

EVALUATION OF POTENTIAL IMPACTS  
TO SURFACE WATER DRAINAGE AND GROUNDWATER  
FROM GOLF COURSE RUNOFF

Prepared for  
BRIDAL FALLS GOLF & COUNTRY CLUB  
18593 - 58th Avenue  
SURREY, B.C. V3S 1M3

Prepared by  
PACIFIC HYDROLOGY CONSULTANTS LTD.  
204 - 1929 West Broadway  
VANCOUVER, B.C. V6J 1Z3

AUGUST 14, 1992

**PACIFIC HYDROLOGY CONSULTANTS LTD.**  
CONSULTING GROUNDWATER GEOLOGISTS

204 - 1929 WEST BROADWAY  
VANCOUVER, B.C. V6J 1Z3  
TELEPHONE: (604) 738-9232

August 14, 1992

Bridal Falls Golf & Country Club  
18593 - 58th Avenue  
SURREY, B.C. V3S 1M3

Attention: Mr. Norman Gaukel

Subject: Evaluation of Potential Impacts to Surface Water Drainage and  
Groundwater from Golf Course Runoff

Dear Sirs:

This letter is further to recent telephone discussions, and also to brief discussions of July 27 and 30, 1992, at Pacific Hydrology's Office, between Mr. Norman Gaukel, Bridal Falls Golf Course Developer, and Ann Badry, Hydrogeologist of Pacific Hydrology Consultants Ltd., about concerns by Regional District of Fraser-Cheam with respect to potential impacts to surface water drainage and groundwater from surface runoff from the proposed Bridal Falls Golf Course.

## 1.0 INTRODUCTION

Background discussion concerning the topography, geology and hydrology in the area of the proposed Bridal Falls Golf Course is contained in Pacific Hydrology's Letter dated February 26, 1992, on the subject "Suitability of Conditions for Onsite Wastewater Disposal for a Proposed Golf Course Clubhouse Near the Trans-Canada Highway Turnoff to Agassiz".

.../2

Bridal Falls Golf & Country Club  
Evaluation of Potential Impacts to Surface Water Drainage and Groundwater  
from Golf Course Runoff  
August 14, 1992 - Page 2

---

In a letter to you (Norm Gaukel) from Regional District of Fraser-Cheam dated March 24, 1992, it is suggested on Page 2 that "...it would be most helpful if you could have a supplementary hydrology report prepared which would deal with the surface runoff issue." The purpose of this letter is to present such a report.

As previously discussed, Ed Livingston, P. Eng., of Pacific Hydrology, visited the site on July 31 to further examine the existing surface water drainage and to consider how operation of the proposed golf course might affect the present natural surface water drainage. As suggested in Fraser-Cheam's letter, further discussions were held with Mr. Richard McDermid, Fraser-Cheam Planning Technician, and also with Ms. Sylvia Letay, Habitat Protection Technician, of B.C. Fish & Wildlife Branch of B.C. Environment. From these discussions, it is clear that the issues of concern are the following:

1. Will surface runoff from the golf course enter the stream system and, thus, eventually, Cheam Lake, presently being restored as a Lake in Cheam Lake Wetlands Regional Park and, if so, will runoff affect the chemical quality of water in Cheam Lake?
2. Will such surface runoff enter the groundwater system and, thus, impact the chemical quality of existing well water supplies?

On Figure 1 attached, relevant features of the existing surface water drainage are shown; Figure 2 is a "Master Plan Concept" of the proposed golf course. Attention is drawn to the planned use of several ponds in the golf course layout.

## 2.0 GEOLOGY

The geology of the subject area is discussed in our previous letter-report of February 26, 1992, which discussed the feasibility of using onsite wastewater disposal for the clubhouse of the proposed golf course. The predominant feature of the area is a large landslide which flowed across the subject area from the mountain slope to the south onto the lowland north of the Trans Canada Highway. The landslide debris under the subject Property is buried by a fan, probably a debris fan, extending from the steep mountain slope to the Highway. The geologic setting seems to be quite straightforward except that there is a prominent mound of sand and gravel on the lower part of the fan; this feature seems to be glacial in origin. The mound of sand and gravel is probably older than the fan and is probably partly buried in the fan. The eastern edge of the fan extends into a wetland area.

Examination of landslide debris on the north side of the Trans Canada Highway shows that it consists predominantly of crushed argillaceous rock which is quite permeable. The debris fan, which is comprised of stratified sandy gravelly sediment, is also quite permeable but the permeability along the layers of the fan is probably higher than the vertical permeability.

## 3.0 SURFACE WATER DRAINAGE

The existing drainage system in the subject area has been in place since the construction of the Trans Canada Highway about 30 years ago. The drainage system consists of open ditches with culverts under roads and two culverts under the Highway. An examination of the drainage shows the following:

1. Surface drainage is minimal; the ditches show clearly that there are no large freshet flows from the proposed golf course area.

2. The only perennial flows from the subject area are at the foot of the fan. As shown on Figure 1 attached to this letter, these flows include a very small flow through culvert "A" and much larger flow through culvert "B". Much of the flow in culvert "B" is from the mountain slope east of the subject area, probably from Popkum Creek.
3. The flows mentioned above in 2. eventually reach the Cheam Lake area.
4. Flow from the proposed golf course area through the existing ditch system, would pass through the extensive wetland northeast of the golf course to reach culvert "B".

Under the prevailing conditions, it is our opinion that properly managed irrigation of a proposed golf course in the subject area will not produce surface runoff during the irrigation season and surface runoff during the winter and spring will remain very low as at present. The existing drainage system is adequate to deal with present and future conditions assuming good irrigation management. The slow passage of water through the wetland between the end of the Bridal Falls Road ditch and culvert "B" will be quite effective in removing any sediment and reducing the content of dissolved constituents such as nitrate and phosphate, if such are applied in golf course irrigation.

#### 4.0 GOLF COURSE IRRIGATION

A properly managed program of irrigation and fertilizer application produces virtually no surface runoff and very little, if any, recharge of groundwater. Most of the irrigation water is returned to the atmosphere by evapotranspiration, with a small amount used up in plant growth and perhaps, here and there, a small amount moving down to groundwater. The situation is quite different in winter months when intense precipitation and negligible plant growth releases more water for groundwater recharge and produces surface runoff.

If fertilizer is applied sparingly and only in the growing season, when the growing plants consume the fertilizer and when groundwater recharge is very small, very little, if any, fertilizer can reach the groundwater. In recent years, when the concern for environment is increasing, golf course management has devised programs of irrigation and fertilization which do not cause degradation of groundwater quality.

Much of the water which enters the ground on the golf course will join the groundwater flowing through the sediments of the fan and will be discharged into the wetland area at the lower end of the fan. Since plans call for irrigating the proposed golf course from a water well, probably located on the lower part of the fan below the irrigated area, a well at such a location would serve as a water quality monitoring well.

## 5.0 CONCLUSIONS

Field reconnaissance shows that the surface water drainage in the area of the proposed Bridal Falls Golf Course is straightforward, with the main features as follows:

1. Surface drainage in the area is minimal and there is no indication that there are large freshet flows.
2. The only perennial flows are represented by groundwater discharge at the foot of the fan on which the Golf Course is to be developed. If there is any excess irrigation water from the Golf Course, it would flow through the extensive wetland area in the northeastern part of the site before reaching the ditch system which would carry it toward the Cheam Lake area.
3. Under conditions of a properly managed program of irrigation and fertilizer application, it is unlikely that fertilizers or pesticides would reach either Cheam Lake or water supply wells in the area.

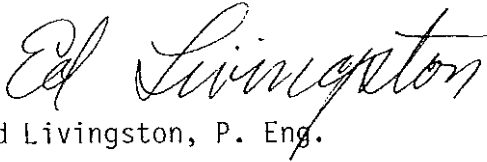
Bridal Falls Golf & Country Club  
Evaluation of Potential Impacts to Surface Water Drainage and Groundwater  
from Golf Course Runoff  
August 14, 1992 - Page 6

---

We trust that this letter contains the information required by Regional District of Fraser-Cheam. However, please do not hesitate to call if we can be of further assistance with this matter.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

A handwritten signature in cursive script that reads "Ed Livingston". The signature is written in black ink and is positioned above the typed name.

Ed Livingston, P. Eng.

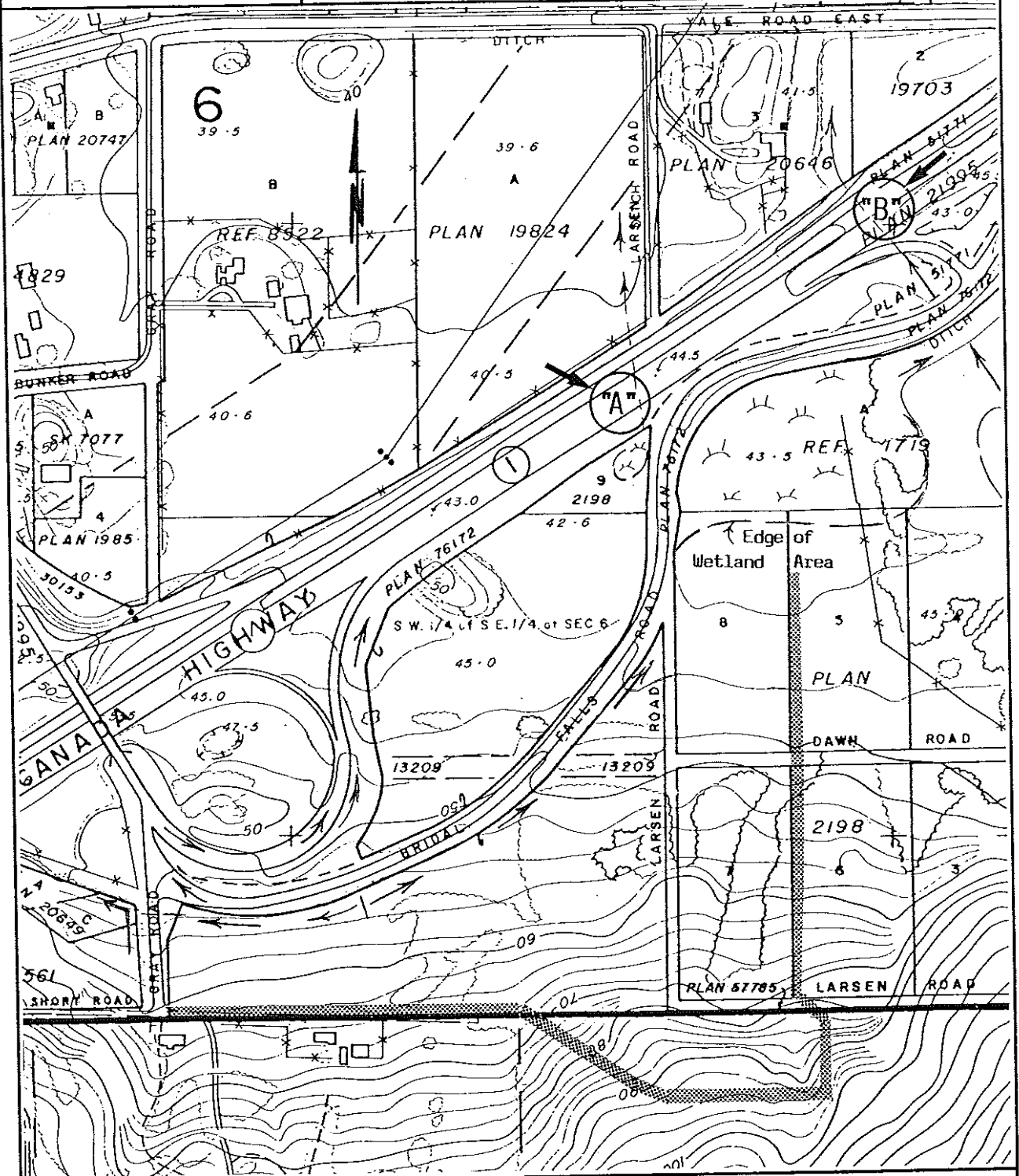
Attachments

## ATTACHMENTS






FIGURE 1

FEATURES OF SURFACE DRAINAGE IN AREA OF  
PROPOSED BRIDAL FALLS GOLF COURSE



Notes:

1. The scale of the base map is 1:5000; contour interval is two metres.
2.  outlines south boundary of golf course (see Figure 1 for layout).
3.  shows direction of surface drainage.
4.  outlines wetland area.

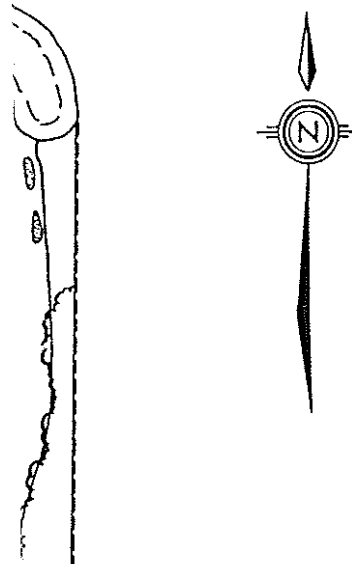
LAYOUT OF PROPOSED BRIDAL FALLS GOLF COURSE

FIGURE 2

# ASTER PLAN ONCEPT

MARCH 1992

HOLE GOLF COURSE, PITCH & PUTT  
DRIVING RANGE.



POTENTIAL YARDAGES

HOLE	7	8	9	1	2	3	4	5	6
LAND	275	166	245	235	220	245	200	224	245
BLUE	265	149	235	225	220	205	220	215	240

SCALE AS SHOWN

