

HYDROGEOLOGIC INVESTIGATION AND ENVIRONMENTAL IMPACT ASSESSMENT
IN REGARD TO ONSITE WASTEWATER DISPOSAL FOR
A PROPOSED DEVELOPMENT AT J'S FLOOD HOPE HUSKY SERVICE CENTRE

Prepared for

J'S FLOOD HOPE SERVICE
(Husky Truck Centre)
61850 Flood Hope Road
C-1, R.R. #2
HOPE, B.C. VOX 1L0

Prepared by

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MAY 29, 1992

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J's Flood Hope Service
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C - 1, R.R. #2
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Attention: Mr. Jae Inn Yi

Subject: Hydrogeologic Investigation and Environmental Impact Assessment in
Regard to Onsite Wastewater Disposal for a Proposed Development at
J's Flood Hope Husky Service Centre

Dear Sir:

Enclosed herewith is our Report covering our investigation of hydrogeologic conditions on Flood Hope Husky Service Centre Property.

We trust that the Report fulfils the requirements of Fraser-Cheam Regional District concerning an evaluation of possible environmental impacts to groundwater. Please do not hesitate to contact us should you wish to have clarification of any aspect of the contents of the Report.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

Ed Livingston
Ed Livingston, P. Eng.



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TABLE OF CONTENTS

<u>Section</u>	<u>Subject</u>	<u>Page</u>
	LETTER OF TRANSMITTAL	i
1.0	SUMMARY AND CONCLUSIONS	1
2.0	RECOMMENDATIONS	2
3.0	INTRODUCTION	3
	3.1 Purpose and Scope	3
	3.2 Authorization	3
4.0	METHODOLOGY OF INVESTIGATION	4
5.0	SURFICIAL GEOLOGY AND SURFACE DRAINAGE	5
6.0	HYDROGEOLOGY	6
	6.1 Groundwater Hydrology	6
	6.2 Groundwater Supply Potential	6
7.0	WASTEWATER DISPOSAL	8

APPENDICES

APPENDIX A	AREA AND WATER WELL LOCATION MAP, SITE PLAN AND SCHEMATIC HYDROGEOLOGIC SECTION
APPENDIX B	OBJECTIVES AND GUIDELINES FOR DEVELOPMENT PERMIT AREA NO. 2-BC
APPENDIX C	SUMMARY OF DRILLED WATER WELLS

TABLE OF CONTENTS (cont'd)

FIGURES

<u>Number</u>	<u>Title</u>	<u>Page</u>
Figure 1	Flood Hope Husky Service Centre Area and Water Well Location Map	A - 1
Figure 2	Flood Hope Husky Service Site Plan	A - 2
Figure 3	Hydrogeologic Section Across the Flood Hope Husky Property	A - 3

TABLES

<u>Number</u>	<u>Title</u>	<u>Page</u>
Table 1	Details About Drilled Water Wells in the Area of the Flood Hope Husky Centre	C - 2

1.0 SUMMARY AND CONCLUSIONS

Pacific Hydrology's investigation of hydrogeologic conditions and environmental impact assessment concerning onsite wastewater disposal for proposed Development, by J's Flood Hope Service, of Lot 1, Section 6, Township 5, Range 27, W.6M., Plan 17065, Yale District, has shown the following:

1. The subject Property is situated on the modern flood plain of the Fraser River and is underlain by permeable sand and gravel which is probably quite thick.
2. The original drainage has been modified, particularly by the diversion of Chawuthen Creek in construction of the Trans Canada Highway.
3. There is abundant good quality groundwater under the subject area, with the water table at a depth about 6 m (20 ft), except when the Fraser River level is high, at which time the water table may rise by as much as two metres. The direction of groundwater movement under the Development site is northward toward the Fraser River.
4. Information from existing wells in the area of J's Flood Hope Service indicates that it is possible to construct a well with sufficient capacity to supply the proposed facilities at sites indicated on the development plan.
5. Available information indicates that conditions are favourable for construction and operation of onsite wastewater disposal facilities on the subject Property. The only possible groundwater contaminant which could result from properly constructed and maintained disposal facilities is nitrate but it would be subject to dilution and removal by groundwater flow.
6. The main hazard to groundwater quality is by petroleum products from an highway spill or leakage from underground fuel storage tanks. Modern construction practises and monitoring facilities reduce the hazard of leakage from fuel storage at the Service Centre.

2.0 RECOMMENDATIONS

The following recommendations are made concerning wastewater disposal for the proposed Development at the Flood Hope Husky Centre:

1. Once the proposed locations of disposal fields are better defined, examine soil profiles to a depth of at least two metres in the field areas to ensure that fields are constructed at locations where soil conditions are suitable for the usual treatment to take place before the effluent enters the groundwater.
2. Ensure that disposal fields are located on the natural soil on the main floodplain surface and not in the gully of former Chawuthen Creek.

3.0 INTRODUCTION

3.1 Purpose and Scope

The purpose of this Report is to present the results of an investigation of hydrogeologic conditions on a 2.94 hectare (7.3 acre) parcel of land located at the Flood Interchange on the Trans Canada Highway, in the area north of the Highway and south of the Husky Truck Centre, in the rural Community of Flood. Specifically, the investigation covered by this Report has been carried out in accordance with the environmental policy of Regional District of Fraser-Cheam, as outlined in "Section 9.02 Development Permit Area No. 2-BC" (Pages 86 and 87 of Schedule A), so as to ensure that there will be no adverse impacts to groundwater from onsite wastewater disposal facilities to serve a proposed motel and other recreational facilities as part of a Development planned for J's Flood Hope Service (Husky Truck Centre). The source of water supply for domestic, agricultural (irrigation) and for commercial uses in the Flood area is, and is likely to remain, entirely groundwater from vertical wells.

The location and topographic setting of the subject Property is shown on Figure 1 in Appendix A. The Property under discussion is legally described as Lot 1, Section 6, Township 5, Range 27, W.6M., Plan 17065, Yale District. The layout of the proposed Development at the Flood Hope Husky Centre is shown on a 1:480 scale plan by Robert Delmas Drafting Service, Hope B.C.; a reduced scale of this plan is included with this report as Figure 2 in Appendix A.

3.2 Authorization

Pacific Hydrology were authorized to proceed with the investigation covered by this Report in a telephone conversation of May 13, 1992, between Mr. Jae Inn Yi to Ed Livingston, P. Eng., of Pacific Hydrology Consultants Ltd., during which arrangements were made for a site visit on May 14.

4.0 METHODOLOGY OF INVESTIGATION

The investigation covered by this Report has consisted of:

- An office review of relevant information concerning hydrogeologic conditions in the subject area - in particular, information contained on water well records filed with Groundwater Section of B.C. Environment.
- As previously mentioned, a reconnaissance visit to the Property on May 14, 1992 by Ed Livingston, during which he inspected the Property with Mr. Yi and discussed development plans and the operation and performance of existing facilities.
- Discussions among Ed Livingston; Mr. Glen Ferguson, the operator of the Husky Truck Centre; and Mr. Stevenson, the resident in the existing house on the subject Property.

The latter discussions were important in obtaining historical information on local experience with water wells and wastewater disposal facilities in the immediate vicinity of the proposed Development. Following the site visit, Mr. Livingston met briefly with Ms. Brenda Lee Hartley, B.Sc., a Technician in the Planning Department of the Regional District of Fraser-Cheam, to discuss concerns of the Regional District with respect to the Flood Interchange Development Permit Area in which the proposed Flood Hope Husky Centre Development is located. Ms. Hartley provided a copy of the relevant pages (86 and 87 of O.C.P. Schedule A) from the Development Plan covering the subject area defining the objectives and guidelines with respect to protection of groundwater; these pages are attached to this Report as Appendix B.

Included in Appendix C is a table which summarizes available information from existing water wells whose records are on file with B.C. Environment.

5.0 SURFICIAL GEOLOGY AND SURFACE DRAINAGE

For purposes of this Report we are concerned only with the surficial geology, as the depth to bedrock is probably 50 m (164 ft) or more. The subject Property is entirely on the flood plain of the Fraser River which is shown by logs of numerous water wells to be underlain by at least 25 m (82 ft) of sand and gravel in which the water table is at a depth of about 6 m (20 ft) in the vicinity of the subject Property. The more detailed driller's logs show that there is usually from 2 to 4 m (6.6 to 13 ft) of sand at surface and that the sand and gravel is compact down to a depth of 5 to 10 m (16.4 to 33 ft). For the purposes of this Report, a soil profile on the subject Property has not been examined; however, from experience, and from the knowledge of local conditions shown by driller's lithologs of sediments encountered in the drilling of water wells in the subject area, the natural soil is expected to be about one metre (3.3 ft) thick.

The surface drainage was modified by the construction of the C.N. Railway many years ago and more recently by construction of the Trans Canada Highway and the Flood Interchange, which form the southwestern and west boundaries of the subject Property. Chawuthen Creek, which drains part of the steep mountain side to the south, formerly flowed westward through the subject Property on its way to the Fraser River. This Creek was diverted completely by construction of the Trans Canada Highway and the creekbed is now dry except for short periods during exceptional spring runoff. There is no other surface drainage in the area; part of precipitation is returned to the atmosphere by evapotranspiration and the remainder seeps into the ground to join the groundwater regime.

6.0 HYDROGEOLOGY

6.1 Groundwater Hydrology

The groundwater hydrology of the subject area is quite straightforward as shown on Figure 3 in Appendix A (Page A - 3). Groundwater from local precipitation and from a groundwater flow system originating on the nearby mountain side is moving through the underlying gravel to the Fraser River where part of it discharges into the River below water level and part joins the downstream underflow of the Fraser River. The level of the water table is controlled by the level of the River so the water table is closest to surface during Fraser River freshet and is at a minimum in winter and early spring. Because of the high permeability of the gravel aquifer, as shown by water well records, the total groundwater flow under the subject Property is probably quite large, particularly at times of high runoff from the mountain side to the south.

6.2 Groundwater Supply Potential

There is a drilled well at the existing house on the subject Property; there is little information on this well as there is no record on file with B.C. Environment and the drilling contractor's name is not known. According to Mr. Stevenson, the resident in the existing house, the well, which is equipped with a jet pump, has more than sufficient capacity and the water quality is good.

There are two wells at the Husky Truck Centre, one under the Garage Building and the other south of the Garage. According to Mr. Glen Ferguson, who operates the Garage, the well under the Building is no longer in use and the casing is collapsing. An attempt was made to rehabilitate the well but this was unsuccessful. The whole Truck Centre/J.R.'s Restaurant Complex is now supplied from a single well located south of the Garage Building. Very little is known about this well but, according to Mr. Ferguson, it was cleaned out and the submersible pump was replaced several years ago. The water from the well may contain some silt and/or very fine sand but it is otherwise of good quality; the well capacity is sufficient for the present use.

The nearest well for which there is a litholog is the well at the Fuel Cardlock Facility which adjoins the Garage on the east. The record on file with B.C. Environment shows that the well was deepened and completed with a stainless steel well screen in 1980. The driller's log is as follows:

0 - 11.9 m (0 - 38 ft)	existing drilled well
11.9 - 14.6 m (38 - 48 ft)	coarse sand and gravel; water-bearing
14.6 - 15.5 m (48 - 51 ft)	sand and gravel, some fine.

The static water level is reported to be 6 m (20 ft); the well capacity was estimated to be 2.27 L/sec (30 i(?)gallons per minute).

From the geology, from inspection of 15 well records obtained from B.C. Environment and from discussions with local residents, we conclude that it is possible to construct a well on the subject Property with a capacity in excess of the requirements of the proposed motel and restaurant. Well capacities in the range 10 to 20 L/sec (130 to 260 igpm) should be possible at either of the suggested locations indicated on the Site Plan (Figure 2, Page A - 2).

7.0 WASTEWATER DISPOSAL

From the Fraser-Cheam Regional District Settlement Plan and from the previously mentioned discussion between Ms. Hartley, District Planning Technician, and Ed Livingston, P. Eng., of Pacific Hydrology, it is clear that Fraser-Cheam Regional District is concerned that both water supply and wastewater disposal should be based on long-term operation, as there is little chance that a community water system or sewer will reach the subject Flood area in the foreseeable future.

Based on current information, all indications are that soil and groundwater conditions for properly designed and constructed onsite wastewater disposal facilities, consisting of conventional septic tank/drain field systems, are generally good. The following is evidence for this conclusion:

1. The area is underlain by permeable sediments.
2. The distance to the water table is sufficient to promote treatment of effluent in the unsaturated zone; well records indicate a depth about 6 m (20 ft) for the water table but it is probably as much as two metres less in early summer when the Fraser River level is at a maximum.
3. There is a large flow of groundwater under the subject Property so that dilution of nitrate in disposal field effluent would be large.
4. The subject Property is large enough so that wells and disposal fields can be separated a sufficient distance from each other.

Because of the layout of the various proposed facilities, it may be necessary to use a pumped type disposal system, with effluent pumped to properly designed fields some distance from the septic tanks. The only potential contaminant in effluent from disposal fields dealing with domestic sewage is nitrate and it is only an health hazard in quite high concentrations (more than 10 mg/L as N) and then only for small infants. With the continuous flow of groundwater under the subject Property, the concentration of nitrate would be reduced to a negligible amount within a very short distance. It is assumed that the facilities for the proposed restaurant will include grease traps and any other necessary equipment to deal with grease and cooking oil characteristic of restaurant effluent and that used fat from french fryers will not be dumped into the sewer.

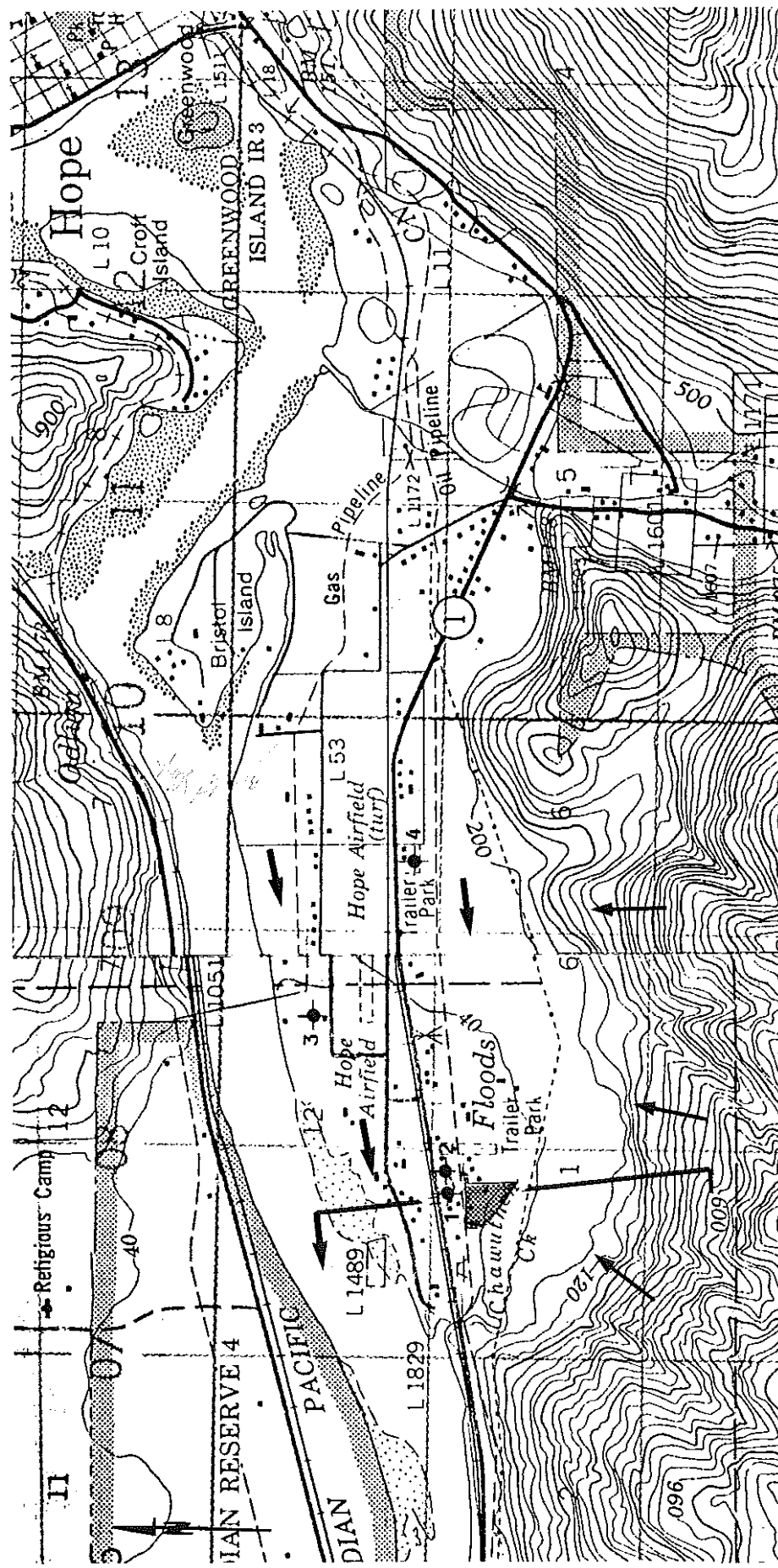
Possible hazards to the groundwater supply are petroleum products from a major truck spill on the Highway and leakage from buried fuel storage tanks. However, because of the direction of groundwater flow under the site, leakage or spills at the Husky Truck Centre would not endanger Wells on the subject Property. Further, increasingly stringent inspection and monitoring regulations by B.C. Environment has much reduced the possibility of contamination from this source.

Most properly constructed and operated onsite wastewater disposal facilities are trouble free. In the case of problems, however, there are well-established techniques to deal with malfunctioning systems and there is sufficient space on the Flood Hope Husky Centre Site to permit reconstruction of fields if necessary.





APPENDIX A

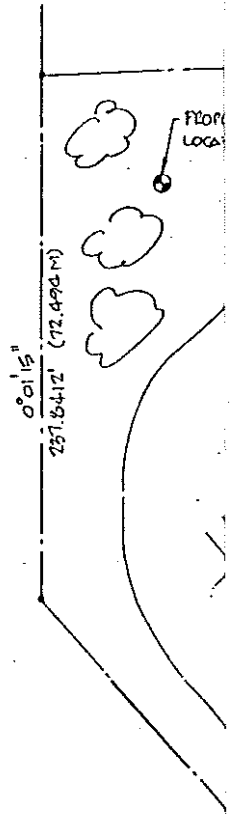
AREA AND WATER WELL LOCATION MAP, SITE PLAN AND
SCHEMATIC HYDROGEOLOGIC SECTION

FIGURE 1 FLOOD HOPE HUSKY SERVICE CENTRE AREA AND WATER WELL LOCATION MAP



Notes:

1. The base map is prepared from 1:50,000 scale topographic maps N.T.S. 92 H/5, Harrison Lake, and 92H/6, Hope, enlarged to an approximate scale of 1:30,000; the contour interval on the Harrison portion is 40 metres and that on the Hope portion is 100 ft.
2.  Flood Hope Husky Centre Property.
3.  Approximate location of a drilled water well (see Table 1 in Appendix B).
4.  Line of schematic hydrogeologic section (see Figure 3, Page A - 3).
5.  Probable direction of groundwater flow.



LEGAL

LOT 1, SECTION 6, TOWNSHIP 5
RANGE 27, WGM, PLAN 17065

FIGURE 2.

FLOOD HOPE HUSKY SERVICE SITE PLAN

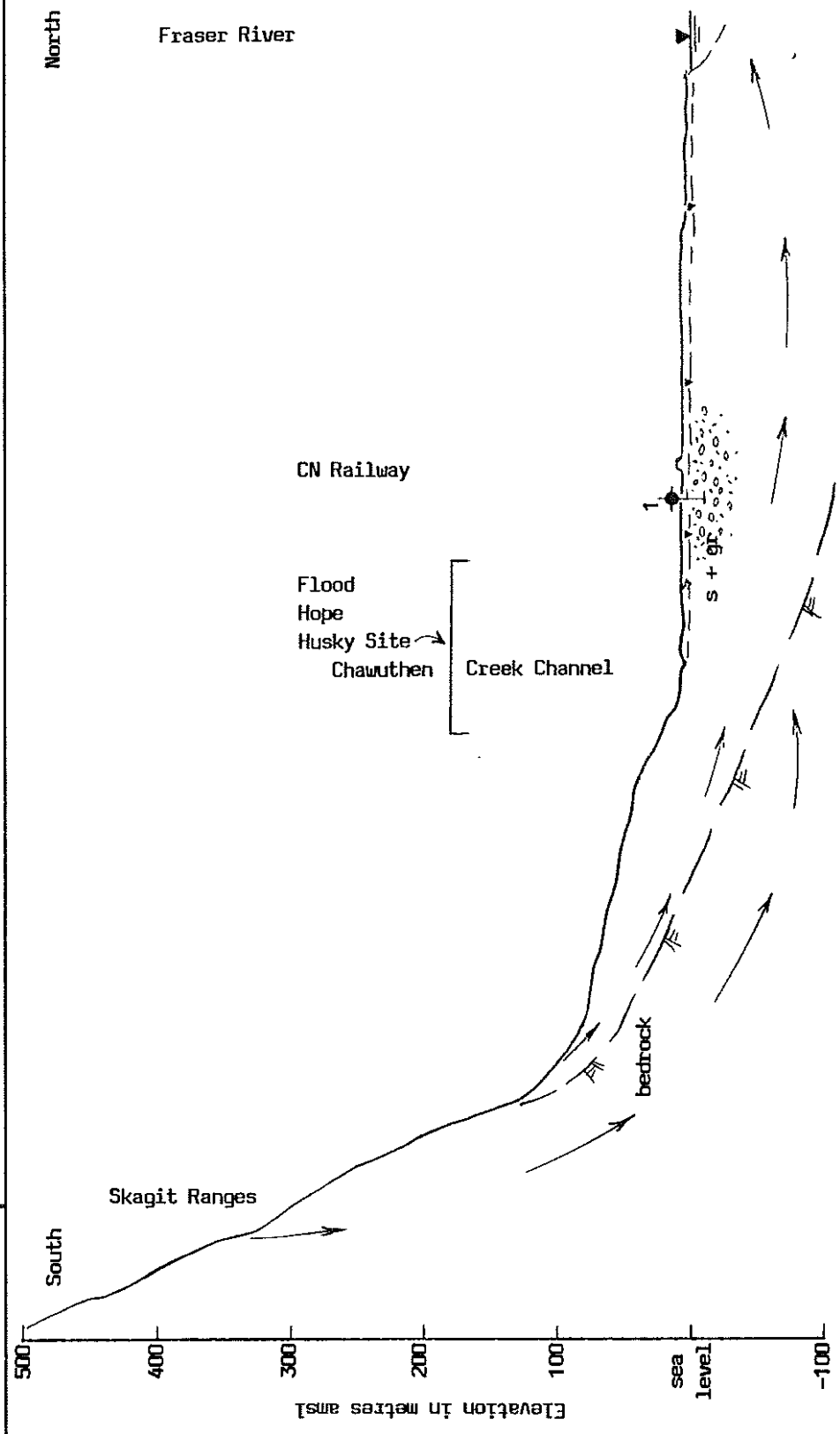
NOTE

1. LOCATIONS OF EXISTING RESIDENCE, NEW MOTEL, ETC.
ARE APPROXIMATE.

OWNER		SCALE	2 1/2" = 100'		PROPOSED DEVELOPMENT
APPROVAL		REV.	DATE	REV.	J'S FLOOD HOPE HUSKY
PREP FOR		(BY)	D	12/92	SILVER CREEK HOPE B.C.
DISTRICT					
ROBERT DELMAS - DEARTH'S - SERVICE 90X 203B HOPE B.C. VOX 110 (604) 869-2226 FAX (604) 869-9408					SITE LAYOUT
DRAWING NO.					REV.

HYDROGEOLOGIC SECTION ACROSS THE FLOOD HOPE HUSKY PROPERTY

FIGURE 3



- Notes:
1. The location of the line of schematic hydrogeologic section is shown on Figure 1 (Page A - 1).
 2. Horizontal scale = 1:10,000; vertical scale = 1:5,000; vertical exaggeration is two times.
 3. 1 indicates approximate location of a water well (see Appendix C).
 4. — defines the water table.
 5. illustrates unsaturated flow, as beneath a wastewater drain field. 6. indicates probable direction of groundwater flow.

APPENDIX B

OBJECTIVES AND GUIDELINES FOR DEVELOPMENT PERMIT AREA NO. 2-BC

9.02 DEVELOPMENT PERMIT AREA NO. 2-BC, known as Flood Interchange Development Permit Area, is established pursuant to Section 945(4) of the Municipal Act.

Category of Designation

(a) protection of the natural environment.

Area of Application

Development Permit Area No. 2-BC, encompasses the lands identified on Schedule E, Bylaw No. 800.

Justification

The construction of the new Trans Canada Highway resulted in the establishment of a new interchange at Flood where highway commercial uses are already developed. These uses are separated from the sewer district by land which is in the Agricultural Land Reserve and the Plan discourages ribbon development between the two. Therefore any intensification of land uses at the Flood interchange area must be based on septic disposal systems which can operate for the long term. Water supply is unlikely to be from any source other than individual on-site wells.

To protect groundwater quality and to ensure that development on-site does not adversely affect development potential on a neighbouring site, the following conditions, objectives and guidelines apply to Development Permit Area No. 2-BC.

O.C.P. SCHEDULE A

Conditions:

- (a) groundwater constraints restricting highway commercial uses;
- (b) relatively high density uses dependent for the long term upon on-site services.

Objectives:

- (a) to ensure adequate on-site sewage disposal for the long term;
- (b) to ensure adequate on-site water supply for the long term;
- (c) to avoid contamination of groundwater.

Guidelines

Development permits issued in this area shall be in accordance with the following guidelines:

9.02.01

New developments should provide for long-term security in the operation of the sewage disposal system. This may require a site plan for a reserve sewage disposal tile field, as approved by Ministry of Health.

9.02.02

Approvals for new developments may require that an engineering study, signed and sealed by an engineer licensed in B.C. be provided which demonstrates that the proposed sewage disposal, water supply and site drainage facilities are adequate and will not lead to environmental problems in the long term.

9.02.03

On-site sewage disposal, water supply and drainage systems should be prohibited in areas where water is subject to degradation, except as otherwise recommended in engineering studies.

9.02.04

New development and on-site services should be located so as not to preclude future uses of adjacent properties.

APPENDIX C

SUMMARY OF DRILLED WATER WELLS

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SUMMARY OF DRILLED WATER WELLS

The summary of drilled water wells contained in Table 1 which follows on Page C - 2 is based on information on file with Groundwater Section of B.C. Environment. A water well inventory was not carried out; therefore, there may be other Wells in the area of the proposed Development which are not known to us. Also, for some wells, such as that at the existing house on the subject Flood Hope Husky Property, there is no record on file with B.C. Environment and, therefore, the details about well depth and completion are unknown.

The locations of those water wells which are listed in Table 1 are shown on Figure 1 in Appendix A (Page A - 1). The precise location of any particular well on a property may not be shown correctly; however, for the purposes of this Report, the precise location is not required, as it will not change the general conclusions drawn from the information. The last owner of any particular well known to us is shown under "Remarks".

Table 1. Details about Drilled Water Wells in the Area of the Flood Hope Husky Centre

Map Ident. No.	Completed Well Depth (ft)	Static Water Level (ft)	Aquifer Material and Well Completion	Lithology	Remarks
1	48	20	Sand and gravel; completed with one 5 ft stainless steel 0.030" slot screen and a 2 foot long riser pipe, set between 41 and 48 ft.	0 - 38 ft existing well 38 - 48 ft coarse sand and gravel; water-bearing 48 - 51 ft sand and gravel; some fine.	8" diameter well; capacity estimated by driller to be 30 gpm; location - at Cardlock Facility at Husky Centre.
2	42	23.3	Gravel; completed as open-end pipe.	0 - 9 ft sand 9 - 42 ft gravel.	6" diameter well; record states that well was bailed at 12 gpm for two hours; location - 82010 Trans Canada Highway.
3	58	27	Sand and gravel; completed as open-end pipe.	0 - 2 ft loam 2 - 58 ft sand and gravel.	6" diameter well; record states that well was pumped at 60 gpm; location - Blk. A. of S.E. 1/4, Sec. 12, Tp. 5, R. 27, Plan B-4042, Yale District.
4	66	30	Sand and gravel; completed with 4 ft of 0.040" slot Clayton Mark stainless steel screen, set between 62 and 66 ft.	0 - 6 ft tan silt 6 - 35 ft compact sand, gravel and boulders 35 - 58 ft sandy gravel; water-bearing 58 - 66 ft medium sand and gravel.	6" diameter well; maximum recommended pump output by driller of 20 gpm; well location - Lismore Trailer Park.