

position shown for it on the design, relatively to the work already finished, then the east breakwater was commenced, and carried out some distance, when it was finally decided to leave 700ft. in the width of entrance instead of 600ft. The increased width had then, perforce, to be left wholly on the east side, which threw the east training-wall rather far into the river. On this plan will be seen the advance made by the shingle-bank, between Wakefield Street and Disraeli Street, towards the centre of the river, which bank has increased somewhat in height since the work was designed, likewise the erosion of the banks of the river which has taken place on the west side within the same period. I may say that, looking at the line of the training-wall on the ground, where it was staked temporarily, it appeared all that could be desired at its lower extremities, but, owing to the advance of the above-mentioned shingle-bank, and the receding of the opposite shore, it might be considered desirable to alter the line of the work, say, between Wakefield Street and the Buller Bridge more towards the west. This is independent of the question of whether or not it would be wise to widen the space between the training-walls now laid down as 500ft.

Drawing No. 2 is a section of the river which it is thought may assist in the consideration of these questions. It shows the improvement in depth to date which has taken place without the assistance of the training-banks. In connection with this, the average velocity of the current in the river at cross-section BB at low water has been calculated from the surface-velocities, which were carefully measured and found to be 1.4ft. per second, and the surface-velocity at the wharves was also measured during low-water spring-tides, after rain, which raised the river 2in. or 3in., and found to be 6.09ft. per second. These velocities were measured with the idea that they would supply a guide to the nature of the current which shipping moving about at the berthages have to encounter. At present at low-water spring-tides the current is found quite swift enough, and a very little rain renders it too swift to move large vessels about safely. It is hoped also that this information may be of use in considering the effect of a possible alteration in the impingement of the current on the line of the wharves, due to an altered curve on the training-bank.

Drawing No. 3 consists of nine cross-sections of the river taken radially to the curves of the training-bank, with the form to which the future channel would have to be approximated as nearly as possible, shown thereon. Of these cross-sections AA and GG have been taken, so that they fall over cross-sections taken on the occasion of the first survey.

In the proposed channel from the Buller Bridge downwards there remains about 1,000,000 cubic yards of material to be removed by scouring and dredging, and, though amending the line of the training-wall may not perhaps lessen this quantity much, it has been thought right to draw attention to this point, as it is feared extensive scouring and dredging operations may have a deleterious effect on the deep water at the entrance.

The range of tide has of late been carefully observed for a lengthened period, and found to be 9ft. 6in. at springs and 5ft. 6in. at neaps.

I trust the data comprehended in this memorandum and the drawings attached are sufficiently explicit to present the position in contradistinction to the state of affairs twelve years ago clearly.

Will Sir John Coode kindly supply data for a short cable, saying whether walls should remain unaltered, or, if not, indicating what he recommends to such extent as would admit of preliminary works being commenced, pending the receipt of Sir John Coode's plan.

September, 1891.

J. A. WILSON, Jun.,

Assoc. M.Inst.C.E., Engineer, Westport Harbour Works.

Enclosure 2 in No 11.

Report by Mr C. Napier Bell on the Progress and Condition of the Westport Harbour Works.

SIR,—

10th October, 1891.

In accordance with instructions received from you through your Secretary, I have the honour to report on the general progress and condition of the works as executed to date.

Accompanied by your Engineer, I inspected the breakwaters, the quarries, the railway, the plant and material, the Orawaiti overflow, and the relief-channel.

Condition of West Breakwater.—The western breakwater has now reached the length indicated on the original design of Sir John Coode. Here the normal depth of water is about 25ft. at low water, but the sea breaking against the stonework makes and maintains a pit or trench all round the end of the work, the depth of which is about 44ft. below low-water spring-tide. This phenomenon has accompanied the breakwater almost from the commencement, with the result that the foundations of the structure are placed at a great depth below the river-channel or the ordinary sea-bottom, and a great extra quantity of stone has been swallowed up in this pit. The breakwater was carried on for a length of about 2,700ft. as a tip bank, and was then carried on from staging to its present end.

Staging damaged in a Gale.—The staging had to be placed in the extra deep water mentioned above, consequently it was unusually high and slender, but, with the exception of being damaged on one occasion by a heavy gale, the construction has been very successfully carried out, and the breakwater stands now in good condition, without damage or deformation by the waves, the average slope of the stonework being about 2 to 1. The end is now being finished off with heavy stone of exceptionally hard and sound granite, and when finished the breakwater will stand any weather. Sir John Coode intended that concrete blocks should be placed on the end and for some 350ft. along the sides. Of course there is no necessity for this where stones of from five to twenty-five tons can be had for the same purpose, and your Engineer will see that stones of this size are placed to protect the ends and sides.

Maintenance.—From the evidence of your Engineer it appears that in places the slopes are liable to slip down, this is caused apparently by the waves excavating the sand on which the stones lie. This source of damage will not go very far, as the stones get too deep down to be further acted