the tunnel with the other main dam on the Mangahao. Further up the Mangahao will be a second dam not directly connected to the tunnel, but which will also store a large quantity of water, and which will, in addition, stop any shingle which is being carried down the river. When working on such a high head storage-capacity is of very great value, and the extent to which this value is to be depreciated by moving shingle filling up the reservoirs has been very carefully considered. The greater portion of the drainage-area of the Mangahao above the proposed intake is in standing bush, mainly forest reserve, which protects the slopes from detrition; and, although the river is subject to great fluctuations in flow, our observations show that it carries a comparatively small amount of debris. The difference between the stream and some of the other Wairarapa rivers, particularly the Mangatainoka, which flows in the next valley to the eastward, is very marked It will be noticed at once that where these two rivers emerge from the hills on the Wairarapa side the Mangahao runs in a deep valley, only changing its course occasionally as it erodes away one or other of the banks, while the Mangatainoka runs on a level almost with the surrounding country, and is constantly changing its course in floods. The difference between the two rivers is due in the main to the fact that the Mangatainoka brings down from the hills more shingle than it can transport across the flatter grade into the Manawatu, while the Mangahao brings down scarcely enough to keep pace with the erosion from its lower reaches, and so has no tendency to build up its bed. It is to be expected, however, that there will be some filling-up of the upper reservoir, but this will keep the main basin lower down on the Mangahao clear for a considerable number of years, whilst the reservoir in the Tokomaru, not being in the main river, will be clear at all times. By the time any filling-up of reservoirs will have materially depreciated the storage value the Mangahao scheme will have become linked up with the large schemes to the north, so that a small reduction in output on that account will not be of serious moment. It is also quite possible to build smaller dams as required higher up the river to prevent shingle reaching even the upper dam as now designed.

Very careful observations of the river during the dry summers in 1916 and 1917 suggest 24,000 h.p. as being the maximum plant capacity to install on this scheme, and during very dry summers one of the units, 6,000 h.p., would need to be a spare. The complete installation for delivery on to the main transmission-lines is estimated to cost £438,654. This amount, which is equivalent to £18·3 per horse-power of plant capacity, though not quite so cheap as for some of the larger developments at Waikaremoana and on the Waikato in generating-cost, is quite a reasonable figure for a development of this size; and when, in particular, we consider that it is almost at the centre of gravity of a load which will in a very short time absorb the whole of the power available, the development becomes a particularly good one.

Compared with Coleridge, the capital cost per horse-power to deliver on to the transmission-line, if the complete development is put in, is less than at Coleridge at its present stage, though not quite so cheap as it will be in its ultimate stages. The running-cost per horse-power on account of the larger development will also be cheaper at Mangahao, while the average distance over which the power has to be transmitted is also less, and, though the cost of transmission per mile will be somewhat greater, there is no doubt but that at rates comparable with Coleridge the scheme would be paying all charges in a very short time.

Waikaremoana Development.

For the East Coast district Lake Waikaremoana is undoubtedly the most suitable source to develop, and from the hydraulic point of view is an exceptionally good development. In normal seasons the greater portion of the water of the lake leaks out through numerous underground channels, which unite some distance below the lake to form the Waikaretaheke River. During most of the past year the lake has also been overflowing directly into the river-channel, but this only occurs during very wet seasons. The lowest level of which we have record was in 1915, when the level was down 14 ft. below the overflow mark. With the water at this low level the flow in the river was considerably reduced, and it is calculated that a minimum flow of not more than 420 cubic feet per second can be relied on. The most suitable position for a power-house is on what is known as the Whakamarino Flat, above the junction of the Kahutangaroa and Waikaretaheke. For the first stage of development it is proposed to divert the Waikaretaheke through a short cutting into a small lake called Kaitawa, and from there pipe it to the power-house, 670 ft. below. This small lake has very little storage value, however, so that the amount of power to be obtained from here is limited to about 29,000 h.p. To carry out the scheme outlined herein more than that amount of power is required to be drawn from Waikaremoana, so that provision has been made for controlling the flow from the lake to provide for the varying demand during the day. Still more power can be obtained later by extending the pipes from Kaitawa to connect through the diversion tunnel directly to the lake, and by this means, and by sealing as far as possible the leaks as the water lowers, the power may ultimately be increased to provide a plant capacity of 136,000 h.p. This stage is not, however, required for the scheme outlined herein, where the power required from this source is estimated at a plant capacity of 40,000 h.p. The estimated cost of works necessary to deliver power on to the main transmission-line is £544,369, or £13·61 per horse-power. This unit-cost is somewhat higher than might otherwise be the case, owing to having to make provision for ultimately still larger developments. It is estimated that in the ultimate economical development to the full plant capacity of 136,000 h.p. this unit-cost would be reduced to about £9·4 per horse-power, or a total of £1,272,305.

The worst feature of the Waikaremoana scheme is the distance that has to be traversed through difficult country before getting any load. On the basis of this report—viz., $\frac{1}{5}$ h.p. per inhabitant of present population—there is only a load of 9,191 h.p. that is nearer to Waikaremoana than to either of the other schemes, whilst on the same basis there is a prospective load on Mangahao station of