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31. Dolerite on properties near Kingston

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At the request of the Department of Public Works a geological examination was made of three allotments acquired from E.V. Fenton in connection with the construction of the Southern Expressway and associated works. The nature, quantity and quality of the dolerite on this property was to be determined and compared with that on adjoining properties (fig. 27).

A previous report (dated 15 February 1969) on the suitability of the above allotments and associated ground for a quarry site was prepared by Professor S.W. Carey.

The resumed area was divided into three allotments, lots 1 and 2 being for a scenic reserve and lot 3 for road access. However, as Carey combined lots 1 and 2 and termed them lot 2; and called lot 3, lot 1, this revised and simpler terminology has been used here.

GEOLOGY OF THE PROPERTY OF E.V. FENTON

The property is underlain by dolerite of two distinct types: fine-grained and very coarse-grained. The properties of these rocks are discussed in a later section.

Lot 1

The facing slope (Proctors Road) is composed almost entirely of a fine-grained, closely jointed, slightly weathered dolerite dyke. As such it occupies about half the allotment. The western boundary is outside the property beneath the new road while the eastern boundary which is clearly discernible on the ground, is shown on the map. A very distinct junction may be observed at several points across the allotment between the above dyke and very coarse-grained gravelly, weathered dolerite. The coarse-grained dolerite forms the remainder of lot 1. A small area of fill conceals outcrops and rock distribution in the level ground around the north end of the allotment. A small quarry has been opened in the fine-grained rock adjacent to the property boundary next to Proctors Road. Any estimation of the quality of this material and its properties are based on this exposure and smaller exposures toward the north end of lot 1 on Proctors Road and in the bed of Vincents Creek west of lot 1.

Lot 2

The only exposures on lot 2 are of coarse-grained dolerite which commonly shows weathering to a coarse gravelly material. A small area of fill covers the level area at the north-west end of the allotment.

Remainder of property

Only coarse-grained dolerite has been observed elsewhere on the property. It is often deeply weathered and one such zone is being worked as a source of gravel by Mr Fenton.

GEOLOGY OF ADJACENT PROPERTIES

The adjacent property owned by P.A. Lake and, further north, that of N.A. Cooper, are underlain by coarse-grained dolerite with two very minor exceptions. Alluvium, fill and gravel deposits are to be found along Vincents Creek and the boundary between such deposits and coarse dolerite

approximates the line of Proctors Road: these deposits occur on nearly level ground. In many places the creek has cut into them exposing dolerite or mudstone (see later). In addition two other occurrences of fine-grained dolerite have been observed. One is very small and located about 120 m north of lot 1, while the second is at the far north-west corner of P.A. Lake's property and passes into the property of N.A. Cooper. It is unlikely that the fine-grained material on P.A. Lake's property could be quarried as the relief of the land is unsuitable.

The line of the expressway approximates the western boundary of the entire dolerite mass and all properties west of it have a mudstone bedrock and are in no way similar to the properties of P.A. Lake or E.V. Fenton. The boundary between dolerite and mudstone is a little irregular and one point of the boundary, which is normally concealed by the earthworks of the highway, is seen in the creek 120 m north of lot 1.

THE DOLERITE ROCK TYPES

Fine-grained dolerite: Exposures show very close jointing producing blocks which are seldom more than 0.15 m^3 and which are easily broken down. This rock type is brittle and weathering is minimal, usually being restricted to a thin coating of iron oxides on joint faces.

Coarse-grained dolerite: Jointing is commonly sparse, with the result that blocks of the order of 0.28-0.85 m^3 are common, making secondary blasting necessary. When fresh the rock is very hard, tenacious and difficult to shatter. This dolerite type is often highly weathered for example in the old quarries in Proctors Road south of E.V. Fenton's property or in the cuttings beside the access track to, and in, E.V. Fenton's gravel pit. The gravel pit is worked in weathered coarse dolerite.

QUANTITY OF DOLERITE AVAILABLE

Assuming that a face is worked along the entire width of the property the maximum volume of fine-grained dolerite that could be produced is 38,000 m^3. Working the fine-grained dolerite completely would result in the removal of about half the surface area of lot 1. Any further quarrying would be in the coarser grained dolerite of which there is a maximum volume of the order of 460,000 m^3 in lots 1 and 2.

Proctors Road is the base level used in the above calculations. A vertical boundary between fine and coarse dolerite has been assumed in these calculations, as suggested by the surface exposures, although the drill hole shows that this is not so. The precise angle is unknown.

USE OF MATERIAL AND EASE OF QUARRYING

Dolerite of any grain size, if fresh, is a suitable material for use in concrete aggregate and hot mix. The quarries around Hobart operate, or have operated in, dolerite of any grain size. Certainly Fenton's lots 1 and 2 would provide a good initial working face, and loss of these lots and their potential face could not be replaced on the shallower slope higher on the hill.

In addition, the coarse dolerite in this locality shows significant weathering and occurs in very large blocks. The cost of quarrying the coarser dolerite would be greater than that for working of the finer dolerite, as secondary blasting would be required to break the blocks down, and special plant would be needed to make an economic separation of the weathered

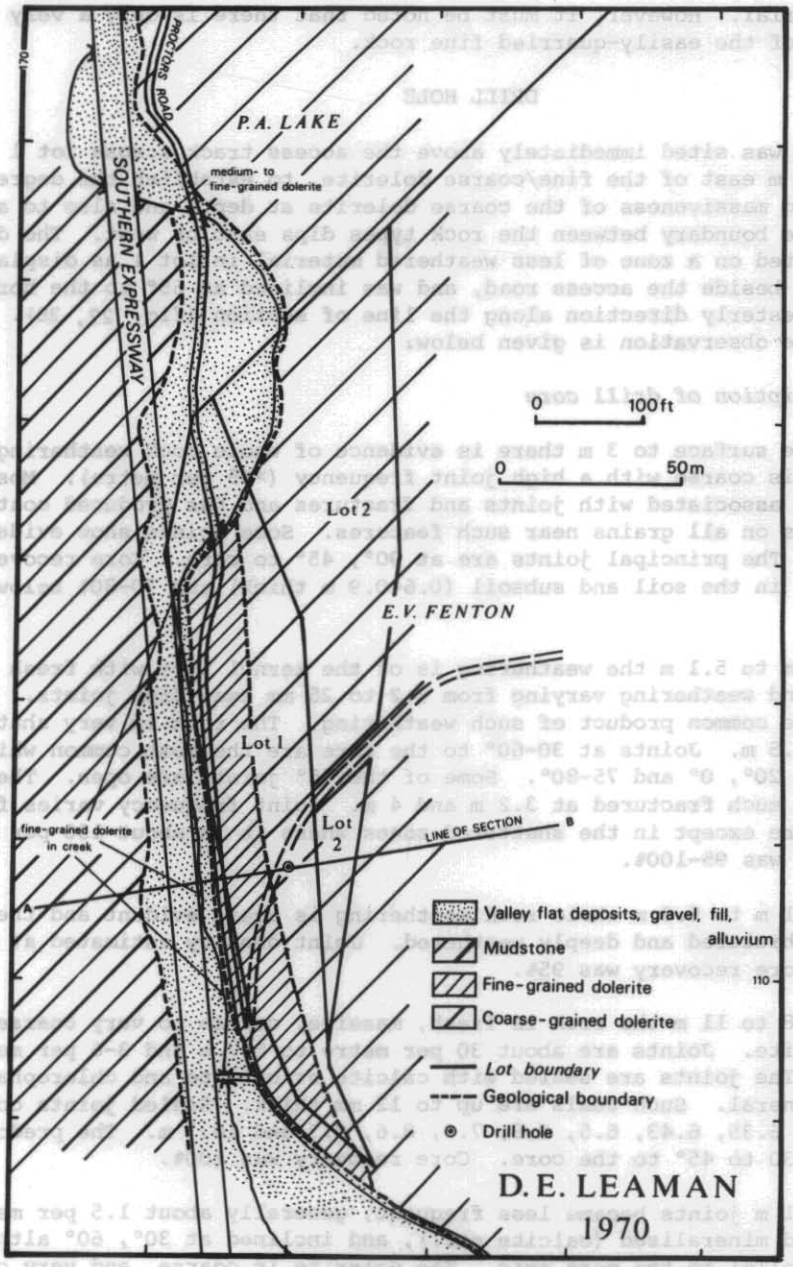

Figure 27. *Geological map of area near Kingston.*

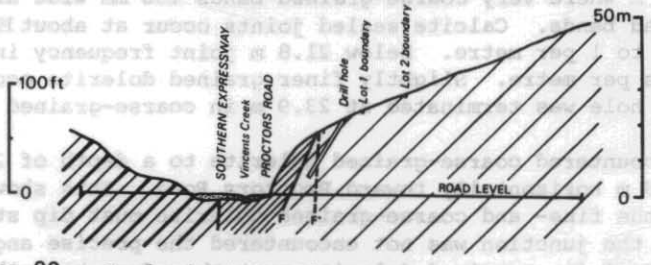

Figure 28. *Geological Section across area near Kingston.*

5 cm

gravelly material. However, it must be noted that there is only a very small volume of the easily-quarried fine rock.

DRILL HOLE

A drill was sited immediately above the access track across lot 1 (fig. 27), about 12 m east of the fine/coarse dolerite, to establish the degree of weathering and massiveness of the coarse dolerite at depth and also to ascertain if the boundary between the rock types dips east or west. The drill site was located on a zone of less weathered material in lot 1 as displayed in the gutter beside the access road, and was inclined at 65° to the horizontal in a westerly direction along the line of section (fig. 27, 28). A summary of the observation is given below:

Summary description of drill core

From the surface to 3 m there is evidence of whole rock weathering. The dolerite is coarse with a high joint frequency (>65 per metre). Most weathering is associated with joints and fractures and has produced coatings of iron oxides on all grains near such features. Some joints show evidence of movement. The principal joints are at 90°, 45° to core. Core recovery was very poor in the soil and subsoil (0.6-0.9 m thick) and 70-80% below 1.9 m.

From 3 m to 5.1 m the weathering is of the kernel type with fresh cores of dolerite and weathering varying from 3.2 to 25 mm away from joints. Iron oxides are the common product of such weathering. The rock is very shattered from 3 m to 3.5 m. Joints at 30-60° to the core are the most common whilst others are at 20°, 0° and 75-80°. Some of the 75° joints are open. The rock was also much fractured at 3.2 m and 4 m. Joint frequency varies from 30-65 per metre except in the shattered zones where it is about 130 per metre. Core recovery was 95-100%.

From 5.1 m to 5.8 m whole rock weathering is again evident and the material is shattered and deeply weathered. Joint density estimated at 130 per metre. Core recovery was 95%.

From 5.8 to 11 m the rock is fresh, massive, coarse to very coarse-grained dolerite. Joints are about 30 per metre to 6.7 m and 3-6 per metre thereafter. The joints are sealed with calcite or calcite and chlorophaeite, a greenish mineral. Such seals are up to 12 mm thick. Sealed joints occur at 6.3, 6.33, 6.35, 6.43, 6.5, 6.8, 7.3, 8.6, 9.7 and 10.3 m. The predominant angle is 30 to 45° to the core. Core recovery was 100%.

Below 11 m joints became less frequent, generally about 1.5 per metre, were tight and mineralised (calcite etc.), and inclined at 30°, 60° although some were parallel to the core axis. The dolerite is coarse, and very coarse bands occur at 12.5, 13.4 and 14.3 m. Core recovery was 100%. Such material continues to 18.9 m where very coarse-grained bands 150 mm wide alternate with medium-grained bands. Calcite sealed joints occur at about 19.8 m with a frequency of up to 1 per metre. Below 21.8 m joint frequency increases to 10 to 16 joints per metre. Slightly finer grained dolerite occurs at 21.8-22.5 m. The hole was terminated at 23.9 m in coarse-grained dolerite.

The hole encountered coarse-grained dolerite to a depth of 21.6 m vertically and 9.8 m horizontally toward Proctors Road. This shows that the boundary between the fine- and coarse-grained dolerite must dip steeply westward. However as the junction was not encountered the precise angle is not known. The volume of fine-grained dolerite must therefore be rather less than the figure quoted.