

noted, however, that on account of the frequent heavy and prolonged rainfalls from the West Coast the Waimakariri may be flooded several times in the year. It is in evidence that the Waimakariri during the past four years averaged two or three small floods each year.

Maximum Flood-discharge.—Owing to the absence of reliable records and sufficient data, and also to the fact that so much of the flood-waters escape over the river-banks and spread across country, we have found it difficult to arrive at even an approximate estimate of a big-flood discharge in the main river just below the Gorge. The cross-sections of the river (A to H) plan No. 3, with levels of a recent fairly big flood, show that in the main river-channel just above the Empire Bridge the discharge has been approximately 60,000 cubic feet per second; but, as this does not represent an exceptional flood, we are inclined to the opinion that, taking the drainage area and other factors into account, a big flood may be estimated as discharging at the Gorge not less than 80,000 cubic feet per second.

Whilst two floodings of Christchurch due to the overflow of the Waimakariri down the old river-channels are on record, there have been several occasions on which the flood-waters have risen dangerously near to the tops of the protective works erected to close up these old channels. From 4 in. to 5 in. between flood-level and top of stop-banks does not appear to provide much margin of safety, considering the interests at stake.

A reference to plan No. 5, showing the contour lines of ground-levels from 5 ft. to 100 ft., and also to plan No. 3, showing the flood-levels at cross-sections A to H, will make clear the ponding-action that takes place in the vicinity of the east end of Coutt's Island. This shows that while at cross-sections H, G, F, and E the flood-waters are bank high and possibly higher, below cross-section D the water is dammed up by the constricted outlet, until at Coutt's Bridge the flood-level is some 5 ft. to 6 ft. above the general ground-surface. This points to the necessity either for a greatly enlarged discharge-channel down to the estuary, or else for a flood-overflow channel of much shorter length with corresponding increase in gradient down to the sea.

SUMMARY OF CONCLUSIONS REGARDING PHYSICAL FEATURES, REGIMEN OF RIVER, FLOODS, ETC.

The following is a brief summary of your Commissioners' conclusions with regard to the above matters:—

- (a.) The main discharge of river was formerly in south branch; now down new north branch.
- (b.) The diversion is due partly to natural causes, but is mainly due to the cut made by the Provincial Government in 1863–64 resulting in the formation of the new north branch, assisted by groynes and the growth of shingle-banks on the south side.
- (c.) The so-called "old north branch" is blocked up at the southern end by a stop-bank, and now provides no relief for flood overflow; its only function is to carry discharge from Eyre and Rangiora swamp lands.
- (d.) Owing to the low banks on the north side it is possible for floods to cut into the back of groynes and other works now protecting the entrance to the old north branch. This certainly should be prevented.
- (e.) The south-branch bed has been building up for years past, greatly due to the south-bank groynes and also due to the diversion of the main stream north. The south-branch bed is badly overgrown with vegetation, and now carries little water.
- (f.) The new north branch is now in process of building up its bed, thus tending to increase the height of flood-level, with consequent danger of bank-overflow.
- (g.) The river-channels are considerably restricted in the neighbourhood of O'Callaghan's Road, Coutt's Bridge, and Empire Bridge. This in combination with the flattened river-slope leads to ponding-up of water at the east end of Coutt's Island.