



THE  
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(PROVINCE OF NELSON.)

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ALFRED GREENFIELD, Provincial Secretary.

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No. 19.

Superintendent's Office,  
Nelson, 11th July, 1871.

THE following Letter and Report are published for general information.

ALFRED GREENFIELD,  
Provincial Secretary.

Colonial Secretary's Office,  
Wellington, 1st July, 1871.

SIR,—I have the honor to enclose a copy of Mr. Blackett's Report, called for in compliance with the request contained in your Honor's telegram of 26th May, that that gentleman should be instructed to inspect the protective works at Westport, and give his opinion on others proposed.

Copies of the enclosures to Mr. Blackett's Report are already in your possession.

I have the honor to be, Sir,

Your obedient servant,

W. GISBORNE.

HIS HONOR THE SUPERINTENDENT, NELSON.

Public Works Office,  
Wellington, 28th June, 1871.

SIR,—In accordance with instructions received in

telegram of May 27th, I inspected, on my return from the Grey, the River Buller and sea-beach at Westport, and have now the honor to forward Report thereon.

As you have already been informed, the encroachments of the sea on the North Beach, during the last year or two, has rendered necessary the removal of a considerable portion of the town, and the inhabitants are in great anxiety lest further encroachments should destroy a still larger portion of it.

On my arrival at Westport, a deputation of the inhabitants explained to me the danger in which the town was considered to be, and also the various schemes for averting which, and for improving the bar and entrance to the river, had been considered and proposed.

These were as follows, viz:—

1st. To re-open, at a cost of £250, an old channel of the river on the South side, and behind Garden Island, the entrance to which, now partially closed by the action of the river, is about a mile above the town, in order that in floods a portion, say one fourth, of the body of the river, should be carried off by that channel, which, pointing nearly in a straight line to the harbor entrance, would have the effect of straightening

the outflow of the river, and give a greater depth of water on the bar.

2nd. To cut a new channel immediately below the town, across a very narrow part of the North Spit, so that the river, instead of pursuing, as at present, a tolerably regular curve to the sea, might flow nearly straight into it.

3rd. To cut a new channel across the North Spit, a little lower down the river, in a really straight line with the general course of the river, above the town into the sea.

4th. To erect artificial works on the tail-end of a Spit lying between the main channel of the river, and a second channel situated below Garden Island, for the purpose of driving the main body of the river in a straighter line to sea, thus assisting the work proposed in No. 1, the effect of both of which, it is thought, would be to cause the sea to deposit material on the North Beach, and the beach to resume, or partially resume, its former shape.

It will thus be seen that there are two main points for consideration, viz., 1st, the preservation of the town from further destruction, mainly to be accomplished indirectly by the means pointed out in Nos. 1 and 4; and, 2nd, the improvement of the entrance, deepening of the bar, and preservation of the river, as a safe and commodious Port for shipping.

Before proceeding to offer an opinion on the above proposals, I will briefly recapitulate the contents of three reports written on the subject of the Buller, and the encroachments of that river and the sea on the Town of Westport, viz. :—

1st. A Report from me, as Provincial Engineer, 1st December, 1868.

2nd. A Report from Mr. Balfour, as Marine Engineer, 11th February, 1869.

3rd. A second Report from me, 8th April, 1870.

In No. 1 Report the use of stone groins was strongly recommended for the purpose of arresting the rapid destruction of the river banks by floods, and works of this kind have been partially carried out by the Provincial Government of Nelson, viz., one large groin and two smaller groins, the latter not yet completed.

This plan, I may say, has been attended with complete success, the only influence now acting prejudicially on the river banks being that of a low swell and surf which rolls in from the sea for a certain distance up the river, gradually undermining the banks and causing them to fall in.

The completion of the smaller groins will, to a certain extent, arrest this action, which, however, may be entirely stopped by covering the banks between the groins with stones, and this may be done at a comparatively small cost.

In No. 2 Report, Mr. Balfour explains that he entirely agrees with the recommendations contained in No. 1, but advises as an addition that the channel behind Garden Island should be opened, at a cost of £2000, as a flood-water outlet, for the purpose of reducing the velocity of the water in the main channel during floods, and thus lessening the destructive scouring action.

In No. 3 Report, the damage done to Westport by the sea is described, and it is pointed out that the commencement of this damage, and the subsequent injurious effects on the town, were owing to the

removal by the inhabitants of an enormous mass of drift-wood collected by the sea, and embedded in the beach like a breastwork, which, being mixed with shingle and boulders, formed an almost impenetrable barrier against the force of the heaviest surf.

It is also explained how, at *that time*, the destruction of the beach might have been stayed by the use of wooden groins filled with stones and placed at a certain angle on the beach, and by the erection of a low breastwork constructed in the same manner. — Of these, *one* experimental groin of wood only was erected, and, while it stood, appeared likely to answer the purpose intended, but not being filled with stones was soon destroyed.

I now forward with this, as a record, copies of these Reports, and also plans A., B., C., D., showing the original channel, &c., of the river, and the alterations effected by the action of floods, and by that of the sea, with explanatory notes.

The plans have been prepared by Mr. Dobson, Provincial Engineer, who, during a residence of some years on the Coast, has carefully observed the changes of the river and the beach.

#### WORKS PROPOSED.

##### 1. To open the channel behind Garden Island.

I have already, by telegram, given an opinion on this work, and have declined to recommend it, on the ground that I considered it very doubtful if it would have the desired effect, and that it might do harm in another direction, for which the Government would be responsible. I will now offer some further remarks on this scheme.

The action of the river has, for some time past, been steadily to close up the entrance of this side channel by delivering into it heavy drift timber and large masses of heavy shingle and boulders; and this would lead us to infer that a constant expenditure would be necessary to keep the entrance open. This inference will be rendered plainer by a glance at the map, which shows that it is essentially and literally a side channel, not in the direction of the main flow of the river. It will also be seen that, from its size, it could never have carried off a very large proportion of the flood-water, and I may state also, on good evidence, that some eight or nine years ago this channel, except in floods, was dry from end to end, and that it was used constantly as a track by the early surveyors, all tending to show that its action must always have been very limited.

Further, it is possible that the success of the experiment might be too great, and that too large a body of water might be made to flow off in this direction to the detriment of the main channel, and the possible destruction of land on the south bank.

Again, supposing the exact desired amount of overflow to be attained, I consider its controlling action would not be so great as supposed, but that it would be dissipated in the wide expanse of water below the island, and influence, to a small extent, only the actual direction of the outflow of the river.

Again, whatever the amount of this effect might be, it would only be exerted during floods, as the entrance to the side channel would be dry or nearly so during the ordinary state of the river. This fact would lead us to seek for some more permanent

controlling power than the flood-water from this side channel.

That the opening of it would cause a deposit on the North Beach, is, I think, highly problematical, and a result, however much wished for, not to be depended on.

It will be borne in mind that Mr. Balfour recommended the opening of this channel, but it was for the purpose of *reducing* the velocity of the river in floods; and it will be seen that we have already provided, by the use of stone groins, against the destructive effects of the velocity, which may now be usefully employed in preserving the depth of the channel.

2. *To cut a new channel immediately below the town, across a very narrow part of the Spit.*

This proposal may, I think, be dismissed with very few remarks.

The Spit here is very narrow, the sea having reduced it to about a chain in width at high water. The channel would not be in the direction of the flow of the river, but nearly at right angles to it, and the action of both river and sea would be to fill up again any channel which might be cut in this place.

Any money spent on this would, I think, be thrown away.

3. *To cut a new channel across the North Spit, a little lower down, in a straight line with the general course of the river.*

This channel would be longer than that described in No. 2, and would be cut obliquely across the Spit.

There would be a slightly greater chance of keeping such a channel open than the above, but, supposing the experiment to be successful and a channel established, we should then have two mouths to the river, and it needs little argument to shew that, this being the case, the chances are that we should have less depth on the bar in each than were only one mouth existed; and the hope of the old mouth being entirely stopped up by the action of the sea is, I think, very small; the entrance no doubt would be shallowed, but the river would almost certainly seek the old exit in heavy floods, to the detriment of the newly formed channel.

There is the chance also of this experiment being too successful, and that the destruction of the lower part of the town, now sought to be avoided, would be hastened by such a process. I cannot recommend the adoption of this proposal.

4. *To erect artificial works on the tail of the Spit.*

This proposal is, I think, deserving of consideration, and might be placed in the list of works necessary to improve the bar, and preserve the harbor in a navigable state.

It would have the effect of deflecting the current in the main channel, and giving it, according to the form and position of the works, more or less a more northerly direction, which is to be desired.

It will now be necessary to refer to the plans of the river, where it will be seen that its course from a point about two miles from the sea, is that of a line nearly straight to commence with, but curving gradually more and more as it approaches the sea, the curvature tending southwards. The general plan of the river is very slightly altered, since the place was first frequented, the principal changes

being an increase in the curvature opposite the Town of Westport, caused by the destruction of the river, banks to the extent of about three chains, the advance of the North Spit, near its extremity towards the South Spit, which has been washed away for a distance of four or five chains.

The actual outflow of the river over the bar, is not only increased in width, but points in a direction considerably more to the southward than before. The depth of the water on the bar is much less than during former years, but very little alteration in this respect has taken place during the last twelve months.

It will readily be understood, however, that these changes, although very small and insignificant, compared with the size and volume of the river, and the magnitude of the forces at work, should appear to be of the greatest importance, and to affect materially the interest of those living on or near the spot.

On the North beach, however, the changes have been much greater; and, although, had proper measures been taken at a much earlier period, its destruction might have been partially arrested, I cannot now recommend that any works shall be undertaken on the beach itself, for the purpose of protecting the town, being of opinion that any expenditure for this purpose must necessarily be very large, and if contributed in part by the inhabitants themselves as proposed, their proportions would be better expended in procuring safer sites, and in removing their properties. There is a prospect, also, that the damage has already reached its greatest extent, as the sea in places has commenced to throw up large quantities of boulders, where formally was sand, forming a bank which is growing in extent seawards. The present movement may, in fact, be but one of those oscillations of the coast line which have evidently occurred, and not unfrequently, in former times.

It now only remains to suggest such measures as may tend to the improvement of the river, and render it permanently safe and commodious.

In the first place, I may state that any attempts to straighten its course will be attended with no advantage, the natural flow of all shingle bearing rivers for obvious reasons, is in a series of curves and in the present case, we may, I think, ensure the permanence of deep water on or near the outer line of the curve, by protecting that line. This will be best done with stones and rocks as above described, and the greater irregularities of the curved line should be adjusted.

As we approach the sea, it will be necessary, in order to prevent the wide dispersion of the current on the bar, to stop its tendency to flow southwards, and to concentrate its force by artificial works to be erected on the South Spit.

These works should be curved in the opposite direction, so as to turn the current more to the North, and give it force to deepen the passage over the bar. Works of a substantial character will be required here, as they will at times be subject to the action of the surf.

To assist the action of the above, I should adopt the recommendation in proposal No. 4, and erect artificial works on the tail of the Spit.

The order in which these works should be carried out, if not undertaken all at once, would be as follows, viz:—

- 1. Curved groin on South Spit, which may cost when complete. Say 20 chains at £500 a chain ... .. £10,000 0 0

This is a work which may be done gradually, by devoting a portion only of this sum to it annually. It is marked A on plans.

- 2. Stone training wall across shallow bay, on North bank where old snag lies, about 5 chains below Stanley Wharf. This is to regulate the curve. 7 chains, at £53 a chain ... .. £371 0 0

This is marked B on plans.

- 3. Training wall or groin on tail of Spit. Say 17 chains, at £53 a chain ... .. £901 0 0

It is marked C on plans.

- 4. Protection of river banks from action of surf, by covering them with stones between the stone groins. Say 17 chains, at £25 a chain ... .. £425 0 0

Marked D on plans.

- 5. Same process carried downwards, along north bank of river, to preserve curve, to be done gradually. Say 15½ chains, at £53 a chain... .. £821 10 0

Marked E on plans.

I have made Mr. Dobson, Provincial Engineer, acquainted with the substance of this Report, which, I may state, he fully concurs.

I am indebted to him for the preparation of the plans, and for much valuable evidence and information bearing on the subject, to which he has evidently given much careful observation.

I have, &c.,

JOHN BLACKETT,  
Acting Engineer-in-Chief.