

accounted for by there having been three large floods in May, July, and November of that year. It is pretty evident that the river at this point shoals up and scours out alternately, and that the mean bed-level fluctuates above and below an average of probably 52 ft. or 53 ft. above datum. The bed appears now to have reached a point of maximum shoaling, and will require a few big floods to scour it out. In any case this is the point at and below which, on account of tidal influence and the flattening of the hydraulic gradient, transient shoaling may be looked for, and for that reason the stop-banks for some distance up-stream and down-stream in this vicinity should be made correspondingly higher.

A reference to the longitudinal section of the Wairau River above the railway-bridge (Plan No. 6) shows a distinct shoaling and raising of the river-bed for some four miles above the bridge, the maximum being probably about 5 ft. The shingle appears to have accumulated in this reach, due to a restriction in the width of the channel for a length of about three miles. It is more than likely that this shingle-wave is of a permanent character and not likely either to increase or diminish, but at the same time its presence indicates the necessity of allowing the Wairau to carry all the flood-water it possibly can, in order to keep the bed-level as low as possible. That this may be effected the flood-discharge must be assisted in every possible way, more especially in the lower reaches or where the river gradient begins to flatten out, by cutting off balloon and other sharp bends such as those below the railway-bridge, which will probably have the effect of extending the present toe of the shingle a little further down-stream; also by keeping the channels and sides clear of all obstructions, and ensuring, with the assistance of sufficiently high stop-banks, an adequate cross-sectional area of channel for the safe passage of the biggest flood reasonably likely to occur.

Your Commissioners are not inclined to think that, taken as a whole and on the average, the quantity of shingle entering and travelling down the river is much greater now than in the past. Bearing in mind the fact that it is the normal flow all the year round that gradually reduces shingle to sand sufficiently fine to be carried out to sea, and that the effect of small floods and big freshes is merely to carry some of the surface shingle a short distance down-stream, your Commissioners are inclined to attribute any recent shoaling of the river-bed in places to the cumulative effect of a succession of small floods and big freshes during the past few years having brought down more than the normal quantity of shingle from the steeper to the flatter slopes of the river. We do not consider that this matter calls for any remedial measures in the shape of dredging, as such, even if practicable, would not have any permanent effect.

One great cause of permanent shoaling in many reaches of the river is the growth of gorse and other vegetation on the shingle-beds, as this may become so firmly established as to defy the scouring-action of floods, and induces the river to form new channels, and on this account the river-bed should be cleared of all willows, gorse, and other vegetation likely to secure a firm footing in the shingle-beds.

FLOODS AND FLOOD-DISCHARGES.

In this case, as in almost all cases your Commissioners have met with where local Boards have had control of river-works, no attempt has been made in the past to collect and note any reliable data as to heights, velocities, duration of the flood-peak, and other phenomena connected with floods. Consequently, your Commissioners have had some difficulty in arriving at any close approximation of what the flood-discharge in the different branches and tributaries of the Wairau has been in the past.

Wairau River floods: Floods in the Wairau may come from some of the tributaries, in which case they are comparatively small, or they may come from the main drainage area of the Wairau itself and from the melting of the snow on the ranges forming the watershed, in which case the floods may be large. Finally, floods may happen very rarely from a combination of both of these contributing factors, the result being what is known as an "old-man flood."

From what data is available we estimate that in the case of a big flood happening occasionally, and of a still larger one happening rarely, the quantity of