

nothing should be done to sacrifice present convenience, or to incur an expenditure which will not result in the greatest possible benefit at the earliest possible date, the necessity for future extensions should be kept prominently in view.

The harbour works now to be undertaken ought therefore to be so arranged that they will admit of additions hereafter, as and when required; and so that incongruities, or the necessity for removing any portions of the executed works may be avoided. In this way only can a complete and comprehensive scheme be ultimately produced.

The merits and demerits of the designs by Messrs. Balfour and Doyne for works both at the "Sugar Loaves" site, and opposite to the Town of New Plymouth, have been clearly pointed out by Messrs. Carruthers and Blackett in their report of 27th November, 1875; it is unnecessary, therefore, to enter upon them here.

In the same report Messrs Carruthers and Blackett fully and fairly describe the relative advantages and disadvantages of the "Sugar Loaves" site and the "Town" site in the following terms. They say: "This (the 'Sugar Loaves') site we recommend as the best on all accounts, except its distance from the town, which will be about two miles, and the consequent necessity of the extension of the railway. On every other ground we are of opinion that there can be no comparison between this and the town site. It is close to the quarry, and the work could therefore be carried on more expeditiously. A much greater length of quay-room, with depth of water sufficient for large vessels, would be available; the holding-ground is better; the access to the harbour would be safe in westerly weather; and, finally, the whole of the works would be protected by the natural barrier formed by the Sugar Loaves, which would break the swell of the westerly and north-westerly seas—those being the heaviest to which the coast is exposed.

Concurring in these views, I have confined my attention to that part of the bay which lies between Mikoti (Mikotahi) and Moturoa on the west.

Accompanying this report are two illustrative drawings—namely: No. 1, a general plan of the roadstead, the foreshores, and the features of the adjoining country, extending from the Town of New Plymouth to the coastline outside Paritutu, reduced from the complete special survey made by Mr. E. C. Jones in 1877; No. 2 is a plan on a large scale, also prepared from Mr. Jones's survey, extending from Moon's Reef on the east, to Paritutu on the west. The respective proposals are shown by distinguishing colours on each of these drawings, as hereinafter explained.

The roadstead at New Plymouth is at present quite open for rather more than one-fourth of the compass, *i.e.*, from W. by S. to N. The heaviest seas are said to proceed from about W. and W.S.W. When from the southward of this quarter the seas on this part of the coast are stated to be not nearly so heavy as from the northward of that point up to W.N.W. With winds from the northward of this the seas are never very heavy. The bottom of the bay generally consists of by no means good holding-ground, the sand being in patches, with boulder stones occurring frequently. This, although prejudicial to the site as a roadstead for anchorage, will not constitute a serious objection when the area is sheltered from the heavy westerly seas.

Bearing in mind the view I have previously expressed as to the paramount importance of providing the largest possible amount of present accommodation for the expenditure of the money now available, I have framed and had under consideration the two designs marked *A* and *B* respectively on Drawing No. 2. Design *A* is indicated by red colour and red lines, whilst Design *B* is shown in brown. Upon this drawing the full extent of the harbour projected by Messrs. Carruthers and Blackett is also denoted by green dotted lines and green colour.

It is proposed to construct, in the first instance, a west breakwater or mole, commencing at the salient point on the foreshore to the southward of Mikotahi, marked *A* on the drawing, near high-water level, and extending thence in a N.E. by N. $\frac{1}{2}$ N. direction for a length of 1,315 feet. The whole work would then trend to the eastward by a curve of 1,500 feet radius for a further length of 700 feet, terminating with a straight arm or kant 690 feet long, pointing N.E. by E. The total length of the breakwater to be executed under this section of the design would thus be 2,705 feet, and the line would correspond with that proposed by Messrs. Carruthers and Blackett, and approved in Council on 27th February, 1878.

The mode of construction I should recommend for the breakwater above described is shown upon the cross section annexed to this report. A work of this type is well adapted for the utilization of local materials and labour, and would necessitate only a very limited amount of diving operations. It also offers advantages over every other system for the successful employment of convicts. Seeing that it has been, and I presume still is, proposed to use convict labour to a large extent in the execution of harbour works at New Plymouth, it is essential that the mode of construction to be adopted should be of the simplest possible character, and dependent to the smallest extent upon the aid of skilled operatives. The breakwater should therefore be formed of rubble-stone, quarried at Paritutu, about 700 yards south-west of the starting-point, and conveyed thence over a self-acting incline, and deposited as *pierres perdues* from four lines of railway, carried upon a suitable timber staging of the type shown on the cross section. The materials would be distributed and consolidated by the waves until the normal angle of repose has been produced on the seaward face. This would be found to correspond very closely with the profile of the mole shown on the section. A protection parapet or bank of stone would be tipped along the crest of the breakwater, and faced on the south or harbour side by a substantial dry rubble-wall, skirting a roadway of 30 feet in width formed throughout the entire length of the work. On this road, and flush with its surface, there would be two permanent lines of railway of the colonial gauge.

Upon the annexed section the profile of the rubble-mound, as proposed by Messrs. Carruthers and Blackett, is shown by green-dotted lines. It will be seen that there is a general similarity between the two sets of slopes. There are two matters in connection with the proposed mode of construction which require a few words of explanation: First, with regard to the permanence of the mound and its sufficiency to resist the impact of the heaviest seas; and, secondly, as to the necessity for depositing the material from a timber staging. Upon the first of these heads, I may remark, after having