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1984/48. Sheffield Regional Groundwater Project : Review of completed work and ideas for the future.

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Abstract

Work carried out on the Sheffield groundwater project up to July 1984 is outlined. A list of existing data is presented. Ideas on future work are discussed. Suggested activities include establishing a monitoring system (similar to the Devonport programme), completing three geological cross-sections across the deep lead system, and carrying out an exploration-type programme (similar to the East Coast water survey) for the non-Tertiary rocks in the Sheffield Quadrangle.

INTRODUCTION

The purpose of this report is to record the work that has been carried out on the Sheffield Regional Groundwater Project. Ideas on possible future work are discussed but detailed planning and supervision will be the responsibility of the geologist taking over this project.

WORK TO DATE (JULY 1984)

The three main activities already started are:

(1) Review of existing data.
(2) Survey of water users.
(3) Diamond-drilling programme.

As far as the first activity is concerned, a list of the maps and papers which have been collected for this project is given in Appendix 1. The documents themselves are held by the Supervising Geologist, Engineering Geology section.

The survey of water users is being carried out by field assistants Jane Mackey and Annabelle Geddes. They are continuing their survey of landowners in the Sheffield area and have a file with the results to date. The file also includes the results of analysis of water samples collected from bores and springs in the area.

A diamond-drilling programme consisting of three holes was carried out between August and November 1982. The purpose of the programme was to explore the pre-basalt Paloona Valley system. The programme is discussed in more detail in Appendix 2.

The diamond-drilling programme results provide evidence to support the existence of the pre-basalt Paloona Valley system or at least the existence of 'deep leads' in the Sheffield area. Whether or not these will be major sources of groundwater is not known at this stage.

IDEAS FOR FUTURE WORK

No detailed planning of future work has been carried out. The following list of possible activities are little more than random thoughts and it is recommended that the whole project be reviewed before further work is considered.

(1) The most urgent need is to establish a monitoring system. Irrigation bores use large quantities of groundwater and it is possible that 'mining' may be occurring in the Sheffield area. The current Devonport monitoring programme should provide useful ideas for the planning of a Sheffield programme.

(2) In the light of the first point above it is probably not wise to openly encourage deep irrigation bores until more is known about the 'deep lead' systems. The three diamond-drill holes could form part of the geological cross-sections across the pre-basalt Paloona Valley. Each cross-section could be completed by water bores, and seismic reflection surveys may also be useful.

(3) A basic aim of the study is to compile a record of water bores and their use in the Sheffield Quadrangle. Most bores are located in the Tertiary rocks. An exploration-type programme (similar to the East Coast water survey) may be considered to obtain information on groundwater from other sources. An extensive survey is probably not justified as the area has a relatively high rainfall, surface water is plentiful, and agricultural land is largely confined to areas where Tertiary rocks occur.

[11 July 1984]

APPENDIX 1

List of available maps and papers

The following is a list of maps and documents which I assembled while working on the Sheffield groundwater project. Unless otherwise stated, the items listed below have been passed on to the Supervising Geologist, Engineering Geology Section.

Topographic maps

1:100 000 scale:

Forth

1:50 000 scale:

Clyde, Deloraine, Devonport, Exeter,
Lorinna, Mole Creek, Rubicon,
Sheffield, Westbury, Wilmot.

1:25 000 scale:

Gog, Latrobe, Railton, Sheffield

Geological cross-sections

Seven cross-sections are available. The horizontal scales are 1:50 000 and the vertical scales are 1:5000. The positions of the cross-sections are plotted on a 1:50 000 topographic map (Sheffield) and a 1:63 360 geological map (Sheffield). A legend is included with the first set of cross-sections.

Boreholes

Diamond-drill hole information, borehole logs, survey data, land-owners agreement, Borehole 2 water analysis (see Appendix 2).

Bore cards

Bore cards are in the central system and W.L. Matthews' compilation for the Sheffield Quadrangle (borehole data, logs, and location map) will be very useful.

Copy of Sheffield Explanatory Report.

APPENDIX 2

Results of the diamond drilling programme

OBJECTIVES

Three holes were sited to explore the pre-basalt Paloona Valley (deep lead) system. A map of the deep lead system is given in Figure 5 (p. 34) of the Sheffield Explanatory Report. Previous water bores near to the drill sites had been stopped while still in basalt at depths of up to 130 m. The first two diamond-drill holes were continued until pre-Tertiary rocks were encountered. The third hole was stopped because of drilling difficulties while still in basalt.

It was thought that the old valley system might concentrate groundwater and that yields suitable for irrigation could be present at depths of 100 m to 200 m.

RESULTS

The results of the three diamond-drill holes are summarised in Table 1. Detailed logging has been started but is not complete (Appendix 1).

Table 1. SUMMARY OF DIAMOND-DRILLING RESULTS

Borehole	*Brief log*
1	0-9 m basalt, 9-26 m siltstone, 26-51 m basalt, 51-72 m siltstone and mudstone, 72-84 m sandstone and conglomerate (sand, gravel and pebbles), 84-101 m pre-Tertiary weathered conglomerate.
2	0-8 m solid basalt, 80-100 m vesicular basalt and agglomerate, 100-130 m interbedded mudstone and basalt, 130-158 m mudstone, 158-172 m pre-Tertiary sandstone.
3	0-130 m basalt and agglomerate.

It is not easy to say whether useful yields of groundwater could be obtained from water bores at the sites of the diamond-drill holes. Detailed logging of Borehole 1 is nearly complete. Open fractures and drilling water loss between 34 m and 44 m suggests that some groundwater may be available from the basalt. The sand and gravel, especially between 80 m and 84 m, is also likely to be a source of groundwater. Detailed logging of Boreholes 2 and 3 is not complete but it is likely that some groundwater may be obtained from the basalt and agglomerate. The behaviour of drilling water in the hole is recorded on the weekly driller's reports and this may give a guide to the presence of open fractures. The driller's reports should be used when the detailed logging is completed.

S.M. Forsyth has looked at several pieces of mudstone from Boreholes 1 and 2. The pollen indicates that the age of the mudstone is late Oligocene or early Miocene (*Proteacidites tuberculatus* Zone or younger).