92L-11-21

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Attention: Syd Heal, Director

Reference: Groundwater Development - Cluxewe River

Dear Sir:

The following remarks are based upon:

- a field examination of the proposed hatchery site;
- studies of air photos that had been taken in October 1966 and September 1980 at different levels; and
- file information on water wells drilled in the Port McNeill area in the middle to late 1960's.

Attached please find three copies of a part of the Port McNeill 92 L/11 topographic map on a scale of 1:50 000. The boundaries of areas where sands and gravels, clays and tills, and bedrock are at or close to ground surface are shown on these maps. These boundaries are **generalized** from the air photos. You will note that two target areas for groundwater exploration have been shown on these maps. The first is close to the area of the proposed hatchery site, while the second, along the middle reaches of the Cluxewe River, is approximately two miles away from the site. It is also remote from electric power and roads. As such, even though it should be a promising area for groundwater development, these factors will most probably eliminate this area for groundwater exploration.

Existing drill hole information indicates that two sources of groundwater exist in the Port McNeill area. These are as follows.

- Sands and gravels reworked (cleaned) and redeposited by recent streams and rivers such as Mills Creek and the Cluxewe River. These sands and gravels were originally deposited by streams during the last phase of glaciation. They are relatively silty in their original state, but are relatively clean and productive in their redeposited state.

- Sands and gravels underlying the clay, till sequence. These have a field permeability that is approximately one fifth that of the reworked sands and gravels.

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The sands and gravels within the target area close to the hatchery site have been reworked from nearby older sands and gravels such as those that are observable in a pit located just off the highway to the east of the target area. These reworked sands and gravels should have a transmissivity (field permeability) of 40 000 US gpd/ft. Similar sediments tested near Mills Creek have a transmissivity of 38 000 US gpd/ft calculated from pump test data. A properly designed and constructed well in such sediments should have a specific capacity of approximately 20 US gpm per foot of drawdown. Therefore the thickness of sands and gravels required to deliver 1 000 US gpm to a water well can be estimated as follows.

static water level	5 feet
length of screen	10 feet
usable drawdown (1000/20)	50 feet
pump submergence	10 feet
safety	10 feet
Total Thickness for a 1 000 gpm Well	85 feet

On the same basis, a 500 gpm well would require 60 feet (85-25). The gravels at the Mills Creek site were 57 feet thick.

The sands and gravels beneath the clay, till sequence have been capable of delivering 100 to 300 gpm to small diameter wells.

If the reworked sands and gravels beneath the proposed hatchery site target area are not thick enough or permeable enough to deliver 500 to 1 000 gpm of water to vertical wells, a collector type well(s) can be designed and constructed that should have a safe productive capacity in the 500 to 1 000 gpm range and a multiple well field total capacity of several thousand gallons per minute.

The thickness of the gravels at the proposed hatching site must become known. The most positive and assured way to obtain not only information on the thickness of the gravels, but also their productive potential, is to drill a test well. Such a well would be 8 inches in diameter, drilled to bedrock or to a depth of 100 feet and would be screened and test pumped if drill results warranted.

Such a test well would cost an estimated $15 000 if fully screened and tested, including our specialist services to supervise the drilling and testing, analyze the data and prepare a report. The report would present the pertinent data and analyses and design and cost the production well phase.

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If the well was unsuccessful, its cost would be approximately $5 000. The cost of the well would decrease by approximately $35 per foot for every foot under 100 feet that it was drilled.

Alternatively, seismic lines could be run through the area to indicate the top of bedrock for a cost of approximately $5 000. However, the results of such exploration would in all probability have to be followed by the test well proposed above before definitive results could be obtained.

In summary, we conclude, based upon available information, that:

1. productive sand and gravel aquifers are present in the area of the proposed hatchery site;
2. there is an 80% chance of discovering an aquifer that will produce 500 gpm of water to an individual large diameter production well and a 50% chance of discovering an aquifer capable of producting 1 000 gpm of water to such a well;
3. there is a 90% chance of developing several thousand gallons per minute of water from collector type wells if the gravels are too thin for vertical wells.

We recommend that a test well as described above be drilled. Such a well should be located along the "old" haulage road that runs close to the Cluxewe River and which has in part been eroded by the river. However, this road can be reached from the road to the gravel pit on which a locked gate is presently installed. We believe that minimal costs would be incurred in the preparation of a drill site and access to it if this route is made available by the forest company.

Unit price bids should be obtained from two or three drilling contractors to finalize costs before the test well is constructed.

If any of the above needs amplification or clarification please do not hesitate to call.

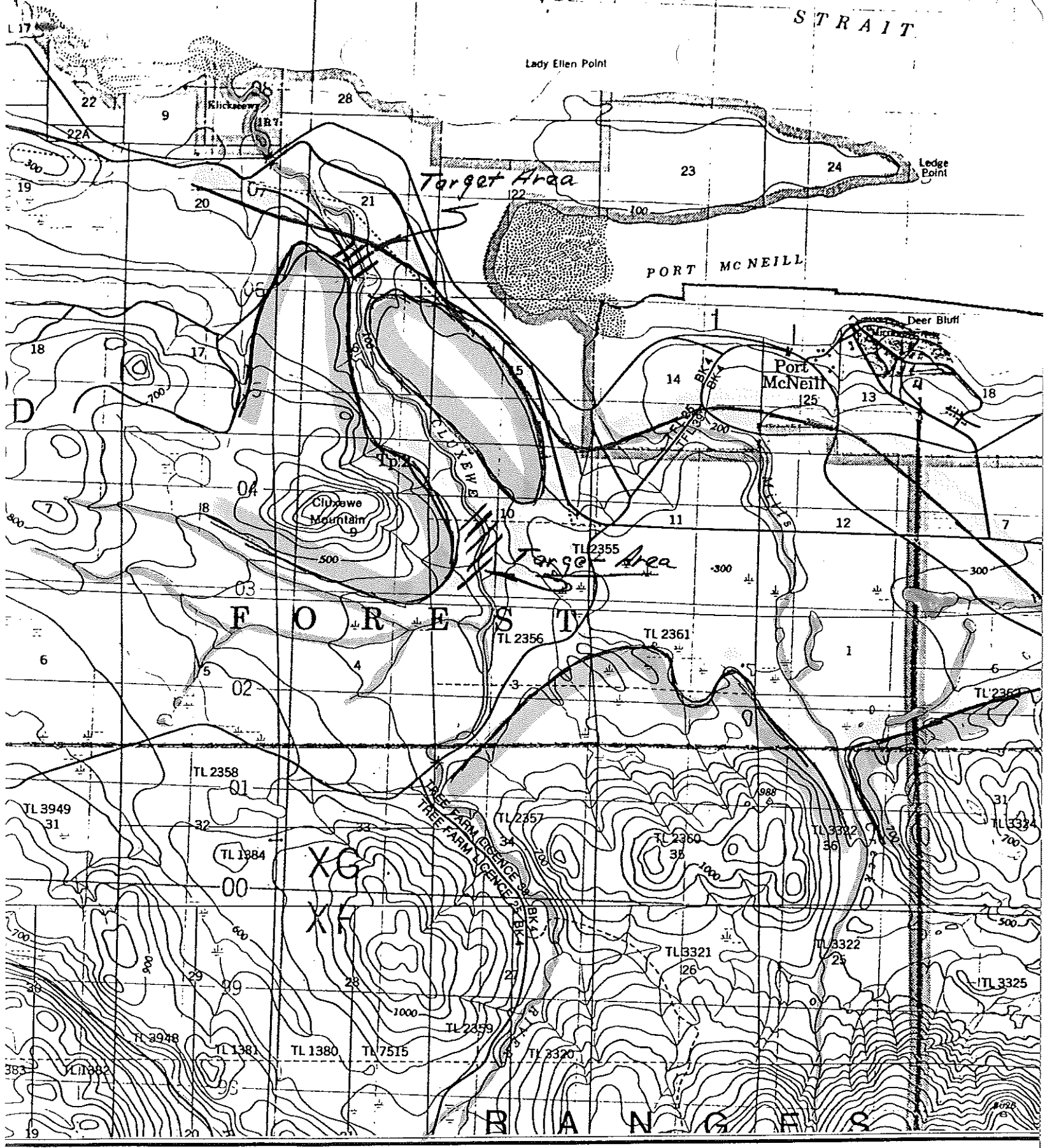
Yours truly

BROWN, ERDMAN & TURNER LTD.

W.L. Brown, P.Eng.
President

WLB/sf

enc.



PORT MCNEILL

BRITISH COLUMBIA

Sand & Gravel
Clay, Till
Rock
(Boundaries Generalized)

Scale 1:50,000 Échelle

Miles 1 0 1 2 3 Miles

Metres 1000 0 1000 2000 3000 4000 Mètres

Yards 1000 0 1000 2000 3000 4000 Verges

CONTOUR INTERVAL 100 FEET
Elevations in Feet above Mean Sea Level
North American Datum 1927
Transverse Mercator Projection