

TR16_164-167

28. Further investigations of drainage problems at the Westville Estate,
Prospect Vale, Launceston.

P.C. Stevenson

The present report follows a preliminary examination of the area by the author (1973).

PART 1. GEOPHYSICAL WORK

The positions of fifty resistivity stations and six seismic spreads are indicated in Figure 48. The resistivity survey was conducted using Wenner configuration at 0.6, 1.5, 3 and 6 m spacings, and the seismic spreads of 12 geophones were fired from both ends, with spacings of 2.1 or 3 m.

The geophysical results proved rather disappointing. The reason for this appears to be the essential physical similarity of the sediments and the underlying weathered dolerite. Both consist of clay and have similar electrical and seismic properties.

SEISMIC RESULTS

In dolerite areas (e.g. at Stn 37) a seismic velocity of 2,100-2,400 m/s was observed and no unweathered layer was detected down to 8 m below the surface. This velocity represents deeply weathered dolerite in a state of clay, but hard rock cores may occur in it. At Stn 27 the sediments are thin, and weathered dolerite having a seismic velocity of about 2,750 m/s occurs at a depth greater than 4.5 m.

Between Stn 22 and 23 a layer with a seismic velocity of 975 m/s overlies a layer of about 5,000 m/s at a depth of about 9 m. The upper 'slow' layer represents the surface clay and the 'fast' layer is probably fresh but fractured dolerite.

At Stn 48 in Bruce Street, an area where the groundwater is known to be very near the surface, seismic velocities of 1,400-1,500 m/s were observed corresponding to clay or soft sand, and no harder rock was detected to a depth of about 5.5 m.

RESISTIVITY RESULTS

No water table was detected from the resistivity measurements, a finding consistent with the predominantly clayey nature of both the sediments and dolerite. Gravels containing free water were rare or at least very thin and were only detected at Stn 11, 12 and 50 and possibly at 13 and 14.

CONCLUSIONS

The bedrock has no effect on the groundwater in the area; the dolerite outcrops are very deeply weathered and contain only isolated boulders in a matrix of clay and the sediments consist largely of clay with only minor amounts of sand and gravel.

The fact that water is carried deep in the clay by some thin sand or gravel layers is borne out by the Council's experience that French drains 2 m deep were not effective.

RECOMMENDATIONS

About 7 holes should be drilled by power auger to a depth of 6 m to reveal at what depth the water is moving and in what material. A careful check of the level at which water first appears and any subsequent changes of water level in each hole should be made. Samples of all materials encountered should be taken paying particular attention to thin sand and gravel which may contain water.

Samples should be taken of the water in each hole for possible analysis. Suggested positions for the auger holes are indicated on Figure 58.

PART 2. RESULTS OF AUGERING

In accordance with the recommendations made in Part 1 of this report auger holes were sunk and sampled.

The results were as follows:

Hole 1 (Surface evidence of a high water table)

Depth (m)	Description
1	Hard mottled brown clay with 30% quartz grains.
2	Powdery sandy clay with 50% quartz and rock grains.
3	Crumbly brown sandy clay with 30% quartz and rock grains.
4	As for 3 m.
5	As for 3 m but more clay and finer grains.
6	As for 5 m.
7	Hard pale brown gritty clay with quartz and rock grains. Water at 6 m.

Hole 2 (Surface evidence of a high water table)

1	Very stiff brown plastic clay, 15% sand and rock grains.
2	Crumbly stiff clay, 30% sand and rock grains.
3	Pale brown gritty clay, prismatic fracture, 25% sand.
4	Very stiff brown gritty clay.
5	Soft grey-brown plastic gritty clay, 20% sand.
6	As at 5 m.
7	As at 5 m. Water at 6 m.

Hole 3

1	Very stiff dark grey clay with dark red sandy lenses.
2	Soapy dark grey clay with white patches.
3	Very stiff soapy clay with white patches, some rock fragments. Struck rock, no water.

Hole 4

1	Stiff light grey clay with darker mottle.
2	As 1 m.
3	Stiff light grey silty clay, yellow mottle.
4	Light grey, brittle silt, quartz grains.
5	Brown gritty clay with quartz and rock grains.
6	Coarse brown clay-cemented grit.
7	As at 6 m. Water level at 1.2 m.

Hole 5

Depth (m)	Description
1	Stiff brown clay with rock grains.
2	Stiff grey clay with brown gritty clay.
3	Stiff gritty brown clay, 30% quartz and rock grains. Struck rock, no water.

Hole 6

1	Stiff dark grey clay with brown mottle.
2	Very stiff grey and brown clay with ironstone fragments.
3	Brittle grey and brown mottled silt.
4	Brown and grey mottled silt.
5	Soft silty clay as above.
6	Soft grey brown and pink silty clay.
7	Soft sandy silty clay as above. Water level at 6 m.

Hole 7

Struck rock.

The overall impression gained from these samples is the overwhelming preponderance of clay. Layers capable of carrying water (sands or gravels) are apparently unrepresented. It should be noted, however, that the samples have been obtained by augering and that some mixing is inevitable, so that thin bands of sand are probably represented by the mineral and rock grains mentioned in the sample descriptions. That these layers are not very effective in carrying water is indicated by the widely varying water levels recorded.

It is also likely that vertical fissures occur in the clays close to surface. These fissures would be transient, opening in dry weather and closing in wet weather, so that the conduct of water in the vertical direction would be intermittent. These fissures would absorb surface water in wet weather and store it, and it could be driven out by a hydraulic head originating up slope.

With such a system of horizontal communication in the thin sand stringers and vertical communication in the fissures varying with time, the whole picture becomes extremely complex and it becomes plain why the investigations have not revealed a simple cause or solution. It also suggests why spring flows vary in time, why they are of such localised occurrence, and why the cutting of ditches and French drains was not very successful.

The nature of the problem makes curative measures difficult but it seems that wet areas are fed principally from fissures and that they can only be drained by ditches cut into the wet areas. Ditches round such areas are unlikely to do more than trap surface water, unless they actually cut the supplying fissures. Sand bands supplying water to the fissures could be drained by gravel packed sumps or wells, but these would be extremely difficult to locate in the best positions, and a piecemeal approach of dealing with springs by local drains as they become apparent is likely to be the best course. Drainage problems are to be expected only where sediments exist and are not to be expected where slopes are steeper and dolerite is close to surface.

REFERENCE

STEVENSON, P.C. 1973. Preliminary investigation of groundwater problems in the Morris Street-Bruce Street area, Prospect Vale, Launceston. *Tech.Rep. Dep.Mines Tasm.* 15:72.

P.C. Stephenson

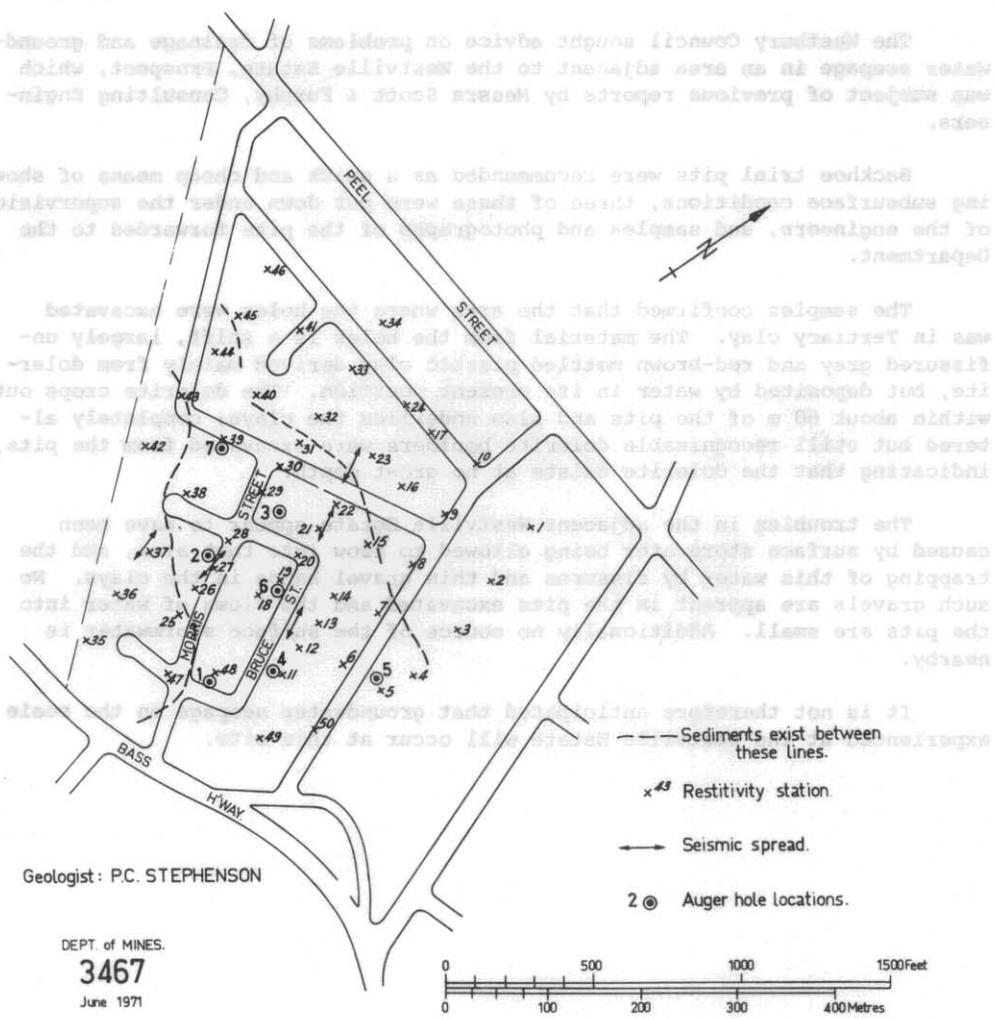
The Westbury Council sought advice on problems on drainage and ground-water seepage in an area adjacent to the Westville Estate, Prospect Vale, which was subject of previous reports by Messrs Scott & Partners, Consulting Engineers.

Section trial pits were recommended as a means of showing subsurface conditions, some of these were dug under the supervision of the engineer, and samples and photographs of the material were forwarded to the Department.

The samples confirmed that the material was in tertiary clay. The material is fissured grey and red-brown weathered, but deposited by water in the area, and within about 10' of the pits are found but still recognizable, indicating that the material is tertiary.

The trouble in the garden is caused by surface drainage, the seeping of this water into the soil, such drains are agreed to be installed, the pits are small, nearby.

It is not understood why that drainage is not installed, it is not understood why that drainage is not installed, it is not understood why that drainage is not installed.



T.J.W.

Figure 48. Locations of geophysical work and augering, Westville Estate, Prospect Vale.

