REPORT

on

Possibilities of obtaining Underground Water at Sheffield

Introduction

The geological examination of the Sheffield District was made at the request of the Kentish Municipal Council. From other sources, the Council had been informed that artesian water existed in the district and was in fact the same flow or stream that had been encountered in a bore-hole at Spreyton.

The Council desired confirmation of this statement on geological grounds as they considered it might be possible to obtain a supply for the township of Sheffield from the source.

Topography

The Sheffield district consists for the most part of an undulating plateau in various stages of dissection. Around the township the general elevation of the country is between 900 and 1000 feet above the sea. To the south-west, there is a gradual increase the general elevation being 1100 to 1200 feet.

The Badgers range occurs to the north with an altitude of 1400 feet and a general trend to the north-north-west. Mt. Roland (4047 feet) occurs a short distance to the north. The plateau is dissected by the Forth River on its western side and the Dasher River on the south and east with general levels 300 to 400 feet below the plateau.

The Don crosses the district in a general northerly direction, but has dissected the district to a much less extent.

Geology

A number of rock formations of different ages occur in the Sheffield district. Descriptions of these will be given below in their order of age from oldest to youngest

(a) Cambrian

In Mineral Resources No. 8, Mr. A. McIntosh Reid, describes a series of sandstones and slates occurring to the north-west of Sheffield. These are similar to the fossiliferous rocks at Caroline Creek, Railton and so are referred to the Cambrian system.

(b) Cambro-Ordovician (Porphyroid) Sedimentary Rocks.

Probably the next series in order of age is one consisting of schistose slates with perhaps subordinate amounts of quartzites and conglomerates. These rocks occur in an area along the Dasher River to the south-east of Sheffield. It is difficult to obtain strikes and dip but in the tributary which runs through Sheffield, exposures give a strike of N.N.W. and a dip to the west at high angles. The rocks are dark coloured types of schist or schistose slates. The series are tentatively ascribed to the Cambro-Ordovician (Porphyroid) System.

In the area about 1½ miles to the south-west of Kentish station, more normal slates are exposed in a road cutting. The strike is east and west and the dip to the north.

In the country between the Forth and the Don R. and along a tributary of the latter, a series of breccia conglomerates occur. These rocks consist of rounded and angular pieces of soft rock types in a soft matrix of the same nature. They resemble similar types at the head of the Comstock Valley and are to be correlated with the Porphyroid or the Dundas series of the Cambro Ordovician.

(c) Porphyroid Igneous Rocks

These occur in three parts of the district, viz to the north, south and south-west of Sheffield. The types in the area to the south are of intermediate composition and are either syerites or syenite porphyries.. In the south-western area the rock is probably ultra basic and of the nature of a perknite or picrite.

The relations of the igneous rocks with the sedimentary could not be observed. It is probable, however, that the rocks belong to the Porphyroid series and are intrusive into the sedimentary types.

(d) West Coast Range Conglomerate Series.

This series contains the typical conglomerates and quartzites of the above named series of the Silurian System. They occupy the high range known as the Badgers to the north-east of the district.

(e) Lower Tertiary

Rocks of this age probably occur over a large part of the district. Owing, however, to the covering of basalt they are only exposed at a few localities where the basalt has been denuded from them.

The best exposure of these beds is along the Don River near the bridge on the Sheffield-Barrington road. A cliff on the west bank of the river exposures 15 feet of sandstones and clays with fossil leaves in them. The clay is overlain by basalt while the sandstones extend below river level.

Along the road near the bridge sands, gravels and clays occur which are doubtfully referred to the same series. To the north west of the bridge sands and sandstones appear to underlie the basalt. Clay is also exposed at localities further north along the Don River.

Other exposures of sub-basaltic deposits occur at various localities along the north western side of the Dasher River. These consist of gravels containing waterworn pebbles up to 4 inches in diameter. Where visible, these rocks overlie the Cambro-Ordovician rocks and underlie the basalt.

It is probable that there is at least one bed of sediments intercalated between flows of basalt. Statements made in connection with existing wells in the township of Sheffield suggest the presence of beds of sand and gravels beneath the basalt at the surface.

It is evident from the above that the sub-basaltic deposits are wide spread. The greatest extent and thickness should occur approximately along the course of the Don River as this represents the course of the former Forth River. The valley of the latter was filled with sands, gravels,clays and which were covered in turn by the basalt. The basalt however, was not confined to the valley of the Forth, but was of sufficient thickness to overflow any low parts of its

eastern watershed and join with similar flows in the valley of the Mersey River.

(f) Basalt

As already stated above, one or more flows of basalt filled the valley of the Forth River and overflowed and joined similar flows in the valley of the Mersey River.

The statements as to gravels in wells in Sheffield point to several flows with thin interbedded sediments between them. The usual type is vesicular fine-grained variety often containing amygdules of calcium carbonate. Though olivine is not in evidence, the rock is probably an olivine basalt, typical of the flows on the north west coast. It weathers rapidly and gives rise to the rich chocolate soil of the district. Along the railway south west of Sheffield a large amount of tachylyte occurs in association with a rock resembling an agglomerate.

In common with the basalts throughout Tasmania, it is regarded as closing the Lower Tertiary era.

(g) The recent deposits include the alluvium, river gravels occurring along the present streams. The largest area exists to the north east of Sheffield. Other areas occur along the Dasher and Don Rivers.

Occurrence of Underground Water.

Practically the whole of the underground water is derived from that which falls upon the surface and percolating through the soil is stored in suitable rocks.

In order that underground water may be stored, the rocks must be porous and permeable i.e. not only must they be capable of containing water, but they must also allow the passage of water through them. Rocks with joints, fissures and other cavities also provide these conditions.

The geological structure plays an important part in the occurrence of underground water. It must be such that the porous beds outcrop at the surface so that the surface water may enter them. The presence of impervious beds above and below the porous ones largely affects the occurrence.

In general, it may be taken that part of the rainfall percolates underground and saturates the underlying rocks to a certain level known as the water table. In special cases such as porous beds intercalated with impervious ones and with structures as basins or a uniformly dipping series, the water may be stored under artesian conditions i.e. when tapped by a shaft or bore-hole it will rise above the surface of the ground. Generally, however, the conditions are such that the water is sub-artesian i.e. it does not rise to the surface, though it may rise above the level at which it was tapped.

Possibilities in the Sheffield District

As seen above, the geological structure of the Sheffield district consists of almost horizontal layers of basalt and sub-basaltic river deposits overlying a basement composed of cambro-ordovician sedimentary igneous rocks.

The Cambro-Ordovician rocks would not be water-bearing ones except in so far as they are jointed. Small quantities might be obtained from shafts and bore-holes intersecting prominent joints.

The Tertiary rocks would, in the case of the sands, sandstones and gravels which are very porous, contain supplies of water. The clays would not readily yield water. The basalt would contain small supplies of water in the numerous joint planes it contains. The Tertiary rocks represent sediments along the former valley of the Forth River and its tributaries. The flow of the former valley would have a slope to the north and the deposits are also likely to be thicker in the northern parts of the district. The basalt also has a general slope to the north.

(a) Sub-artesian Water

As already indicated by the numerous wells sunk in the Sheffield district, especially in the township, the geological conditions are suitable for the occurrence of sub-artesian water supplies. These wells have been sunk to depths ranging up to 60 or 70 feet. Generally they have passed through basalt for their full depth, but in the best wells i.e. those giving the largest amount of water, such as those at the hotel of Mr. Maddox and near the old butter factory, they passed through the upper layer of basalt and entered beds of sand and gravels respectively. The sands and gravels are the most porous rocks and it is natural that the largest quantities of water would be obtainable therefrom.

(b) Artesian Water

There is only a very slight possibility that water exists under artesian conditions. These conditions might occur in the basal beds of the Tertiary system. These beds probably outcrop in the south-western part of the district at altitudes of 1200 to 1300 feet above sea-level. They then extend north under the cover of basalt, and in the vicinity of the Sheffield cemetery would probably be 50 to 100 feet beneath the surface and therefore at 700-750 feet above the sea. The slope to the north is therefore fairly steep and the difference in height of 450 to 500 feet might give sufficient pressure to cause the water to be under artesian conditions.

To test this properly a bore-hole would have to be sunk in the deepest part of the old Forth Valley. It is impossible to determine such a position with any degree of accuracy from the available evidence at the surface, and several holes might have to be sunk to determine it.

Further, even if the water was under artesian conditions it is highly improbable that it would have sufficient pressure to enable the township of Sheffield to be supplied by gravitation, and pumping would have to be resorted to. It has been stated that artesian water exists under the township and that it is connected with the artesian water at Spreyton, many miles to the north.

It need only be stated that the geological conditions at Sheffield and Spreyton are totally different, to prove the fallacy of this statement. At Spreyton, the water is obtained from a porous pebbly bed in the Permo-Carboniferous rocks, while at Sheffield the water (sub-artesian or artesian) is in basalt and Tertiary beds, and the geological and geographical barrier of the Badgers exists between the two localities.

Conclusion

The geological conditions at Sheffield are suitable for the occurrence of sub-artesian water, as proved by the existing wells. It is possible though not probable that artesian water may exist in the deepest part of the Tertiary sediments in the old Forth Valley. The position of this deep part cannot be accurately determined on the surface and several trial bores might be necessary to locate it.

In view of the cost of these and the uncertainty of obtaining artesian water, it is a matter for serious consideration whether attempts should be made to obtain an artesian supply. A question worthy of consideration is that of obtaining a supply of sub-artesian water from a number of wells in close proximity. This would require tests of the quantity and quality of water from the best of the existing wells. Such a scheme would require a pumping plant with several suction lines or smaller pumping plants on each well.

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