	323	470	225	501	211	425	300	263	337	402	169	188	249
277	586	351	320	467	219	498	206	425	300	261	334	402	168	187	261
278	583	348	306	462	216	496	202	422	297	260	334	399	167	185	272
279	572	348	286	456	213	496	198	422	300	260	334	396	168	183	283
280	552	345	270	453	210	490	195	419	297	257	334	391	166	180	292
281	535	343	260	447	210	490	192	419	297	256	331	394	163	182	286
282	527	340	260	442	210	487	192	416	297	259	331	391	161	192	275
283	510	340	262	436	207	487	193	416	300	258	328	388	159	207	262
284	496	340	267	436	206	479	193	419	300	258	328	385	158	223	249
285	467	337	273	433	202	476	193	419	294	257	328	382	157	236	236
286	439	337	279	430	200	476	191	416	294	256	328	379	156	248	224
287	411	340	281	430	199	473	191	413	294	253	326	377	153	260	216
288	365	340	286	428	200	467	192	413	294	251	326	371	151	267	222
289	328	340	286	425	199	467	197	413	294	249	323	368	148	275	231
290	300	337	289	422	197	467	201	416	294	247	323	368	147	283	244
291	276	337	289	419	194	464	207	413	292	247	323	368	148	292	255
292	252	337	289	413	190	459	211	416	292	244	328	368	148	297	266
293	232	337	287	411	188	450	217	413	297	242	331	368	145	303	276
294	219	340	289	411	187	436	220	413	297	240	331	371	143	306	283

YEAR DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
255	326	276	345	205	348	191	147	430	419	583	487
256	320	270	343	204	362	188	146	419	413	583	484
257	317	266	334	200	365	186	144	416	408	583	484
258	311	260	328	199	362	184	143	419	408	586	481
259	309	255	323	195	360	182	143	425	408	589	479
260	306	251	323	194	354	181	142	425	405	589	476
261	300	246	320	193	345	178	141	413	408	589	476
262	294	244	317	188	340	177	140	399	430	589	470
263	292	242	314	187	334	174	140	391	442	586	470
264	286	237	309	183	326	173	137	385	447	583	467
265	282	232	306	179	320	169	134	374	450	583	467
266	277	231	300	179	317	166	131	362	450	580	464
267	274	228	297	175	314	164	129	354	453	580	462
268	272	227	297	171.6	309	162	129	348	456	580	456
269	269	223	294	171	309	161	128	343	456	580	453
270	268	219	294	168	303	161	127	337	459	580	453
271	266	214	292	172	300	160	129	331	459	578	447
272	263	211	289	175	303	158	126	323	459	575	445
273	258	208	289	175	303	156	125	314	459	572	442
274	254	206	289	176	297	153	124	311	459	572	442
275	251	204	286	174	294	152	126	306	459	566	439
276	247	203	283	172	292	150	123	303	459	555	430
277	247	199	286	170	286	148	122	294	459	538	430
278	247	199	283	169	282	146	121	294	456	535	428
279	247	195	283	169	279	146	119	294	456	535	419
280	246	193	283	168	278	143	117	294	456	532	408
281	243	190	283	166	276	142	119	294	453	532	382
282	238	187	286	160	276	140	116	294	453	535	365
283	238	186	250	157	273	138	115	294	450	535	343
284	234	185	174	154	273	138	113	297	450	532	328
285	233	182	143	154	273	136	112	300	450	530	317
286	232	181	134	152	272	135	112	303	445	530	311
287	230	179	130	151	271	134	112	303	447	533	300
288	230	177	125	150	268	135	108	306	445	538	289
289	230	174	122	150	268	132	108	306	445	541	286
290	231	172	119	151	268	129	105	306	445	544	280
291	229	170	116	152	268	128	103	306	445	549	275
292	229	168	113	151	267	128	101	303	445	552	269
293	229	168	112	151	267	127	100	303	442	558	264
294	228	168	110	150	265	124	97.7	303	442	558	262

B.C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS, NECHAKO RIVER EROSION AT MIWORTH AND ASPEN LANE, PRINCE GEORGE, B.C.

NECHAKO RIVER DAILY FLOWS, WATER SURVEY OF CANADA GAUGE 08JC002

YEAR / DAY	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
295	228	167	108	149	262	125	97.1	297	439	564	262	208	340	289	408	191
296	228	167	105	150	260	125	94.3	297	436	564	263	198	343	289	399	192
297	228	165	104	149	259	122	94.3	294	416	566	263	187	345	292	396	191
298	227	157	103	152	256	120	95.7	294	402	572	264	179	345	292	396	190
299	224	152	103	151	253	119	94.3	294	399	575	267	171	345	289	394	188
300	223	152	102	149	253	117	94.3	294	402	575	268	167	345	289	394	186
301	221	152	98.5	150	252	117	90.6	294	408	578	270	162	345	289	394	187
302	219	153	97.4	151	249	117	87.8	292	408	578	270	158	343	286	396	187
303	219	153	96.8	153	246	119	86.7	297	411	578	273	152	343	286	399	187
304	217	151	95.1	154	246	119	87.2	303	413	586	276	150	345	286	402	186
305	214	160	94	155	244	119	95.4	306	413	606	281	147	345	283	405	186
306	209	166	92.9	156	243	114	88.1	306	419	631	286	148	345	282	408	185
307	209	168	91.7	157	243	111	84.1	303	419	634	292	141	345	282	405	186
308	209	170	90	155	246	110	84.7	300	425	626	294	114	345	282	402	186
309	209	172	90.3	156	249	110	87.5	300	425	617	300	130	345	282	399	185
310	211	176	92	157	257	111	89.5	297	428	609	303	136	345	281	399	182
311	208	178	88.1	157	263	113	89.5	297	428	606	306	138	343	281	396	178
312	209	179	86.7	157	263	113	88.3	294	428	612	309	139	345	281	394	176
313	204	183	86.1	158	262	114	87.8	292	428	614	309	140	351	278	388	175
314	197	184	83.8	159	262	113	85.8	294	428	617	311	139	348	268	385	173
315	214	185	83	160	261	100	85.5	292	428	623	314	139	348	257	382	170
316	230	187	82.1	160	260	101	86.1	297	425	612	314	139	348	257	382	168
317	237	187	81	160	258	101	83.5	297	425	592	314	138	348	257	382	163
318	233	187	81.3	161	261	99.1	84.1	300	425	575	317	137	348	261	379	162
319	195	187	81.3	162	272	99.1	82.7	300	425	524	317	136	348	261	377	159
320	144	184	81	163	278	97.7	77.6	297	419	436	314	133	348	261	374	150
321	140	182	81	164	279	97.1	78.2	300	411	433	314	125	348	262	374	161
322	148	181	80.4	163	278	96.3	76.5	303	416	459	317	116	348	256	374	159
323	213	180	80.4	161	279	96.3	75.6	306	416	487	317	108	354	206	374	156
324	237	179	78.4	161	281	96	74.8	306	419	487	317	101	362	201	374	154
325	251	177	79.6	161	286	94.9	74.5	306	413	447	317	96.3	368	195	371	153
326	269	176	80.7	162	294	94.3	73.6	306	419	453	314	93.4	368	193	368	154
327	269	173	78.4	161	297	94	72.5	311	416	419	314	92	365	198	345	145
328	270	170	75	162	294	92	71.9	320	419	402	314	89.2	362	224	328	109
329	261	168	71.9	166	294	85	71.1	326	416	388	314	86.4	362	228	317	97.7
330	249	167	71.1	165	294	79	71.4	328	413	379	306	85.5	362	227	294	99.4
331	241	165	70.2	168	294	77.9	70.8	331	408	368	309	85	362	221	196	147
332	235	164	69.1	179	294	77.3	70.8	331	413	371	306	85	357	212	191	161
333	229	163	67.7	192	294	76.5	70.8	331	413	396	303	85	354	204	190	154
334	225	161	67.1	193	294	72.2	70.8	328	422	388	300	85	354	198	187	139
335	218	161	67.1	190	292	68	70.2	326	425	394	300	85	348	190	186	130
336	214	161	67.1	190	286	67.4	69.4	323	425	394	297	85	351	184	181	128
337	211	161	67.1	187	289	67.1	69.1	317	428	391	294	85	331	176	178	127
338	210	160	66.8	183	286	66.8	68	314	419	391	292	85	314	168	176	127
339	209	158	66.8	178	286	66.5	66.8	326	396	396	289	85	303	161	173	127
340	206	156	66.5	169	289	67.1	67.1	317	326	396	292	85	292	154	173	127
341	204	153	66.5	173	294	67.7	66.8	314	317	394	294	85	281	150	171	127
342	202	152	66.3	177	294	67.6	66.8	345	331	396	297	85	270	144	171	127
343	201	150	65.1	157	292	66	66.5	365	340	396	303	85	259	*136	171	127
344	199	150	63.1	148	289	65.1	66.5	368	328	402	303	85	250	133	171	127
345	198	150	60.3	144	279	66	66.5	368	326	413	297	85	245	129	171	127
346	194	151	58	140	292	66.3	66	379	334	425	292	85	238	124	171	127
347	193	151	56.4	137	286	64.6	66.5	391	334	422	279	85	234	121	171	127
348	190	150	57.5	135	289	63.4	67.1	396	334	419	263	85	227	118	171	127
349	189	148	58.6	132	283	63.1	66.5	396	328	419	241	85	225	115	171	127
350	187	146	59.7	130	282	62.9	66.3	391	317	425	224	85	222	112	171	127
351	185	144	60.9	127	281	61.9	66	408	317	413	214	85	218	109	171	127
352	183	142	58	126	283	60.3	65.7	419	282	425	208	85	214	108	171	127
353	181	144	57.8	125	289	59.5	65.4	422	263	481	204	85	210	106	171	127
354	181	146	57.5	123	300	58.9	65.1	428	267	496	200	85	209	105	171	127
355	178	144	60	122	289	57.8	65.1	419	258	467	198	85	207	103	171	127
356	176	142	56.9	120	282	56.6	65.1	413	247	450	198	85	201	101	171	127
357	175	141	56.6	119	275	56.4	65.1	422	236	487	198	85	198	99.1	171	127
358	173	136	56.6	118	266	55.5	65.1	430	235	501	198	85	193	97.7	171	127
359	172	135	56.6	117	230	54.9	65.1	439	240	487	198	85	190	97.7	171	127
360	172	133	56.4	116	213	53.8	65.4	430	230	481	198	85	187	97.1	171	127
361	171	131	56.1	116	219	53	65.7	425	221	484	198	85	184	96.3	171	127
362	170	128	55.8	114	247	51.8	66	419	219	498	197	85	181	96.3	171	127
363	170	125	55.5	113	237	51.3	66.5	428	216	479	197	85	178	96.3	171	127
364	170	122	55.2	113	227	51	67.7	385	212	479	195	85	177	96.3	171	127
365	168	121	54.9	112	215	51	69.4	374	208	459	194	85	176	96.3	171	127

YEAR / DAY	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
295	425	225	413	300	240	334	374	143	311	292	467	182	108	124	119	114
296	413	229	413	300	237	334	371	141	311	297	464	182	110	122	118	112
297	391	231	413	297	236	334	371	140	311	303	462	184	108	120	116	111
298	385	235	419	297	237	343	371	139	314	306	462	185	111	122	114	112
299	391	237	422	297	236	348	368	139	314	309	462	182	109	122	114	112
300	385	241	422	297	235	348	368	139	317	311	459	182	108	122	115	111
301	379	242	425	297	234	345	365	138	317	314	459	180	108	122	115	109
302	374	242	436	297	234	343	365	138	320	314	459	180	107	122	113	110
303	371	249	459	297	233	343	348	138	320	314	456	179	107	121	115	109
304	368	253	476	297	232	345	340	140	320	317	456	179	106	121	116	108
305	365	255	481	297	232	345	326	139	323	326	456	178	104	120	115	106
306	362	255	481	297	232	343	317	134	323	328	453	179	104	118	115	107
307	360	255	479	297	231	345	303	118	323	328	450	178	104	116	116	109
308	348	255	479	300	229	345	294	94.3	320	334	450	176	106	115	118	110
309	328	254	476	303	229	343	289	77.9	320	345	447	174	105	113	118	111
310	314	252	473	303	227	343	283	96.8	320	348	447	172	106	110	119	109
311	300	249	470	294	225	343	278	92.9	320	345	445	172	105	105	121	108
312	286	243	470	289	222	334	274	114	320	343	445	172	108	106	122	108
313	278	241	470	283	218	317	270	123	320	343	445	171	110	104	122	110
314	268	236	470	278	212	306	267	127	317	340	442	167	110	103	124	109
315	261	232	467	275	206	294	263	127	309	337	442	167	99.1	103	124	108
316	257	227	470	271	202	286	260	127	297	334	439	166	92.9	104	123	108
317	251	225	473	268	198	278	257	127	283	334	439	164	97.7	105	122	108
318	247	224	470	265	195	270	255	127	273	340	436	162	116	102	123	107
319	229	222	464	263	191	263	252	127	262	345	436	161	119	101	124	108
320	210	219	445	261	187	257	249	127	253	345	433	161	118	99.9	125	108
321	223	216	416	258	185	252	246	126	246	345	436	160	108	100	125	109
322	239	215	399	256	182	248	243	126	241	343	439	145	92	97.5	125	110
323	257	212	405	259	181	244	241	126	235	337	439	117	94	96.1	125	109
324	247	210	391	263	177	242	238	126	229	326	436	97.7	91.7	93.3	127	109
325	228	211	377	270	176	242	236	127	229	306	433	92.9	113	92.3	127	108
326	213	211	368	270	172	238	234	127	228	303	433	133	115	90.8	128	108
327	181	213	360	271	170	234	233	127	227	300	433	156	115	89.8	129	108
328	201	210	351	269	167	232	232	127	227	283	433	147	115	89.9	119	108
329	199	207	345	268	164	229	231	127	225	273	433	144	114	90	127	108
330	197	202	340	265	161	227	230	126	222	266	430	142	114	89.1	126	108
331	195	182	334	264	158	225	227	126	219	252	419	140	114	87.8	120	106
332	185	184	328	266	156	222	209	126	219	241	402	140	114	83.5	116	98.6
333	120	201	328	269	154	220	210	125	214	203	394	139	114	58	114	94.5
334	163	195	323	271	152	217	210	125	212	221	379	139	114	68	99	85.5
335	179	186	320	270	150	214	201	124	210	215	371	139	114	73.6	90	96.9
336	187	175	320	272	149	210	194	123	207	211	362	139	114	76.5	72	86.4
337	186	189	306	275	148	198	126	123	205	207	351	139	114	74.2	90	85.5
338	186	191	279	277	147	191	127	123	202	204	328	139	114	71.9	110	86
339	187	188	245	276	147	177	130	123	200	200	320	137	114	69.4	108	85.8
340	187	165	244	274	146	165	135	123	197	196	334	136	114	66.5	107	84.1
341	186	164	241	272	146	135	139	123	195	193	331	135	114	64.8	107	84.4
342	185	161	241	272	144	152	142	124	194	189	343	135	114	62.3	106	83.8
343	186	159	238	269	144	177	146	124	191	187	328	135	114	60.9	105	83.3
344	186	159	238	264	143	193	148	125	190	187	311	133	114	59.7	106	83
345	186	159	237	259	142	194	157	125	185	187	328	130	114	58.3	110	82.6
346	187	158	231	257	142	194	159	125	184	184	337	128	114	56.9	120	81.6
347	190	155	228	255	141	194	163	125	180	183	331	126	114	56.4	137	81
348	193	153	227	255	140	194	168	126	177	181	323	125	114	55.8	150	80.7
349	198	150	227	249	139	194	170	126	173	181	320	123	114	55.5	158	81
350	199	145	227	244	137	194	175	126	170	181	317	122	114	55.2	164	80.4
351	193	143	225	241	136	195	180	126	167	180	320	120	114	55.2	159	81.3
352	191	142	224	226	135	195	182	126	164	178	323	119	114	55.5	154	81.6
353	191	141	222	226	134	194	187	126	164	177	306	118	114	56.1	149	82.4
354	194	141	221	226	133	194	189	126	159	176	297	118	114	56.6	140	84.4
355	195	141	221	227	132	194	195	126	156	172	297	116	113	57.2	137	83.8
356	195	141	221	227	131	193	198	126	154	172	294	116	113	58	132	83
357	194	142	221	227	130	193	199	126	153	171	294	115	113	59.5	125	82.7
358	193	142	221	229	129	191	203	126	151	171	292	115	113	60	121	83.8
359	195	142	219	232	129	191	209	126	150	171	292	113	113	60.9	114	83.8
360	194	142	218	234	127	191	210	127	150	171	289	113	113	61.7	108	83.5
361	193	142	219	238	127	191	214	126	149	170	289	112	113	62	107	83
362	192	142	220	239	125	190	215	125	147	170	289	112	113	62.3	107	83.3
363	190	142	221	243	125	190	215	123	146	170	289	112	113	62.6	115	82.7
364	188	142	221	244	124	188	215	122	144	170	289	110	113	62.9	120	82.1
365	184	142	222	245	123	187	215	122	144	168	286	109	113	63.7	118	81.6

YEAR / DAY	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
295	146	147	149	153	131	128	131	91.5	120	126	120	145	123	113	361	229
296	145	146	148	153	129	126	130	91.8	120	125	120	145	122	112	364	229
297	144	145	148	152	128	123	128	91.8	117	123	121	145	120	110	365	229
298	144	144	152	151	128	120	128	92.2	114	122	121	145	119	110	374	231
299	146	143	150	149	128	118	127	91.9	116	121	122	146	119	112	374	229
300	148	142	149	148	127	118	127	90.5	115	116	122	142	119	112	377	228
301	148	141	146	145	127	115	126	90.2	115	111	122	141	120	112	380	230
302	146	139	134	144	126	114	125	90.8	116	111	120	141	119	111	383	230
303	146	138	109	144	125	114	126	88.4	114	117	120	140	119	110	385	231
304	145	138	114	143	124	114	123	87.9	112	120	119	139	117	108	385	231
305	143	138	111	144	124	114	124	88.2	111	121	121	138	118	107	385	231
306	143	137	138	144	125	113	124	88.1	111	118	121	139	118	104	387	232
307	142	136	139	143	127	111	124	88.2	109	117	122	140	117	101	389	232
308	140	136	140	141	128	110	123	88.4	108	118	123	140	116	99.5	390	231
309	138	136	140	140	128	111	124	89.4	107	120	123	140	113	98	392	231
310	138	135	140	137	129	109	126	89.8	107	121	126	141	113	96.8	397	229
311	138	135	142	135	129	107	126	89	106	122	131	140	113	95	397	229
312	137	134	143	134	126	108	127	88.6	102	123	135	140	113	88	394	228
313	136	134	141	125	97.1	108	124	89.5	105	124	136	140	113	80	394	225
314	136	133	141	70.7	100	109	124	91	100	125	135	139	112	74	395	223
315	135	133	137	69.7	107	108	123	91.9	97	126	133	138	113	72	400	222
316	134	132	137	89.4	120	108	122	90.8	72	126	132	137	112	74	406	221
317	131	131	134	98	121	107	122	88.4	86.6	127	132	136	113	78	406	220
318	131	131	132	97.3	120	107	121	85.5	91.5	126	129	135	112	95	406	219
319	130	132	130	97	121	107	120	77.2	94.2	125	130	134	112	106	406	217
320	130	132	131	96.2	122	108	121	79.5	94	124	131	133	113	107	409	215
321	129	131	132	96	119	107	119	84	90	126	131	132	111	109	409	214
322	127	131	133	96	112	104	119	89	86.8	128	131	130	97	112	396	213
323	112	131	135	95.8	111	104	119	91	84.8	128	131	128	97	107	351	212
324	101	131	135	94.2	104	109	118	90.8	82.6	127	131	126	97.1	104	299	212
325	90.7	131	133	94	108	112	117	89.4	79.2	126	129	111	99.9	102	230	212
326	123	122	132	93	113	111	115	88.9	74.4	125	129	89	102	104	212	211
327	123	118	131	92	119	111	116	88.8	73.8	122	121	68	104	105	204	210
328	124	117	131	91.5	121	111	111	89	81	124	103	76	106	107	196	211
329	124	116	130	90	121	111	104	89	86	126	108	90	104	106	192	210
330	123	115	130	90	123	111	96	88.7	88.5	120	115	105	107	105	190	209
331	122	115	130	89	123	111	97	88.4	89.1	118	118	113	110	100	188	209
332	121	115	129	88.5	123	110	99	88.6	86.5	119	115	119	113	88	189	209
333	121	115	128	88	118	110	105	88.8	87	122	116	122	114	74	191	208
334	121	114	127	88	122	109	112	89	85.8	125	117	123	116	70.5	193	208
335	120	113	128	87.8	122	110	120	90	82.8	124	114	123	112	74	196	208
336	120	112	129	87	119	109	118	91	81.5	123	111	122	112	82	198	206
337	119	112	131	86	120	109	115	91	80.2	123	107	122	109	90	202	190
338	118	111	132	85	120	106	113	90.8	80	126	105	123	105	92	204	180
339	118	110	133	84.5	119	104	113	90.4	81.1	133	107	120	106	91	206	177
340	117	109	133	84	117	105	112	90	83.8	132	111	117	108	87	207	175
341	115	108	133	83.5	117	107	108	90	84	131	116	116	109	82	206	174
342	114	106	132	82.5	118	107	103	89.9	82.8	130	119	117	111	70	202	174
343	114	105	131	82	117	106	104	89.2	81.7	129	120	118	108	65	198	175
344	113	103	130	81.7	117	105	107	88.4	80.4	127	118	119	110	75	194	175
345	112	102	129	81.4	117	101	110	88.5	80.2	126	117	120	113	85	192	176
346	112	102	127	81	117	98.1	116	89	80	125	120	118	112	96	189	177
347	111	101	126	80.5	116	98	119	90	80.1	123	121	117	110	108	186	179
348	111	99	125	80.2	115	97.5	118	90.5	80	124	120	118	109	115	183	178
349	110	99.5	123	80	114	98	117	90	80.2	125	122	117	108	121	180	177
350	110	99	122	80	114	99	116	89	80.1	125	124	116	108	123	178	175
351	110	98	120	80	114	100	115	87.5	79.2	126	123	116	107	124	176	171
352	110	98	119	80	114	101	114	86.5	76.5	127	118	117	105	122	174	169
353	110	97.5	118	80	114	101	114	85.8	74.8	128	98	117	105	120	173	167
354	110	96.5	116	80	114	101	113	84	73.1	129	99.5	117	104	119	172	165
355	108	96	115	79.5	114	101	113	81	73	128	105	110	103	117	172	162
356	107	95	114	79	113	102	112	80	73.2	127	110	111	104	116	172	161
357	106	95	113	78.8	113	102	112	81	74.1	126	114	112	105	115	172	160
358	106	94.5	112	78.5	112	102	111	85	75.3	126	119	113	107	113	172	161
359	106	94.5	110	78	112	102	111	91.8	76	126	122	112	107	111	171	163
360	106	94.5	109	77.8	113	102	110	98	76.1	127	123	111	108	111	170	165
361	106	94.5	108	77.6	113	102	110	105	75.8	128	125	110	107	113	168	167
362	106	94.5	107	77.4	113	102	109	114	74.7	130	123	109	109	116	166	168
363	104	94.5	106	77	112	102	109	112	73.2	131	121	108	105	118	164	169
364	103	94.5	105	76.8	112	102	109	111	72.1	130	115	108	102	119	163	167
365	102	94.5	104	76.5	111	102	108	111	72	129	109	109	99.7	120	162	165

NUMBER OF DAYS THAT FLOW EXCEEDED NOTED DISCHARGE

YEAR / FLOW	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
100	245	337	258	244	312	317	185	354	365	365	365	324	258	356	262	363	365	365	365	365	365	361	365	361
200	218	158	174	116	233	183	98	320	365	257	310	181	227	225	213	186	219	218	248	317	315	222	256	176
300	139	120	137	75	124	35	0	281	351	245	236	168	200	167	207	151	186	147	213	94	97	189	199	113
400	105	100	111	34	80	0	0	116	296	213	179	155	102	110	176	127	146	124	194	36	0	112	166	66
500	85	85	94	0	28	0	0	65	128	181	112	133	44	76	127	93	77	109	93	13	0	19	133	21
600	57	76	84	0	0	0	0	16	69	63	64	76	14	52	109	52	45	81	82	0	0	0	103	0
700	45	66	73	0	0	0	0	2	20	18	47	2	2	0	83	0	5	47	67	0	0	0	74	0
800	33	53	54	0	0	0	0	0	3	0	33	0	0	0	57	0	0	16	29	0	0	0	59	0
900	17	29	37	0	0	0	0	0	0	0	20	0	0	0	45	0	0	0	0	0	0	0	41	0
1000	17	0	21	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	24	0

YEAR / FLOW	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
100	355	365	365	363	343	320	239	331	260	253	290	238	268	353	290	211	312	282	363	356	356	251	356	365
200	239	210	274	285	105	134	58	138	145	136	133	123	113	133	145	121	147	138	151	151	149	130	234	236
300	166	130	256	156	35	114	7	102	112	74	103	87	77	113	100	91	129	123	118	111	128	101	179	143
400	120	0	226	122	0	89	0	87	81	35	58	41	54	51	81	15	88	45	97	78	107	10	131	131
500	110	0	154	48	0	0	0	37	22	19	21	25	12	11	33	0	28	3	34	32	15	4	93	121
600	33	0	141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	0	40	110
700	7	0	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	90
800	0	0	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72
900	0	0	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
1000	0	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17

MAXIMUM DAILY FLOW m3/s

1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
994	929	1070	462	544	323	297	708	807	742	943	705	714	699	1060	671	708	847	841	549	385	561	1080	532

1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
736	388	1050	580	314	459	391	592	591	591	594	525	588	519	568	453	598	521	602	646	570	509	718	1010

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GEONORTH ENGINEERING LTD.

PLATE 371-D7