

to cope with the heavy detritus, or the deposits may have been due to some abnormal increase in the quantity of sand brought down the river in more recent times, or probably to both causes combined. The idea which has been repeatedly put forward, that the bed of the river below Mercer can be brought back to its original depth through some system of groynes or other river-works, is, in our opinion, utterly fallacious. The river below Mercer has a summer fall to mean sea-level of only 4 in. to the mile, and no practicable scheme of training would result in producing an increased bottom velocity sufficient to provide the required scouring-effect.

The sand constantly rolling down the bed of the river is deposited at the foot of the delta, forming a sand-bank in Maioro Bay, which is gradually moving seawards. This is well shown on the plan forwarded herewith and recorded as M.D. 5354/E [not printed], on which is indicated approximately the relative positions of the end of the bank as surveyed in 1862 and in 1913. From this it appears that the toe of the delta has extended some 200 to 250 acres into the bay during the intervening years, and if it were not for the tidal scour in and out of the bay there is little doubt but that the bay would be rapidly filled in by sand from the river. It appears to be unquestionable that the process of shoaling is continuing at the present time, though at a very slow rate of progress. The tidal energy is largely dissipated in Maioro Bay and in the numerous delta-channels, with a consequent reduction in the scouring-effect upon the bed of the river as high as the head of the delta at Kaitangata, and owing to these conditions the tidal problem in this river is a very complex one.

The Waipa River junctions with the Waikato River at Ngaruawahia, but differs much from it in character. The drainage-area discharging into the Waipa, and the country through which it flows, are of a more stable and less easily eroded nature, and consequently there is a much less quantity of moving sand than in the Waikato. At times, however, there is a large quantity of fine silt carried down in suspension.

The Waipa has deep water for some 25 miles of its length, and, except for a few sand-bars and shoals in the upper portion, it is easily navigable for boats drawing 4 ft. 6 in. to 5 ft. as far up as Pirongia, a distance of about 35 miles by river above Ngaruawahia. The river-banks, which, generally speaking, are high, are in places badly overgrown with willows, of which the branches overhanging the stream fall into the river and choke it. In the early days of settlement this river was largely used for the transmission of goods up to Pirongia and even as far as Te Kuiti.

The principal creeks discharging into the Waikato River below Ngaruawahia are the Mangawara, the Onetea, the Whangape, the Opuatia, the Whangamarino, and the Mangatawhiri. There are also the Aka-aka, Awarua, and Otuaa Creeks which discharge into the northern channel through the delta and therefore practically into Maioro Bay.

The Mangawara Creek is navigable with a good depth of water in summer for about 4 miles of its length, above which, owing to its tortuous course, it becomes difficult for navigation even for small launches. This creek has already been dealt with in connection with a suggested canal to the Piako, utilizing its valley and waters.

The Onetea Creek has a length of only about $1\frac{1}{4}$ miles, and connects Waikare Lake, which has an area of about $13\frac{1}{2}$ square miles, with the Waikato River. It has a good depth of water, except where it junctions with the lake, but is badly choked by willow-growth on its banks.

The Whangape Creek is the outlet from the Whangape Lake to the Waikato, and has a length of about 2 miles. It has deep water up to within a short distance of the outlet from the lake, but is much choked through the growth of willows. At the western side of the lake the Awaroa Creek enters it, and is navigable with considerable difficulty in summer by light-draught launches only for a distance of about 10 miles. The lake itself has an area of some 2,800 acres, but is shallow and badly overgrown with weeds. There should be dredged a channel across its width of about $2\frac{1}{2}$ miles, which, with a moderate amount of dredging in the Whangape and Awaroa Creeks and clearing of willows, would give a satisfactory and valuable waterway for launch traffic. This work should be undertaken, as there is a considerable amount of settlement in this district which is almost wholly dependent on water carriage for goods to and from the railway at Rangiriri.