

The breakwater now under construction is known as the "authorised" or "river" scheme, the alternative design prepared by the Board's Engineer being the "Stony Point" scheme. There are also Sir John Coode's, Mr. Rees's, and a comprehensive design for a deep-water harbour of refuge by the Board's Engineer. Another scheme is also shown upon the plan attached to Sir John Coode's report, and called Mr. Drummond's, but of which I have no particulars, and therefore do not refer to it again. Sir John Coode's design, dated December, 1880, bears a strong resemblance to that prepared by him for Timaru. It took the form of a partly-enclosed area open towards the Waikanae Beach, and connected to the shore by a high-level iron viaduct, 1,410ft. in length, the estimated cost being £246,400. The area enclosed is about six acres, with a depth at entrance by present soundings of 21½ft. at low-water spring tides. His design evidently took this form in order to avoid intercepting the sand-bearing current that he was led to believe set along the beach from the eastward. The Stony Point scheme was prepared with the view of obtaining greater depth of water (25ft.) at a shorter distance from shore, and at the same time affording more room for vessels to round up under the shelter of the work during south-east gales. It also kept well clear of the Turanganui River, and afforded greater area for reclamation purposes. Mr. Rees's scheme had much the same objects in view, but was some distance farther to the eastward. It ran more directly into a depth of 30ft. of water. The "harbour of refuge" was still farther to the eastward: it was formed by two converging piers like that built at Madras, with 42ft. of water at the entrance, and enclosing an area of about fifty acres. The authorised scheme was prepared by the Board's Engineer after careful inquiry into the merits of the different proposals, and with regard to the funds at his disposal, and was approved by the Government with a slight alteration in its direction.

Upon comparing the soundings taken for Sir John Coode with those more recently taken by the Harbour Engineer, I find a considerable difference, denoting either that the sandy bottom is changing or that there had been carelessness in taking them originally—the three-fathom line agrees tolerably well, but not the others. Captain Kennedy, an old resident, asserts that the bay has shoaled 4ft. since 1861, and that there is less water on the middle bank than formerly. This evidence, however, requires support.

I attach a sketch-plan on which are shown the various schemes suggested, with an abstract of particulars concerning them in a condensed form.

I will hereafter give further particulars of those designs which have been or may yet be considered suitable to the requirements of the port, and will now proceed to report under the different heads indicated in my letter of instructions.

1. "*The Present and Probable Future Effect of the Proposed Works.*"

I understand this to mean the works as authorised by Government.

Their construction is now in proper train, all preliminary works being completed. A railway, 3¼ miles in length, has been laid down to Kaiti Beach, from whence stone is hauled for concrete. Cement-sheds, block-yard, stone-crushers, and workshops have been erected, and which are most complete and suitable, the arrangement being all that could be desired. A wharf and viaduct of timber-work, capable of carrying 30-ton blocks, has been constructed, extending from the block-yard on the riverbank to the root of the breakwater, a distance of 1,580ft. The concrete pier has been carried out for a length of 215ft., commencing 100ft. above low water or the Bush Beacon. There are also 486 concrete blocks stacked in the yard, ready for insertion in the work as required. The plant imported for the work seems very complete, and of most suitable design. Its arrangement is also judicious, and calculated to enable the Board to prosecute the work in a rapid and economical manner.

So far as the work has been extended, the effect has been to cause the ebb-tide to clear the inner face of sand and silt, the rock being clean to low-water mark. In all probability this will continue for some distance as the work progresses, a result that was looked for by the Engineer when designing it. It is doubtful, however, how far out this effect will be felt, as upon reaching deeper water the force of the tidal current will be much reduced. Upon the western bank of the river at its mouth a sandspit has shown a tendency to encroach upon the channel at its narrowest part. This only occurs for a short distance below high-water mark, and is evidently caused by the flood-tide flowing into the river parallel with the Waikanae Beach, whereas formerly it had a wider and more direct entrance, the current not being concentrated in the same direction. It is maintained by some that this action has carried a considerable quantity of sand into and some distance up the river, where the water is said to be shoaling. I think that this latter result can be in a great measure traced to the long absence of floods, which when they occur will probably restore its normal condition. It is also feared that the western spit will extend seawards, keeping pace with the construction of the pier. I do not think that there is any proof of this so far, as for some distance above low water this spit consists of papa rock, the sand in question merely working eastwards along the beach and into the river by the united action of the waves and flood-tide. The pier is not yet far enough advanced to afford shelter to this portion of the beach from the southerly swell: when this is the case this action will probably cease.

There is no evidence of the sand travelling permanently in either direction. The beach has a very stable appearance, and in my opinion can only come from the prevailing heaviest seas working it along the Kaiti Beach, which for nearly the whole distance to the Island consists of a papa reef. Since the commencement of the work sand has collected in the angle formed between the viaduct and Maori Point, and which has been for some time used in the construction of blocks; the quantity is, however, insignificant.

Judging of the probable effect of the works upon the river, I think that the bar will improve. The river-channel, after being scoured out by a flood, will also retain a more permanent character. A great deal might be done to improve the channel at the entrance by a small expenditure in removing the rocks now existing in mid-channel, and by blasting away the papa reef on the eastern