HYDROGEOLOGIC EVALUATION
IN REGARD TO DISPOSAL OF WASTEWATER AND STORM WATER ON A PROPOSED SUBDIVISION AT 8611 GAGLARDI STREET IN THE DISTRICT OF MISSION

(District of Mission Subdivision Application 90-07)

Prepared for

MR. & MRS. M. MANZER
8611 Gaglardi Street, R.R. #2
MISSION, B. C. V2V 4H9

Prepared by

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SEPTEMBER 10, 1990

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September 10, 1990

Mr. & Mrs. M. Manzer
8611 Gaglardi Street, R.R. #2
MISSION, B. C. V2V 4H9

Subject: **Hydrogeologic Evaluation in Regard to Disposal of Wastewater and Storm Water on a Proposed Subdivision at 8611 Gaglardi Street in the District of Mission**
District of Mission Subdivision Application 90-07

Dear Mr. & Mrs. Manzer:

This letter is further to a discussion among Mr. & Mrs. Manzer, property owners, and Ed Livingston, P. Eng., of Pacific Hydrology Consultants Ltd., onsite at the subject property on August 28, 1990.

1.0 INTRODUCTION

The purpose of this letter is to discuss our hydrogeologic evaluation concerning the proposed subdivision of a parcel of land at 8611 Gaglardi Street in the District of Mission; the subject Property is legally described as Lot 7, D.L. 436, Group 1, Plan 9965, New Westminster District. The regional topographic setting of the Property is shown on Figure 1 in Appendix A; the local topography and the proposed lot layout is shown on Figure 2.

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Preparation of this letter-report is based on the following:

1. N.T.S. topographic map 92G/1f, **Mission**, of scale 1:25,000 and 1:2,500 District of Mission topographic plan, Sheet No. 1733S.

2. Geological Survey of Canada Map 1485A, **Surficial Geology Mission British Columbia**; scale 1:50,000, 1980.

3. Geological Survey of Canada Bulletin 322, **Post-Vashon Wisconsin Glaciation, Fraser Lowland, British Columbia**; by J.E. Armstrong, 1981, 34 pp.

4. Geological Survey of Canada Paper 83-23, **Environmental and Engineering Applications of the Surficial Geology of the Fraser Lowland, British Columbia**; by John E. Armstrong, 1984, 54 pp.

5. **Design Manual Onsite Wastewater Treatment and Disposal Systems**; United States Environmental Protection Agency, October 1980, 392 pp.

6. B.C. Ministry of Health **Sewage Disposal Regulation** (B.C. Reg 411/85, O.C. 2398/85), Sept. 30/86, 17 pp.

7. Examination of five test pits, one dug on each of the unoccupied lots of the proposed subdivision and three on the presently occupied Lot 3.

8. General hydrogeologic reconnaissance.

As required by the District of Mission, this letter-report addresses the following:

1. An investigation and interpretation of the soil and groundwater conditions to assess their suitability for disposal of surface storm water and wastewater from domestic systems.

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2. Consideration as to whether the proposed subdivision layout is acceptable or whether revision is advisable.

3. An evaluation of the short and long term effects on adjacent properties of the disposal of storm water and wastewater from the proposed subdivision.

2.0 SITE INVESTIGATION

A small excavator was used to dig five test pits on the subject Property at the approximate (unsurveyed) locations shown on Figure 2 in Appendix A. The descriptions of sediments exposed in the pits are contained in Appendix B. Four of the pits reached weathered bedrock consisting of loose angular sandstone rubble. All of the holes were completely dry and none showed any mottling or other signs that the near-surface sediments are subject to saturation. A static water level of 7.6 m (25 ft) below ground surface is recorded on the driller's log for the drilled well located on the southwestern part of proposed Lot 2; the driller's log also gives an overburden thickness of 3 m (10 ft). Based on conditions shown in the test pits, it seems likely that part of the three metres of surficial sediments includes weathered sandstone rubble.

3.0 TOPOGRAPHY AND GEOLOGY

As shown on Figure 2 in Appendix A, the subject Property, which is bounded on the southwest by Silverdale Road and on the southeast and east by Gaglardi Road, covers the top and flanks of a small hill. A small perennial deeply incised creek runs through the northwest corner of the Property. The total area of the proposed subdivision, as shown on a plan by J.M.C. Wade & Associates, is 1.846 ha.

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The proposed Manzer Subdivision is underlain by dark grey sandstone of Middle Jurassic Age. The bedrock is exposed in several places on the Property, with the best exposure on the southwest boundary, in the road cut along Silverdale Road. Bedrock also outcrops on the small hill close to the east boundary, near the garage and along the driveway east of the existing house on proposed Lot 3. The weathering of the rock is quite uneven with outcrops occurring where the rock is resistant to weathering. In other places, the bedrock is weathered to loose rubble to a depth of a metre or more. The uneven topography of the bedrock is shown by the fact that no outcrop is evident in the valley of the creek which runs through the Property. The uneven weathering can also be seen in the outcrop along Silverdale Road.

On the proposed Subdivision, the bedrock is overlain by an intermittent cover of glacial debris, with the thickest overburden on the western side of the Property. Exposures in the creek valley indicate that the surficial sediments consist largely of bouldery glacial outwash.

4.0 GROUNDWATER HYDROLOGY

The proposed Manzer Subdivision is located in an area of groundwater recharge. Precipitation during the growing season is mostly returned to the atmosphere by evapotranspiration. During winter and early spring, part of the precipitation moves down through the soil and rock rubble to the unweathered sandstone bedrock. Depending on the density of fractures in the rock, part or all of the water moves down by way of fractures to the water table in the rock. Part of the water also likely moves along the top of the fresh bedrock to areas of groundwater discharge at lower elevation. Water from precipitation or from wastewater disposal facilities undergoes chemical changes as it passes through the fine grained soil near surface and also through a network of fine fractures in the bedrock.

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The water level in the dug well is close to the bottom of the creek; this may represent a perched water table in less permeable material along the creek. The elevation of the water level in the dug well appears to be higher than that reported as the static level in the drilled well; this, however, could only be confirmed by obtaining and comparing water level elevations. For the purposes of this investigation, it is not necessary to determine this relation.

5.0 WASTEWATER DISPOSAL FACILITIES

The emphasis of our investigation of soil and groundwater conditions on the subject Property has been to evaluate overall conditions in terms of general suitability for the use of individual onsite wastewater disposal facilities. Because of the very uneven topography of the bedrock surface and uneven weathering of the rock, there are obvious places where it would not be possible or advisable to construct such facilities. Also, since the proposed lots are quite large, there is some uncertainty about the future location of houses on the lots and, for this reason, the location of wastewater disposal facilities cannot be defined at this time. Thus, under the existing conditions, further investigation will be required once specific sites for the facilities are selected.

In general, the present investigation has shown that parts of each of the proposed lots is suitable for construction and operation of conventional or pump-fed disposal fields. There are no signs of high water table on the Property; therefore, the questions which arise in regard to the use of onsite wastewater disposal facilities are whether the wastewater will go into the ground, whether it will undergo changes and how such disposal may affect the surrounding area.

In our opinion, the rubble of weathered rock is a suitable material on which to construct disposal fields. The openings between rock fragments are filled with a fine brown loam soil, and many of the fragments are partially decomposed and are permeable. The fact that roots penetrate more than one metre into this material is also another indicator of favourable conditions. The permeability of the fresh sandstone is certainly very low; however, the sandstone is sufficiently fractured so that water can move slowly down through the fractures to the water table. By the time the wastewater reaches the water table, it will have been renovated by movement through the overburden and rock such that the only undesirable constituent reaching the water table is likely to be a small amount of nitrate.

The fact that the wastewater disposal facility serving the existing house on proposed Lot 3 has, according to the Manzers, operated satisfactorily for about thirty years, is confirmation that soil and groundwater conditions are suitable for the use of such facilities.

6.0 STORM WATER DISPOSAL

In consideration of the topography of the proposed Manzer Subdivision, storm water from roofs and paved areas should logically be piped or ditched to the creek on the western side of the Property or to the road ditch along Silverdale Road.

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7.0 WATER SUPPLY

There is an existing drilled water well on proposed Lot 2; this well supplies water to the existing house on proposed Lot 3, through a buried pipe to the house, which is located about 65 m (215 ft) to the south. The capacity of the well, which was drilled to a depth of 62.2 m (204 ft) in September 1974, was rated by the drilling contractor at 0.3 L/sec (4 i(?)gpm). The well has apparently been in continuous use since that time and has been quite adequate. The water quality seems to be good but there is no analysis to confirm this.

The subject Property also contains a dug well; it is located on the southeast side of the creek, close to the east boundary of proposed Lot 1. This well supplied the house before the drilled well was constructed. It is a rectangular excavation covered by an aluminium roof and appears to be in good condition. There was a small trickle of water in the creek at the time of Ed Livingston's site visit on August 27 after a particularly dry summer; therefore, the dug well may be a viable source of domestic water. The capacity could be determined by careful pump testing, with the water quality confirmed by chemical and bacteriological analyses. Pump testing to evaluate the capacity of such a dug well should be carried out in late summer-early autumn before the start of heavy rainfall.

Water supply on Lot 2, and also on Lot 1, could be from a well(s) drilled in rock. The permeability of the unweathered sandstone bedrock is very low with the water contained in fractures; thus the capacities of rock wells vary from place to place depending on how many water-yielding fractures are intersected by the well. We expect that most rock wells drilled at random locations on the lots of the proposed Subdivision are likely to have sufficient capacity to meet the requirements of the new District of Mission Bylaw No. 2203-1990, but the owner must be prepared to drill as deep as 100 metres (330 ft), or more, if necessary. Careful pump testing is required to determine reliable well capacities.

8.0 SUMMARY AND CONCLUSIONS

1. The proposed Manzer Subdivision is located partly on sandstone rock outcrop, with much of the remainder underlain by angular sandstone rubble formed by weathering. The loose rubble is over one metre thick but the driller's litholog of the drilled well, which is located on the property, indicates that weathering may extend to a depth of 3 m (10 ft), or more.

2. All of the test pits were dry at the time of examination at the end of August and there were no signs that saturation occurs in the rubble zone. The water table in the bedrock is shown by the driller's log of the drilled well to be at a depth of 7.6 m (25 ft) below surface.

3. The subject Property is in an area of groundwater recharge with most of the recharge likely moving directly down into the fractured sandstone.

4. Conditions for wastewater disposal facilities are favourable on much of the Property but specific conditions must be confirmed at each site which is chosen for a wastewater disposal field.

5. Disposal of storm water to the creek and to the road drainage on the south side should be satisfactory.

6. There is no reason to believe that disposal of wastewater and storm water from the proposed subdivision would have any negative impacts to the surrounding properties.

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7. The situation in regard to water supply for the three lots of the proposed Manzer Subdivision is as follows:

   a. There are two water wells on the subject Property, one of which is a shallow dug well and the other a drilled well in rock.

   b. The rock well was reported by the driller to have a capacity of 0.3 L/sec (4 gpm); continuous use by residents of the house since 1975 shows that the well has adequate capacity for domestic purposes and that the water quality is satisfactory. However, it is not known whether this well water source will comply with the new District of Mission Bylaw No. 22031990.

   c. The dug well on proposed Lot 1, which formerly supplied the existing house on proposed Lot 3, seems to be in good condition. However, its capacity and the water quality would, as for the drilled well, have to be confirmed in order to establish whether they conform with the new District of Mission Bylaw No. 2203-1990.

   d. Drilled wells completed in fractured rock at random locations on each of the lots of the proposed subdivision are possible sources of individual domestic water supplies; the depth of such wells may be as great as 100 m (330 ft), or more, and careful pump testing must be carried out to determine reliable capacities for long term use.

Yours truly,

PACIFIC HYDROLOGY CONSULTANTS LTD.

E Livingston per GB

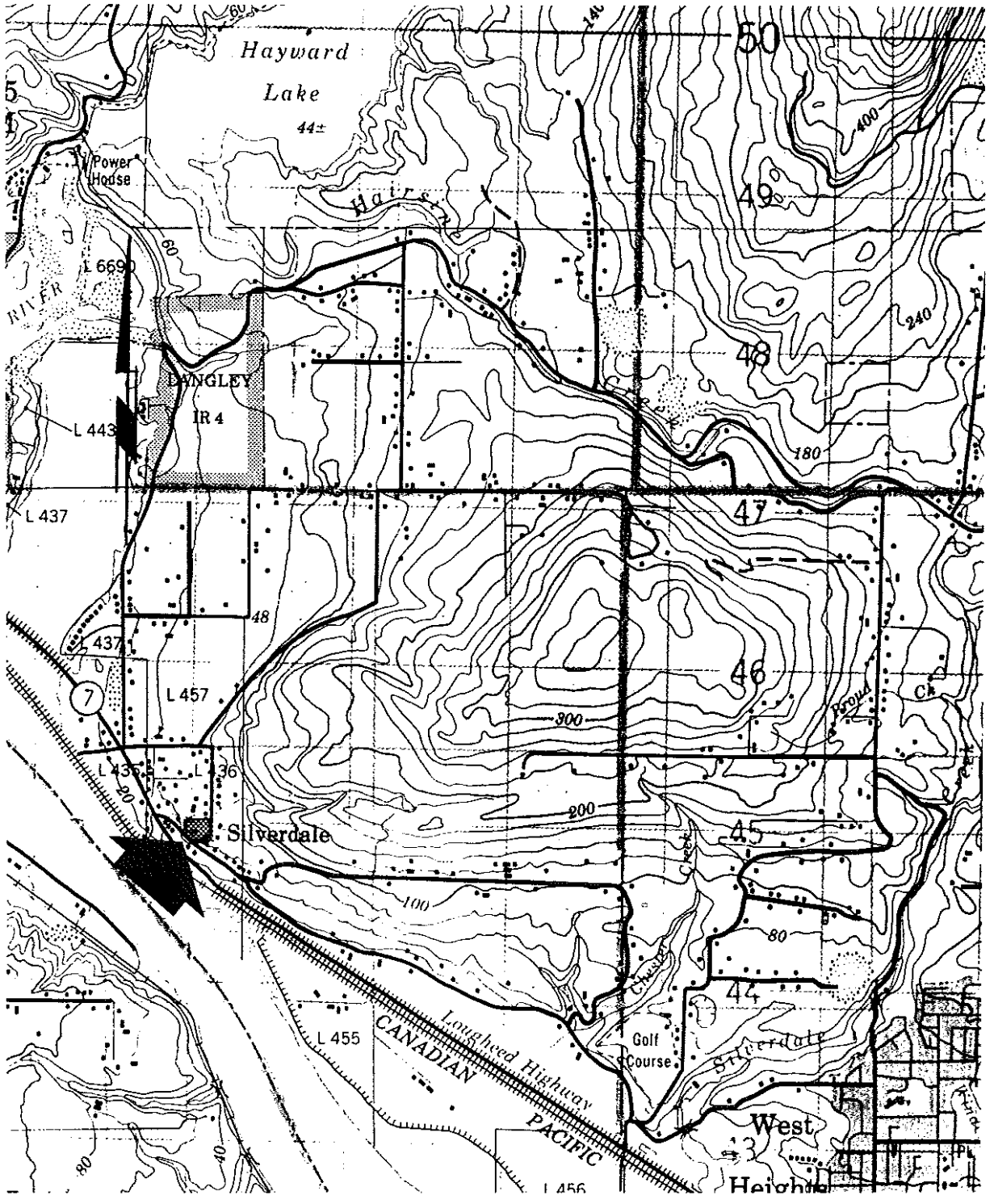
E. Livingston, P. Eng.

Attachments

APPENDIX A

AREA LOCATION MAP AND SITE PLAN

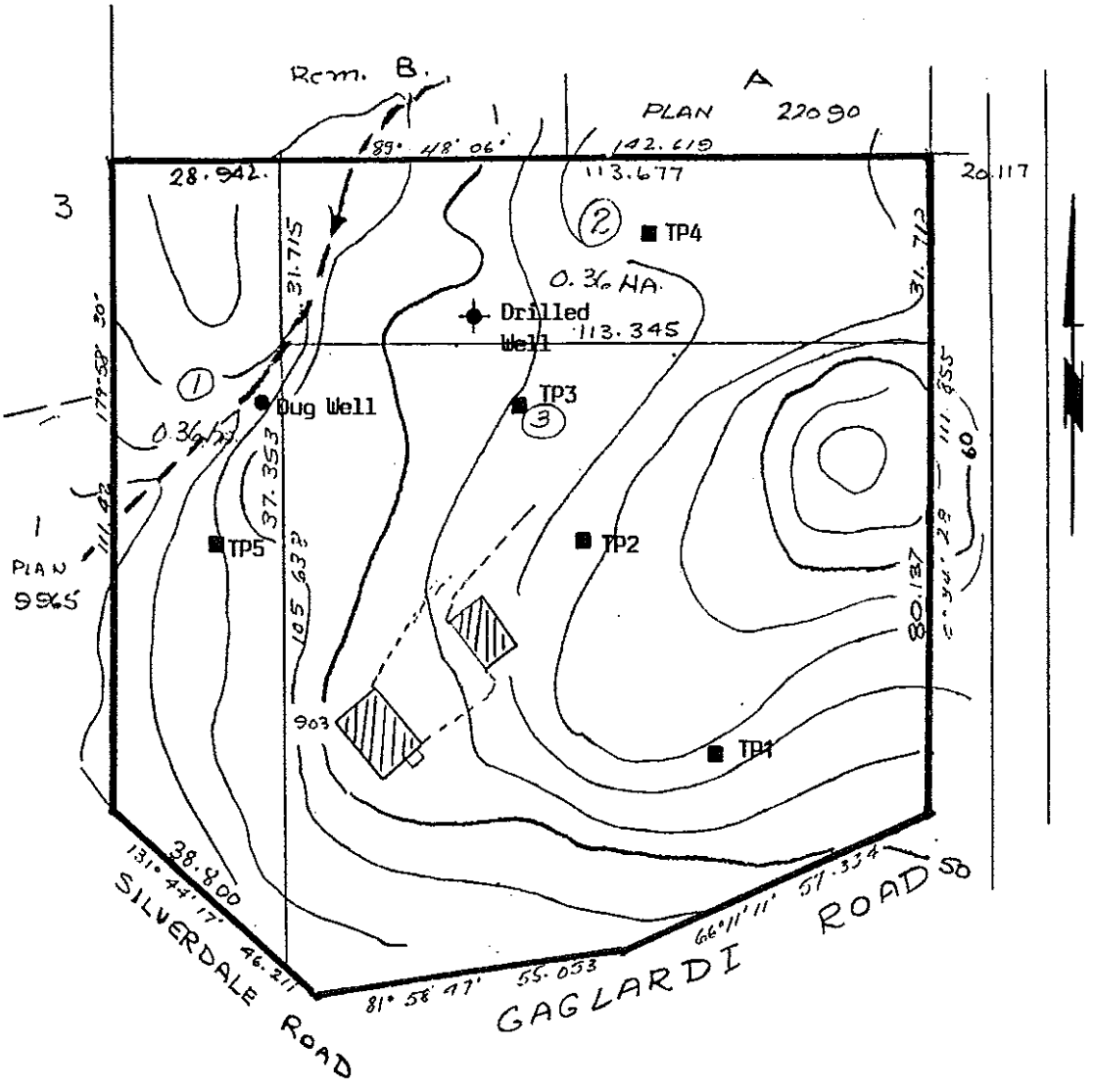
FIGURE 1	AREA LOCATION MAP - PROPOSED MANZER SUBDIVISION AT 8611 GAGLARDI STREET



Notes:

1. The base map is 1:50,000 scale topographic map N.T.S. 92G/1, **Mission**, enlarged to a scale of approximately 1:39,000.
2. ▶ ▒ indicates the location of the proposed Manzer Subdivision.

FIGURE 2	TEST PIT LOCATIONS ON PROPOSED MANZER SUBDIVISION AT 8611 GAGLARDI STREET



Notes:

1. The base map is J.M.C. Wade & Associates Plan M2569 of scale 1:1000, reduced to an approximate scale of 1:1300; contour interval is two metres.
2. ——— defines the boundary of the proposed Subdivision.
3. ■ TP1 marks the approximate (unsurveyed) location of a test pit.
4. ● ✦ marks the approximate (unsurveyed) respective location of a dug and drilled well.

APPENDIX B

TEST PIT LITHOLOGS

MANZER TEST PIT LITHOLOGS

Location of Property: In the District of Mission, at 8611 Gaglardi Street, near the intersection of Gaglardi Street and Old Silverdale Road.

Legal description of Property: Lot 7, D.L. 436, Group 1, Plan 9965, N.W.D.

Date of test pit digging and examination: August 28, 1990.

Test Pit 1 on Proposed Lot 3

Litholog:

0 - 1 m (0 - 3.3 ft)	The pit is entirely in loose rubble of broken rock. The angular fragments of dark grey sandstone are partly weathered, with the spaces between the fragments filled with brown sandy loam. The rock is more firm at the bottom of the pit.

Test Pit 2 on Proposed Lot 3

Litholog:

0 - 0.15 m (0 - 0.5 ft)	brown stony loam soil with many roots
0.15 - 1.5 m (0.5 - 5.0 ft)	angular loose sandstone rubble with brown sandy loam soil filling spaces between fragments; roots extend to the bottom where the rock is more firm.

Remarks: The pit is located in a gently north-sloping swale.

Test Pit 3 on Proposed Lot 3

Litholog:

0 - 0.15 m (0 - 0.5 ft)	brown loam soil with matted roots
0.15 - 0.9 m (0.5 - 3.0 ft)	very sandy loam with roots to the bottom; loose; no mottling
0.9 - 1.1 m (3.0 - 3.5 ft)	more compact loam with rounded pebbles
at 1.1 m (at 3.5 ft)	may be contact with underlying bedrock.

Test Pit 4 of Proposed Lot 2

Litholog:

0 - 0.15 m (0 - 0.5 ft)	brown sandy loam soil with matted roots
0.15 - 0.9 m (0.5 - 3.0 ft)	very sandy loose brown soil with few small rounded pebbles
0.9 - 1.1 m (3.0 - 3.5 ft)	compact gravel; may be weathered till.

Test Pit 5 on Proposed Lot 1

Litholog:

0 - 0.5 m (0 - 1.5 ft)	brown, loose sandy loam soil with many stones and a few fragments of rotten wood
0.5 - 1.6 m (1.5 - 5.3 ft)	brown, loose, angular sandstone rubble with a few rounded cobbles; fragments of rotten wood down to about 0.9 m (3 ft); roots to the bottom.

Remarks: The upper part of this pit containing the wood may have been disturbed by land clearing and landscaping for gardening. Slabs of fresher sandstone at the bottom of the pit show that it is close to bedrock.