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Notes on Pleistocene and Tertiary Geology, Quesnel - Marguerite

Conditions here are similar to those described in the Prince George area with the following differences. The tertiary sediments are better exposed and may well be thicker in this area. Landslides are very common, many being of such tremendous size that they are not immediately apparent. Those which were observed involve the Tertiary sediments and seem to be of Post Pleistocene age. However, slides of Pleistocene age or older are probably so greatly modified as to be unrecognizable. Glacial deposits associated with glacial episodes older than the most recent episode are not as well-developed in this area or at least are not as well exposed.

This area is similar in that there have probably been changes in drainage in late Pleistocene time. These have been great in the Prince George area but certainly extend into the Quesnel area also. These changes probably occurred during and following the various glacial episodes of the Pleistocene. In degradation of its bed the Fraser has not yet cut down far enough in this area to expose much evidence of former channels. In the Quesnel area, the vast landslides have also contributed to the confusion. In fact, ice loading during glaciation may have been an important factor in promoting some of the large landslides. Some of the exposures of Tertiary sediments in the main valley of the Fraser which seem to be folded may not really be ~~technically~~ tectonically folded but may be contorted by sliding.

In spite of the fact that the Tertiary rocks are thick and widespread they are not often well-exposed in this area. An interesting section is exposed across the Quesnel River and south of the town of Quesnel where landslides have been a great problem to the P.G.E. and the Department of Highways. Here are thick beds of vari-coloured compaction shales with occasional beds of plant remains. These beds are usually light and bright-coloured with cream and red-orange colours predominating. The shales seem to go back to silty clay when saturated and probably slake quite easily. A "fault" zone over 100' wide consisting of shale breccia is well exposed. This has a patch of very compact till on one side and may well be due to Pleistocene or post-Pleistocene landsliding.

In this area, numerous landslides which involve the Pleistocene glacial debris are probably actually initiated in the underlying Tertiary sediments. A study of landsliding in this area would be very interesting.

In contrast to the Tertiary, the Pleistocene glacial and interglacial deposits are quite stable and may be seen in high vertical bluffs. These are stable probably because they are predominantly sandy and silty, ~~because they have~~ with fairly high permeability, ~~and~~ they probably do not contain swelling clays which may well occur in the Tertiary plant-bearing beds and tuffs. A study of landsliding may well give inportant clues as to the thickness of Pleistocene deposits and may indicate the location of the walls of the pre-Pleistocene river valleys.

In the Pleistocene there are remarkable facies changes in rather short distances. Such a section is very well shown in the high bluffs facing the north shore of Diamond Island near Alexandria. Here, there is a change from grey clay silt, mostly contorted and containing a few pebbles, to a section with of about equal thickness made up of very dirty outwash with lumps and lenses of till inter-bedded with lenses of silt. These are probably deposits of a glacial lake containing floating ice. ~~deposits.~~ Incidentally, Tipper mentions on the Quesnel sheet that there may be more than one till at this location. This is not the case.

Near Australian, Alexandria, and probably in other places, the top terrace which is at an elevation about 150' to 225' above the river is covered with 3' to 12' of light-coloured silty sand. This section contains a buried soil profile which is thicker and better developed than the top soil profile. A typical section showing this is found north of Diamond Island and is as follows:

½' soil profile, 3" choc. Brown over buff

1½' sand

1½' buried soil, 2" dark grey over 1' buff with white mottling over about 4" hgy with white mottling.

2 ' sand

In one place at Australian, this soil contains two thin peaty horizons. This buried soil occurs only on the high terrace; similar silt with a similar top soil profile is found on the lower terraces but the buried soil profile is missing. The significance of this soil profile is unknown.

It would be very interesting to get a C14 age for this soil. However, such an age determination is complicated by two factors. In every case, the buried soil is close enough to surface so that tree and shrub roots reach the buried soil. In this area, the sand very often contains lignite grains from the Tertiary lignite beds. This soil therefore may contain recent carbon from roots and very old carbon from lignite. Possibly by using a large sample of the peaty material from Australian and picking out all rootlets, etc. a fairly accurate age determination could be obtained.

The significance of this buried soil is not apparent. It seems to indicate that following floodplain deposition by the Fraser River in post-glacial time, a soil developed on the flood plain and then the river rose enough to inundate the floodplain and deposit several feet of sediment before commencing its present cycle of degradation. An age determination would give some idea of the rate of down-cutting and would enable some sort of correlation with events in the lower Fraser Valley to be made.

In the Prince George area we find that there are two tills in a number of places; three tills may be seen in a location just south of Prince George. Three tills were encountered in the Airport Hill well near the airport. In only one place in the Quesnel area, namely on Australian Creek was more than one till seen. Here at the pipeline crossing the section consists of: ~~about 52' sands and gravels of various sizes mostly clean.~~

About 52' sands & gravels of various sizes, mostly clean
6' Till
About 25' Silt, sandy silt and sand
" 15'? Covered
1' Grey silty sandy till
1'- 2' Brownish grey extremely compact silty sand
More than 1' + Extremely compact grey silty sand with rare pebbles.

The upper gravels are probably terrace gravels possibly partly mixed with fan gravel from Australian Creek. The section below the till is probably interglacial silt although in this area there are glacial lake beds which resemble these silts.

This section is quite close to contorted Tertiary sediments exposed along the creek to the east. The lower till ~~is~~ probably rests silty on the Tertiary sediments forming the east wall of the Fraser Valley.

The contortion of the Tertiary sediments just upstream is believed to be the result of landslides associated with down-cutting of Australian Creek.

If this reasoning is correct the lower till and associated deposits should dip westward rather rapidly following the old valley wall. The Fraser River terrace deposits should become thicker westward. A casual examination of Australian Creek shows that it contains less water downstream especially below the highway culvert. This indicates that it is probably underlain by permeable terrace deposits some place west of the highway downstream from the pipeline crossing.

It should be mentioned here that the nearest outcrops of Tertiary rocks north of Australian Creek occur in road and railway cuts about 2 miles north of the highway culvert on Australian Creek. These consist of pale coloured deeply weathered sands and silts with variable moderate southerly dips which are probably due to old landslides. There is some basaltic flow rock in one railway cut at an elevation much below the usual occurrence of such rock. These Tertiary outcrops here and at other places both north and south occur on a gentle slope above the highest (?) terrace of the Fraser River which is in this area at an elevation of about 2300'. This may be seen on air photographs.

The immdeiate problem in the Australian area is water supply for the Westcoast Transmission Co. pumping station. This station is located about 1/4 mile north of Australian Creek on the east side of the P.G.E. track. The installation consists of pumping equipment and a group of 16 houses located north of the pumping station. At present water is obtained from a pair of sumps on Australian Creek and pumped through a 6" pipeline about 4600' long to the pumping station. The lift is about 260'. The pump at the sumps is run on gas and must be started manually at the beginning of each days pumping period. This is inconvenient and costly in the winter months. A well located at the station would eliminate this problem. The water requirement is about 15,000 gpm (Imp.) but a flow of 20 gpm (imp) is desired.

According to the station manager, it is both difficult and expensive to cross the PGE track and the main highway with either wires or pipes so that much of the advantage in having a nearby well is lost if it is located west of the P.G.E. track even though it be close to the existing water pipeline.

The best conditions for well construction will certainly be found in the younger Fraser River terrace deposits which are predominantly sand and gravel with some silt. The younger glacial lake deposits are silty sandy materials which are not as good aquifers but which are not unfavourable. The older glacial deposits which are found in this area are so poorly exposed that it is impossible to speculate about their properties as aquifers. It might be mentioned here that the wells in

the Pineview area near the Prince George Airport are in a sand aquifer below the second (from the top) till: this sand is a fair aquifer. The Tertiary sediments are predominantly unfavourable as aquifers; however, in the exposures along the road and P.G.E. track north of the pumping station there are beds of sand and coarse sand which might make a fair aquifer. The problem in drilling on the east side of the P.G.E. track is to reach favourable material below the water table before reaching the less favourable materials of Tertiary age which make up the old valley wall. If a test hole should get into the Tertiary rocks before finding a suitable aquifer the hole should be continued for at least 100' in the hope of finding a permeable sand or gravel bed.

The next step in this ground-water investigation is to drill one or more test holes. Since there is a distinct economic advantage in locating the well on the east side of the P.G.E. track the first hole should be drilled there as close to the track as is practical and at the south end of the pumping station property where the track is further from the valley wall. The water table is probably about 200' below surface here so such a hole should probably be planned to go at least 250' and probably more like 300'.

If such a hole is unsuccessful because it encounters Tertiary rock at relatively shallow depth a decision should be made, on the basis of economics, whether to drill a hole west of the highway along the existing water pipeline where conditions would seem to be more favourable. A location near the bend in the old highway at elevation 1017 on Westcoast Transmission Co. map 60090-L-5919 sheet 1.

For such test drilling 8" churn drill holes should be used. Below the Water table bailer samples should be taken about every 2'. One of the problems will be to decide if and when the hole encounters Tertiary rocks which in this area may be no more competent than Pleistocene sediments. Some of these rocks have pale green and yellowish colours that are quite distinctive. In other places they may consist of soft dark-coloured compaction shales which would, in drilling, be difficult to distinguish from Pleistocene clays or silts. In any case if water is found in the Tertiary rocks samples should be taken and checked for high iron, chlorides, sulphate and Ph.

Another source of ground water which might be worth investigating if drilling is unsuccessful is water in ~~this~~ shallow sandy deposits probably underlain by less ~~porable~~ permeable Tertiary ~~deposits.~~ bedrock. From the W.C.T. ~~Co.~~ West Coast Transmission houses northward for a short distance the station manager reports that there are springs and areas of wet ground. These may be places where the permeable materials become thin and the ground-water moving down the slope reaches the surface. It may be possible to obtain the required amount of water by collecting this flow by means of shallow drains. Such drains might consist of tile pipe laid in a gravel filled trench leading to a sump. It is difficult to estimate just how much water might be obtained by this means but the cost of constructing a short experimental drain ~~is not~~ would not be high.