

SESSION II.
1921.
NEW ZEALAND.

ORARI RIVER

(REPORT OF RIVERS COMMISSION ON).

Presented to both Houses of the General Assembly by Command of His Excellency.

REPORT.

To His Excellency the Right Honourable John Rushworth, Viscount Jellicoe, Admiral of the Fleet, Knight Grand Cross of the Most Honourable Order of the Bath, Member of the Order of Merit, Knight Grand Cross of the Royal Victorian Order, Governor-General and Commander-in-Chief in and over His Majesty's Dominion of New Zealand and its Dependencies.

MAY IT PLEASE YOUR EXCELLENCY,—

The Governor-General's Commission, dated the 8th April, 1919, directed us to inquire into certain matters in respect of the Clutha, Orari, Rangitata, Waimakariri, Ashley, and Maerewhenua Rivers, and such other rivers as might be added thereto from time to time. The Governor-General's further Warrant, dated the 22nd July, 1919, added to the Commission the Waihi, Wairau, Waiau-uha, Taieri, and Aparima Rivers.

The time within which we were required to furnish our reports was extended by the Governor-General to the 7th June, 1920, further extended to the 7th December, 1920, and still further extended to the 7th March, 1921.

The present report deals only with the Orari River. The reports on the Clutha, Rangitata, Waimakariri, Ashley, Maerewhenua, Wairau, Waiau-uha, Taieri, and Aparima Rivers have already been presented, and the report on the Waihi River will be furnished shortly.

Your Excellency's Commission directed us, in respect of each river,—

- “(1.) To inquire into the cause or causes of the silting-up of the channel, the flooding of the adjacent lands by the said river, the erosion of its banks, and the damage to the surrounding country ;
- “(2.) To ascertain the nature and extent of the damage done to the lands adjacent to the said river, and what area of land is affected by such floods or erosion, or both, and whether it is practicable at reasonable expense to prevent such flooding or erosion, or both, either wholly or partially ;
- “(3.) To ascertain the best method of providing for the control of the said river and its tributaries so as to safeguard the lands affected, and to provide for the effective control and improvement of the said river and its banks ;

- “(4.) To ascertain the nature and extent of any drainage-works that may be required, and the best method of carrying out such works ;
- “(5.) (a.) To furnish estimates of the cost of such remedial measures as you may recommend should be taken for the effective control and improvement of the said river and its banks ;
- “(b.) To report what area or areas of land should be constituted a district in respect of which a rate may be levied to secure and pay the interest on and provide a fund for the repayment of any loan that may be raised to carry out any river-improvement works which you may recommend should be undertaken ;
- “(c.) To report your opinion as to what matters, if any, should be adjusted by legislation ; and
- “(d.) Generally, to report your opinion on all matters arising out of or touching the premises, including the question as to whether or not one or more competent authorities shall be appointed to control the whole or any portion of the said river, and what statutory powers should be possessed by such authority.”

Our Commission also required us to report separately in respect of each river.

INVESTIGATIONS MADE.

Sittings, Evidence, and Inspections.—After examining the various rivers in Otago upon which they were directed to report, your Commissioners arrived at Temuka on the 2nd July, 1919, and on the following day proceeded with their investigations in connection with the Orari River.

In company with Mr. J. E. McEnnis, Resident Engineer, Public Works Department, Christchurch, your Commissioners, on the 3rd July, inspected the Rangitata, Waihi, and Orari Rivers.

On the following day a sitting of the Commission was held in the Temuka Borough Council Chamber, when eleven witnesses were examined.

On the 11th July your Commissioners again inspected the Orari River from the sea-coast to the bridge above Geraldine, interviewing the settlers *en route* and examining the work that has already been done in the direction of clearing the river at Badham's Bridge and embanking at the Clandeboye Settlement. It was found that this settlement was in a rather precarious position at two points.

Your Commissioners also inspected the works erected on the south side of the river by the South Orari River Board, and could find no evidence of maintenance of these works, which were in a dilapidated condition.

PHYSICAL FEATURES.

The Orari River drains 220 square miles of country above the railway-bridge. The river possesses peculiar characteristics in that in normal times its flow becomes smaller as it leaves the hills and approaches the mouth, for a certain distance, and then increases slightly again. In regard to flow, during a large part of the year the river actually goes dry some distance below where it enters the plain, and the water reappears near the mouth in the form of springs. This is due to the shingly nature of the bed and the plains surrounding it. However, in time of high flood this characteristic is not apparent, as the shingle below, becoming charged with water, can absorb no more, and the flood-flow then proceeds uninterruptedly to the sea. The result of the first characteristic is that the bed becomes smaller over a considerable length, and therefore inadequate to carry the floods, which naturally become larger as they approach the sea, provided, of course, that the rainfall is general.

This river carries a fair amount of shingle, which is transported practically entirely during floods, and as the flood subsides bars of shingle are left at various points. (It is recorded that in 1902 a flood left a bar of shingle in the river-bed near Mr. G. A. M. Macdonald's Orari homestead higher than the level of the pad docks, but later freshes gradually reduced this.) The reduced flow is unable to move this shingle, and when the next flood occurs these bars of shingle become points of danger which may cause a rise in the flood-waters greater than any rise previously observed at that spot, even though the flood in question may not be so

great in volume as the previous one. No doubt the practice of burning off the natural vegetable covering on the hills, together with the burrowing of rabbits, has tended to augment the quantity of shingle entering the river since the advent of the white settler.

At the mouth the river is largely obstructed by a bar thrown up by the waves ; this, by damming up the flood-waters, tends to flood all the adjacent low-lying country. It is only relieved when floods burst through the bar and for a time enable the river to maintain an open channel.

HISTORY AND CONDITION OF EXISTING WORKS.

Old maps made when the Canterbury Development Company first explored the country show that the Orari flowed through a depression which can still be traced near the Geraldine Racecourse, and had no defined channel where it now flows below that point.

In 1871 the river overflowed its banks and threatened all the land lying to the south of its present course between the railway and the sea. During the following year the South Orari River District was constituted, and remedial measures were carried out, which up to the present have kept the river within its proper channel. Unfortunately, however, as previously mentioned, the Board has entirely neglected the work of maintenance.

In 1902 the river again overflowed its banks some miles higher up, near the bridge approaching Geraldine, and flowed into the Waihi and thence into the Haehaetemoana, flooding the Town of Temuka and the intervening country. This threatened district was constituted the Upper Orari River District in 1903, and protective works were constructed, the results of which have been satisfactory.

Other threatened spots about two miles above the railway have been protected, but with works which cannot be regarded as likely to safely withstand a heavy flood.

Works were constructed many years ago on the northern bank some miles above the railway-bridge, probably by the Geraldine County Council, though no proper record of this could be found. These works appear to have proved entirely successful.

Unfortunately, willows have been used extensively in connection with protective works, and have not been kept within proper control. The lopping of willows was done in such a way that branches were allowed to float down the river and take root wherever they might. This has resulted in the river-bed becoming choked, so that it is now in places in a shocking condition, and insufficient to carry the flood-waters. In a river with fine shingle and silt, willows allowed to run broadcast in this manner are particularly harmful, as they take root and increase so rapidly. As the shingle buried the stumps of the older trees small shoots have sprung up around them, so that now the willow-stumps with their offshoots cannot be pulled out without the most drastic means being adopted.

Unfortunately, the Government has leased the bed of the river for grazing, permitting the erection of fences across the river-beds, these fences being frequently constructed with willow posts and stakes, all of which grow. The presence of the willows, and the islands which they have formed, have caused the river to attack its natural banks, and have greatly widened the bed by this erosion. This has provided a still wider field for the growth of willows, and has brought about the deposit of more shingle.

The bridges at present crossing the river at Geraldine and at Orari (both road and railway) appear to provide sufficient waterway to pass any flood that need be expected.

FLOOD AND FLOOD-DISCHARGE.

Owing to the fact that neither the County Council nor either of the River Boards has any accurate data, your Commissioners have found it impossible to calculate the volume of the largest floods that have been experienced.

Evidence showed that heavy floods occurred in February, 1868 ; in 1892 ; December, 1902 ; and December, 1911. The flood of 1868 was probably the greatest that has ever been recorded, as, although there were then no willows or gorse in the river-bed, nor stop-banks erected, the flood-waters covered a large area of country. It is recorded that sheep from Rockapuka were deposited in the streets of Temuka.

None of the local authorities kept any figures (or, at any rate, they were unable to produce any) showing the amount of damage done by floods. Floods in this river are of very short duration and quickly subside.

It was stated in evidence that the river-bed at the Rolleston Bridge has risen 3 ft. 6 in., at Clandeboye considerably, and at the Orari traffic-bridge 3 ft. No absolute measurements, however, could be produced to substantiate these statements, although work which has had to be done to the road bridge at Orari appears to bear out the statement. The reverse, however, has occurred at the Geraldine Bridge, where, owing to the shortening of the bridge and the confining of the waters by stop-banks, the bed of the river has scoured deeper, no doubt depositing the scoured material further down.

REFERENCE NO. 1.

To inquire into the cause or causes of the silting-up of the channel, the flooding of the adjacent lands by the said river, the erosion of its banks, and the damage to the surrounding country.

As previously stated, the silting-up of the channel and the flooding of the adjacent lands is due primarily to the river naturally having low and ill-defined banks; secondly, to the growth of willows, gorse, and other exotic vegetation in the channel, thereby arresting the natural travel of the shingle, which shingle has no doubt increased in latter years as the result of accelerated denudation due to causes referred to above. The increased quantity of shingle, together with the willows, blocking up the natural channel, have forced the river to erode the banks in its efforts to maintain a channel sufficient for its flood-flow.

REFERENCE NO. 2.

To ascertain the nature and extent of the damage done to the lands adjacent to the said river, and what area of land is affected by such floods or erosion, or both, and whether it is practicable at reasonable expense to prevent such flooding or erosion, or both, either wholly or partially.

As previously stated, the absence of any proper records in the hands of the local authorities or individual settlers makes it impossible to estimate the extent of the damage done. Its nature is at least threefold: first, loss of land by erosion (area cannot be ascertained); secondly, crops and pasture are damaged by submersion by flood-waters, and a few stock lost by drowning; thirdly, metal is washed off the roads, and some damage is done to the railway.

The area flooded or likely to be flooded is approximately 30,000 acres.

Your Commissioners are of the opinion that it is possible to prevent both the flooding and the erosion at reasonable cost.

REFERENCE NO. 3.

To ascertain the best method of providing for the control of the said river and its tributaries so as to safeguard the lands affected, and to provide for the effective control and improvement of the said river and its banks.

Your Commissioners recommend the following remedial measures:—

(a.) Clear out a uniform channel through the gorse, willows, and other obstructions from the Upper Orari Bridge, near Geraldine, to the estuary. It will not be necessary to clear the whole width of the river-bed; in fact, the growth now existing at the sides can with advantage be left to assist in building up that portion of the bed, and gradually raising it above flood-mark and rendering it suitable for farming purposes.

(b.) When a channel through the gorse and willows has been cleared (and it must be understood that clearing involves more than the mere cutting of the trees—they must be poisoned and actually removed), any gaps existing between the willow plantations on each side must be filled up with fresh willows (which must be kept under control), and by gabion nets at special danger-spots. The rows of willows facing the stream must be wired together so as to prevent any one from drifting away if undermined, and so as to assist in catching debris flowing or being otherwise carried down the river.

(c.) Wherever the flood-levels are above the natural bank of the river, stop-banks must be erected where none exist, or existing stop-banks must be raised as required. The grade level of stop-banks to be aimed at should be not less than 2 ft. above the flood grade. These stop-banks need not be made along the edge of the cleared channel, as this would necessitate their being of considerable height; they can, however, be kept back on the higher available ground.

The width to be cleared, which is to be regarded as the minimum width within which the river can be reasonably controlled, is indicated on plan No. 1, and no stop-banks should encroach within this width, though, as before stated there is no particular advantage to be gained by moving the levees on to this alignment. Though floods appear to have been passed for many years through the road and railway bridges, the rise in floods in this locality appears to indicate that the width to which the river is confined is somewhat scant.

The present banks from the lower ends of Sections 12567 and 4019 are undoubtedly too close together, and it would be far better to face the position and move them back in order to leave an adequate channel, rather than to attempt, by raising very high levees, to keep the river within the extremely restricted limits now apparently aimed at by the landowners.

REFERENCE NO. 4.

To ascertain the nature and extent of any drainage-works that may be required, and the best method of carrying out such works.

The only drainage-works required are those in the Clandeboye Settlement, and these are not in any way rendered necessary as a direct result of the foregoing recommendations. Being of quite a minor nature, they need not be dealt with in this report; suffice it to say that your Commissioners found in some cases one settler unable to drain his land by reason of the fact that his neighbour lower down was not facing the position satisfactorily. A River Board with the powers also of a Drainage Board would soon rectify this matter.

REFERENCE NO. 5.

(a.) *To furnish estimates of the cost of such remedial measures as you may recommend should be taken for the effective control and improvement of the said river and its banks.*

The estimated cost of the remedial measures indicated in the foregoing recommendations is £6,000.

(b.) *To report what area or areas of land should be constituted a district in respect of which a rate may be levied to secure and pay the interest on and provide a fund for the repayment of any loan that may be raised to carry out any river-improvement works which you may recommend should be undertaken.*

The Geraldine County should be the district in respect of which a rate may be levied to secure and pay the interest on and provide a fund for the repayment of any loan that may be raised to carry out the river-improvement works recommended by your Commissioners.

As certain parts of the county will derive a direct and substantial benefit, those portions will, of course, be specially rated under the graduated system as laid down in the River Boards Act.

(c.) *To report your opinion as to what matters, if any, should be adjusted by legislation.*

Your Commissioners are of opinion that no legislation is necessary other than such as may be required to vest the control of the river-bed in the County Council, with power to sell or lease to adjacent owners such portions as are not required for the permanent channel, either after such portions have been reclaimed or in their present state.

(d.) *Generally, to report your opinion on all matters arising out of or touching the premises, including the question as to whether or not one or more competent authorities shall be appointed to control the whole or any portion of the said river, and what statutory powers should be possessed by such authority.*

This point is practically covered by our remarks under clause (b), wherein your Commissioners recommend that the whole of the river should be under the control of the Geraldine County Council, which should, for the purposes of this control, have the powers not only of a River Board, but also of a Drainage Board.

This our report, which has been unanimously adopted, we have the honour to respectfully submit for the consideration of Your Excellency, together with the transcript of the evidence taken by us in the course of our investigations, and the following plans (not printed) illustrating our report :—

Plan No. 1 : Plan of Orari River (scale, 10 chains to 1 in.) extending from the Geraldine Bridge to the sea.

Plan No. 2 : Longitudinal section, Geraldine Bridge to the sea, showing generalization of ground-lines, river-bed, flood-levels, existing stop-banks, and proposed new stop-banks. (Scales, 30 chains and 30 ft. to 1 in.)

Plan No. 3 : Lithograph showing the area flooded.

Given under our hands and seals this 5th day of March, 1921.

F. W. FURKERT, Chairman.
 ASHLEY J. HUNTER, } Members of
 F. C. HAY, } Commission.

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