

(j.) The alternative proposal, shown in green, would lower the lake 1 ft. more and leave 40 acres of water with 3 ft. 6 in. of water in deepest parts.

Of the two schemes I recommend (h), as there would be less fear of creating marshy conditions in the lake.

The existing tunnel can be utilized by constructing a shaft with the necessary inverts to control level of lake.

At Ellerslie end of the lake, where rock was suspected, I have caused steel rods to be forced down, and show on plan the localities where rock was found.

I am quite satisfied that the marshy lands can be adequately drained without causing the complete draining of the lake as an aid thereto.

With regard to (g)—the effect the entire draining of the lake would have upon the Onehunga water-supply—I may say at once that this aspect of the case is most complex, and it is impossible to be dogmatic in this connection.

Plan 6 represents the locality of Lake Waiaatarua and surrounding country, and I have endeavoured to make the position as clear as possible. Geologically is shown by colours yellow and neutral tint the clay and volcanic formation respectively.

Without doubt the present lake was once an ordinary valley composed of clay lying on Waitemata marl series. Later on volcanic disturbances caused a lava-flow from Mount Wellington to close up the lower end of valley, and a lake resulted. During such eruption volcanic ash, &c., fell on the clay ridges and spurs, and was subsequently washed therefrom into the new lake-bed, and this no doubt accounts for a lot of the soft mud at the bottom of the lake. This mud runs down some 7 ft. to 9 ft. ere the bottom becomes hard and gritty: this grit is probably light fine scoria. The intervening years have seen the annual denudation of slopes of debris and soil.

Throughout the lava-flow can be seen signs of ancient channels leading from the lake-end at Ellerslie towards the Manukau Harbour, and there is no doubt that the only overflow from lake is at this end. Signs of water in motion are noticeable immediately on the Panmure Road close to Rock Cottage, on either side of which escapes are apparent. One escape—probably the largest—can be traced from Rock Cottage to Martin's, and thence to near Dr. Dickson's house at Penrose, thence to rifle range on foreshore. The other escape takes place on Ellerslie side of Rock Cottage. Various broken channels can be seen leading in direction of Onehunga, but it would be impossible to definitely affirm one way or the other that the water from Lake Waiaatarua finds its way thereby to Onehunga Springs. The present flood-level of lake is 92.50 ft. above ordinary high-water mark, so there is a decided fall. It goes without saying that the water escapes to Manukau Harbour, but exactly where it is hard to say, and therefore the whole matter is problematical. It should be noted that the water disappears into ground in places, apparently finding underground channels.

The locality plan shows sundry local floodings that take place in very wet weather, but such places are low basins or depressions. Caves of varying sizes can be found throughout the whole volcanic area extending from Mount Albert to Mount Wellington, so that it is hard to say what direct percolation there is to Onehunga Springs and pumping-station. Probably when the lake reaches its summer level there is very little percolation, as then the lake would become practically a tight reservoir by reason of the plugging of fissures by silt-deposits. Quite independently of Lake Waiaatarua supplying the Onehunga Springs there is a very large tract of volcanic country extending from Three Kings Mount to Mount Wellington, which no doubt provides the main supply of water towards these springs.

Much of the water appearing in Ellerslie and Penrose is due to natural conditions of drainage of storm-waters from slopes of One Tree Hill and Remuera and Ellerslie slopes. In the vicinity of Remuera, Greenlane, and Ellerslie Stations the Railway Department actually discharge storm-water into caves, and this must reach the lower levels and cause temporary flooding. The furthest any one could go would be to say that it was possible that Lake Waiaatarua contributed a portion of the water reaching Onehunga Springs.

If the lake is not entirely drained out, then there could not be the same objection. I therefore find it impossible to be dogmatic as regards the question of water-supply being affected.

I have prepared the following figures as regards the capacity of Lake Waiaatarua under varying conditions:—

At summer level (approximately 88.50 ft.)	...	...	124½ million gallons.
If reduced to 81.50 ft.	...	...	35 "
If reduced to 80.50 ft.	...	...	23½ "

Assuming that the lake is reduced to 81.50 ft., it would have a wet area of 46 acres. The direct rainfall on to this lake would be 43.3 in. annually, and allowing for an evaporation of 20 in. we would have approximately 24 million gallons to keep lake up to invert level. There would also be the run-off from watershed (1,100 acres) in addition thereto, which I estimate at about 540 million gallons annually.

Onehunga Water-supply.—From data received I find as follows:—

Population of district supplied, 8,500.	
Annual pumping	208 million gallons.
Less used by abattoirs	25 "

For domestic and other supply

Daily consumption per head, 59 gallons.

Probably springs have watershed of 2,500 acres in addition to lake watershed.

Rainfall run-off likely to be 1,100 million gallons annually, but this will not all centre around Onehunga Springs.

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