

water, although the works themselves would necessarily be carried out in deep water, and would therefore be very costly

Town Site.—The second site which was recommended by them for adoption near the town has many drawbacks, but these would to a certain extent be counterbalanced by its proximity to the present town, supposing its size to be limited to the requirements of coasting-steamers and small craft alone. It would, however, be quite unsuitable as a harbour of refuge, and could only be entered by foreign-going ships during fine weather

The area actually sheltered by the works would consist almost entirely of water of a less depth than 4 fathoms, so that a sailing-ship drawing, say 18ft. to 20ft. could not, if a stiff breeze were blowing, be brought up in time to prevent its running aground.

To remedy this obvious fault Messrs. Balfour and Doyne recommended a future extension of the work—namely, the lengthening of the western mole to a total of 83 chains. This would only partially remedy the defect, whilst the same length of mole at the site we recommend below would give a first-class capacious harbour capable of accommodating the largest vessels, and in any number likely to arrive.

Another objection to the town site is the badness of the holding-ground, the bottom consisting of patches of very rough and jagged rock, slightly covered in places with sand. The existence of these rocks practically lessens the available depth of water, and their positions being uncertain would render them dangerous to any vessel drawing nearly the amount of water shown by the soundings.

It will be seen also by reference to the plan that the river Huatoki empties itself into the space embraced by the harbour-works, and all sand, silt, and *débris* would thus be delivered within the harbour-area, and ultimately have an injurious effect.

The entrance is also in very close proximity to shoal-water to eastward, and, as strong westerly winds prevail throughout the year, the entering or leaving the harbour would generally be attended with some risk.

For the above reasons, and on account of its distance from the only available quarry, and its great cost if carried out in its entirety, we do not recommend the adoption of the town site.

Sites now proposed.—A better harbour than that last described could be constructed at about the same cost at the old whaling-station near the Sugarloaves. This 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 of 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 Sugarloaves, which would break the swell of the westerly and north-westerly seas, these being the heaviest to which the coast is exposed.

This harbour would be sufficient for all local requirements. Seeing, however, that national as well as local interests must be considered, we do not hesitate to recommend a larger harbour at the same site, suitable for a harbour of refuge as well as for local trade. This could be obtained by placing the mole further to seaward in deeper water, and increasing its length by about 10 chains.

Proposed Works.—Town sites. These would consist of a mole extending from the shore for a distance of 60 chains into 5 fathoms at low water. Whaling-station site (small harbour). A similar mole of 70 chains long would be required at this site, extending into 5 fathoms at low water. Whaling-station site (large harbour). Here a similar mole of 80 chains will be required, extending into 7 fathoms at low water.

At all the above sites it is possible that an eastern mole will also be found necessary, although we are of opinion that the western mole in each case will be sufficient, but there is a greater probability that it will be required at the town site than at the others. The moles would consist of random rubble, thrown in with an inner slope, varying from $1\frac{1}{2}$ to 1 to 2 to 1, and an outer slope, such as the nature of the material may demand, varying according to the sizes of the rocks obtainable, averaging 5 to 1, to a depth of 6ft. below low water, and $1\frac{1}{2}$ to 1 below that depth.

The eastern mole, if found necessary, might be constructed with an inner slope of $1\frac{1}{2}$ to 1, and an outer slope of 2 to 1. The top of the western mole would be 20ft. above low water, and 30ft. wide on top, with a parapet of concrete 6ft. high on the outer edge.

On account of the cost we have not provided for vertical inner walls to act as quays. It will be cheaper to erect quay-accommodation hereafter of wood or iron, from time to time, as occasion may require.

Quarry.—The material to be used in the construction of the moles would be procured from the landward Sugarloaf (Paretutu), which consists of vertical cliffs of hard volcanic rock from 200ft. to 300ft. high, their base being at an elevation of about 200ft. above sea-level. The material appears to be admirably adapted for the purpose, and in sufficient quantity. It is probable that it may be quarried in such large blocks that steeper slopes to the moles than we have estimated for may be found workable. The loose stones on the beach might to a certain extent be used in the works, but the quantity is not sufficient to reckon as a principal source of supply. The material will be brought down direct to the work by self-acting inclines should either of the whaling-station sites be adopted. Should the town site be adopted, haulage by locomotives for two miles and a half will be necessary.

Costs Areas, and Quay-accommodation. In the subjoined table are shown the respective costs, areas, and lengths available for quay-room in the three harbours under report. It will be seen that the harbour at the town site would cost, if completely carried out as proposed by Messrs. Balfour and Doyne, £738,000. The large harbour at the whaling-station site would cost only £550,000, although it would be a very much better harbour, enclosing more than double the area, and with four times the quay-accommodation suitable for large vessels.