DEPARTMENT OF
~~NATIONAL RESOURCES~~
NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1980/28

INVESTIGATION OF A SOIL DRAINAGE PROBLEM AT COOK PRIMARY SCHOOL, ACT

by

P.D. HOHNEN

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CONTENTS

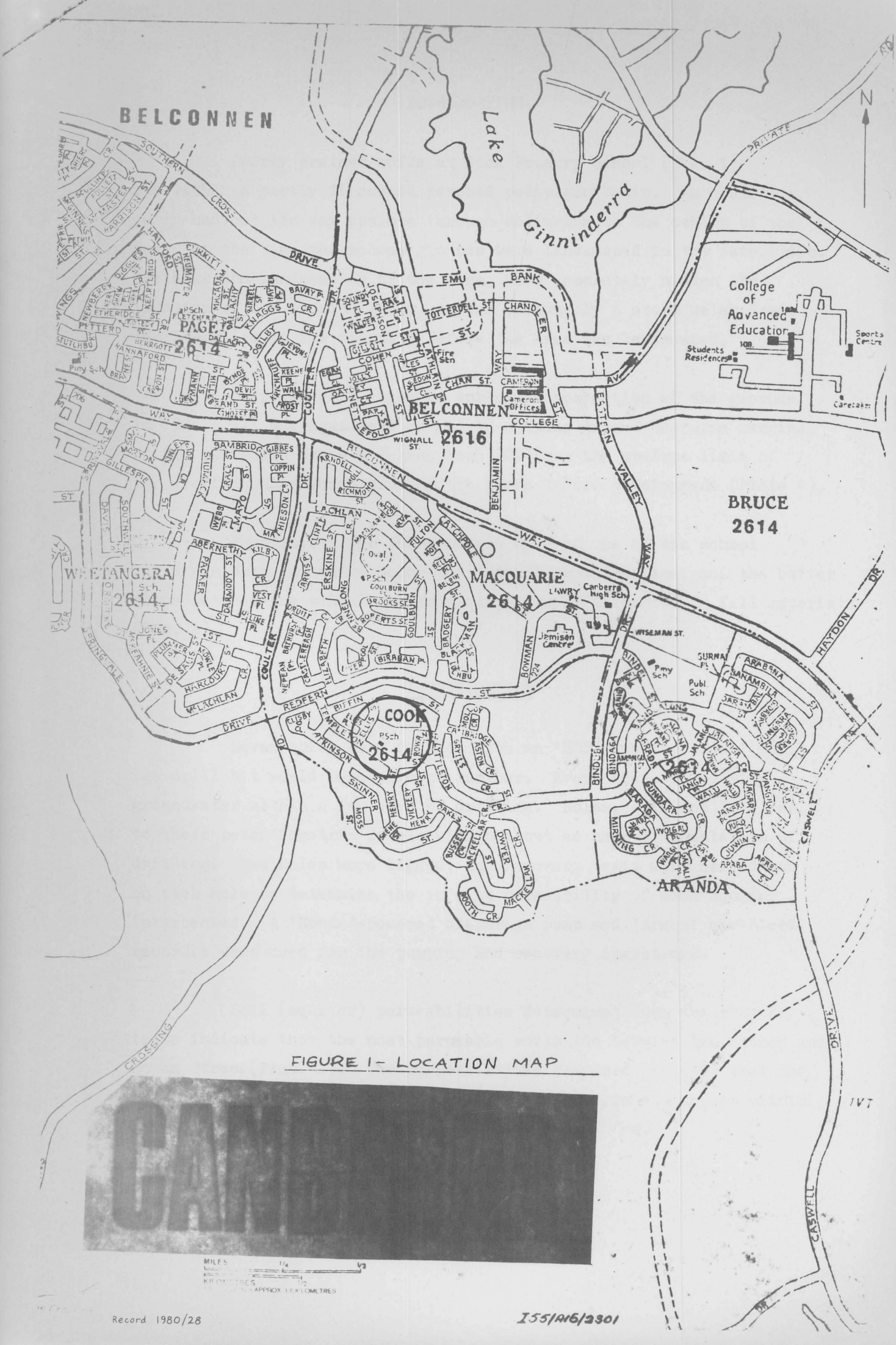
FIGURES

PLATE

ABSTRACT

Permanent waterlogging of soils at several places in the grounds of Cook Primary School during the exceptionally wet years of 1973, 1974, and 1975, caused playing areas to deteriorate. The Department of Education requested that the Bureau investigate the seepages and propose remedial drainage measures.

Auger holes were drilled to determine soil properties. The seepage has been attributed to the intersection and partial removal of natural soil aquifers. Agricultural drains are recommended to re-establish permeable pathways for shallow groundwater. An alternative recommendation is to pump from a deep bore in the underlying fractured rock.



Record 1980/28

I55/A16/2301

INTRODUCTION

Poorly drained soils at Cook Primary School (Fig. 1) lie within a partly dissected perched pediplain basin. An erosion gully had cut its way upslope through colluvium to the centre of the basin at the time the school grounds were landscaped in the late 1960s. Drainage and landscaping of the area, have completely hidden the location of the erosion gully, though presumably a storm water drain was installed in its vicinity before the area was landscaped.

Seepages were observed during an inspection of the grounds in 1975. All seepages were on gently sloping ground near the margins of the pediplain basin and less than 200 from the upslope limit of the erosion gully which drained the basin before development (Plate 1).

Foundations for the southern side of one of the school buildings were excavated below the natural groundsurface, and the batter slope between the school and Templetion Street is partly on fill materials (Fig. 2).

INVESTIGATION

Seven holes were drilled with an 'HDBA Proline Auger' until the drill bit would penetrate no further. Every hole filled with groundwater within a few days of drilling. Holes, 4,6, and 7 filled to their potentiometric levels within about an hour of completion of drilling. The holes were logged, and recovery tests were carred out on each hole to determine the in situ permeability of each aquifer intersected. A 'Honda'-powered diaphragm pump and 'Arkon' air-bleed recorder were used for the pumping and recovery operations.

Soil (aquifer) permeabilities determined from the recovery tests indicate that the most permeable soils lie between the church and Rowan Street(Plate 1). The permeabilities measured indicate that the soils are amenable to drainage by agricultural-type drains set within the aquifers at invert depths of not less than 90 cm.

CONCLUSIONS

1. Highly permeable colluvial fan and basin deposits, which are the transport medium for shallow drainage or interflow in the higher parts of Cook, have been intersected by the cut-and-fill processes of landscaping operations during the construction of Cook Primary School. This has allowed seepage from the colluvium, of water that was previously confined beneath low-permeability clay soils (Fig. 2).

2. Agricultural drains installed at depths of more than 90 cm as shown in Plate 1 would re-establish a permeable pathway for water percolating through soil materials.

3. After installation of the drains, some temporary seepage may still occur in widely scattered areas within the school grounds during years with higher than average rainfall because soils in a downslope direction have a lower permeability and a reduced ability to transmit water. Water in excess of the amount that can be transmitted will appear as seepage at the surface.

4. An alternative method of draining the affected area would be to construct a bore and fit it with an electric submersible pump. This method relies on pumping from the underlying fractured-rock aquifer to lower the potentiometric surface of the soil aquifers, and has been successful in a similar situation at Red Hill. The depth of such a bore would be about 40-50 m, and drilling and completion of the bore would cost about $5500; installation of a pump would be an additional charge.

RECOMMENDATIONS

It is recommended that agricultural drains be installed to drain the worst seepage areas on the southeastern side of the school grounds in the corner formed by Templeton and Rowan Streets. It is proposed that the drains have a gradient of about 2.5% (1 in 40) and are connected to stormwater drains near Rowan Street.

Recommended drain routes are oriented to have the shortest paths and the steepest gradients that buildings, bicycle stands, and storm-water invert levels will allow.

SCHEMATIC CROSS SECTION EXPLAINING SEEPAGE AT COOK SCHOOL

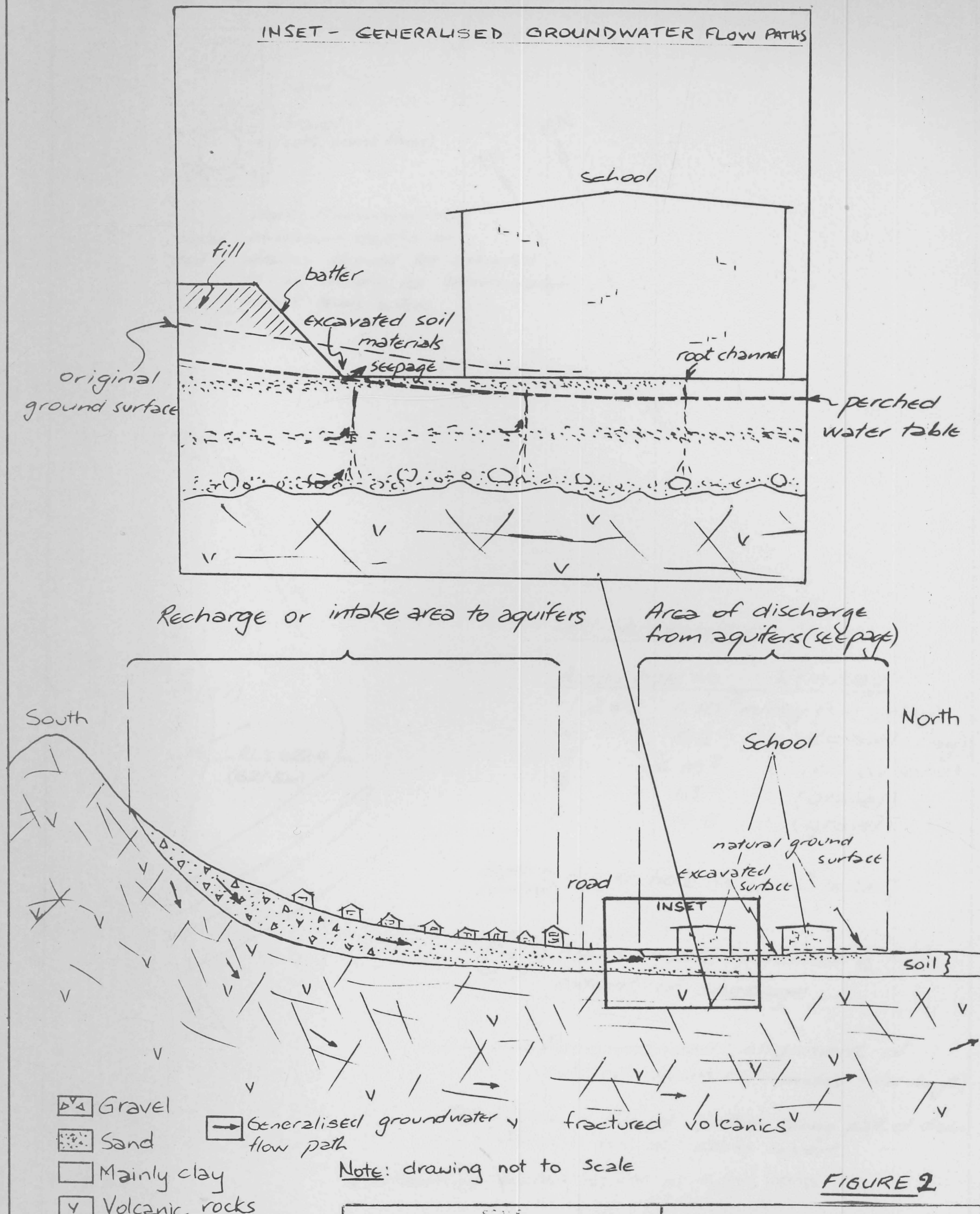


FIGURE 2

COMMONWEALTH OF AUSTRALIA
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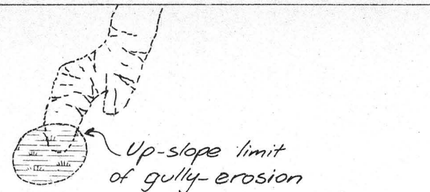
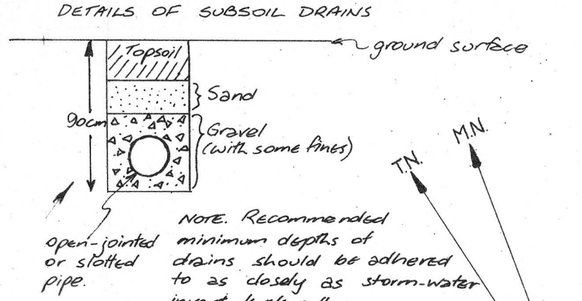
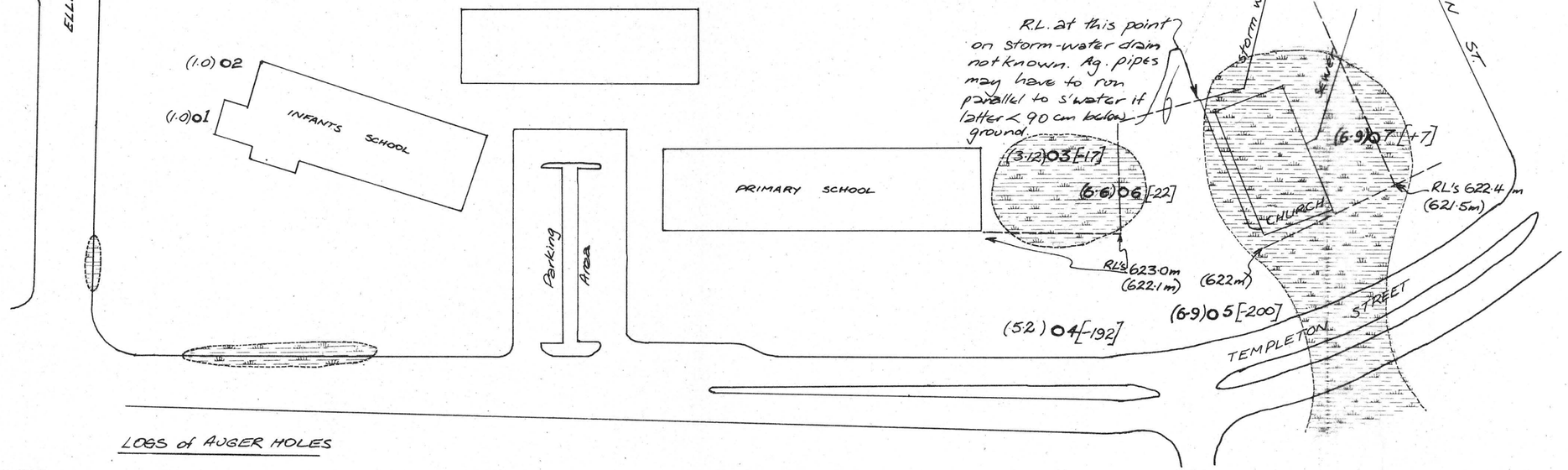
TITLE	Schematic Cross Section
PROJECT	Seepage at Cook Primary School
PDH Project geologist	
Drawn by	PDH
Drawing No.	I55/A16/2302

Groundwater Seepage at Cook Primary School







LOGS of AUGER HOLES

Holes 1, 2 & 3
0–30 cm topsoil
30–90 cm completely weathered dacite

Hole 4
Moist clayey sand at 2.7–3.0 metres
Saturated gravel at 4.6–5.2 metres

Hole 5
Wet clayey sand at 75 cm
Saturated, loose sand from 4.0–5.3 metres

Hole 6
Wet clayey gravel at 45–90 cm
From 2.4 metres to bottom, highly weathered dacite

Hole 7
Wet clayey sand 30–60 cm
Saturated, loose gravel at 1.8–2.1 metres

Poor core recovery (due to saturated soils) precludes details, but all holes intersected sandy clay with aquifers (water bearing layers) at depths shown opposite

0 10 20 30 40 50 100 m

Soil Permeabilities:

Auger hole No.	k (m/day)	
1, 2 & 3	$< 10^{-2}$ m/day	(silt & clay)
4	0·2	(gravel & clay)
5	$< 10^{-2}$	(clayey sand)
6	1·3	(gravel)
7	14·0	(gravel)

depth (metres) ○ Auger hole No. [S.W.L.* in cm.]

Approximate position & extent of seepage

------ Recommended alignment of subsoil drains (174 metres total length)

RL's 623·0m – R.L. of surface along path of drain
(622·1m) – R.L. of drain invert

* Standing water levels in April, 1975

AMENDMENTS			
No.	Description	Author	Checked
A1			
A2			
A3			
A4			
A5			

SCALE (m) 0 10 20 30 40 50

Base map/survey

Geology by J.P. Ceplecha, P.D.H.

Compiled and checked: P.D.H. Project geologist
Checked and approved: Senior geologist

Supervising geologist

COMMONWEALTH OF AUSTRALIA
BUREAU OF MINERAL RESOURCES
CANBERRA, A.C.T.

TITLE: Groundwater Seepage at Cook Primary School

PROJECT: A.C.T. Seepage Problems

To accompany Record | Drawn by: PDH | Drawing No.: I55/A16/2303

Record 1980/28