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PARLIAMENT OF TASMANIA.

ENTRANCE TO MACQUARIE HARBOUR:

REPORT BY C. NAPIER BELL, M. INST. C.E.

Presented to both Houses of Parliament by His Excellency's Command.

REPORT ON ENTRANCE TO MACQUARIE HARBOUR.

By C. Napier Bell, *M. Inst. C.E.*

April, 1890.

Sir,

I came to Strahan on the 21st April, and at once proceeded to inspect the entrance and the Bar. I also went up the Gordon River and ascertained as nearly as I could the influence of the tides at the upper end of the harbour.

From information furnished me by Mr. Bennett, the Harbour Master, and my own observations, I ascertained that the tides at sea have a small range of from 18 inches at neaps to 3 feet at springs. In calm weather when the rivers are low the ordinary range of tide at Strahan is about 8 inches, and at the head of the harbour 6 inches. From the great size of the harbour this slight range of tide gives an enormous volume of water passing in and out over the bar.

Any wind is liable to disturb the tides and raise the level of the water inside the harbour independently of tidal action, and at sea strong winds and high seas on shore raise the level of the sea on the coast to the extent of completely masking the effect of the tides. From these disturbing causes the regularity of flood and ebb in the harbour is frequently destroyed, and the tide may run into the harbour for a whole day or longer, and out of it similarly; with floods in the rivers the flow is continually out, and a strong wind into the entrance may raise the water at Strahan 3 feet 6 inches above ordinary level.

When I visited the entrance there was spring tide, and the rivers were very low. I found a powerful current running out on the ebb-tide, and a strong inflow with flood tide; I noticed that the ebb current was stronger, and lasted much longer than the flood.

The western shore of the entrance is a ridge of low hills of quartzite rock, and the currents from the harbour hug the irregular line of the rocky shore in very deep channels. The eastern shore is all sand, and it extends from the north beach, and bends round into the harbour in the form of a great peninsula of high sand hills covered with dense bush. The tongue of this peninsula projecting towards the entrance is all bare sand which blows about with every wind, and vast quantities are blown into the harbour with N.W. winds.

At the time of my visit, with a slight swell from the W.S.W., I found the currents of the sea close to the breakers to be flowing towards the N., and as the prevailing winds are S.W. the usual set of current along the sea-shore will be towards the N. There are frequent gales and long periods of rough weather from N.W., and at such times the shore-currents may set to the southward. These shore-currents, caused by the direction of the waves on the beach, convey the sand of the sea shore with them.

From an inspection of the chart it appears evident that this great and deep harbour has been blocked at its entrance by the travel of the sands from the north beach into it, where they have formed extensive shoals through which the navigation is by channels which have been marked by beacons. These shoals extend for about five miles from the entrance into the wide expanse of the harbour, and, after passing thence, the whole harbour, which is 20 miles long and 5 wide, is from 30 to 120 feet deep; it is therefore obvious that the sand-banks near the entrance could not have come from the creeks and rivers discharging into the harbour.

When the tide flows from the sea into the harbour the water is filled with sand in suspension, which, being raised by the surf on the beach and spits, is carried into the harbour, where it settles on the sand-banks; the ebb tide carries the sand out again, but the harbour, being still water, retains

more than is carried out; and it appears that this is the manner in which these shoals of sand have been formed. That the growth of the sand-banks must be exceedingly slow is inferred from the fact that little or no difference can be detected in the form or extent of the banks, nor the depth of the channels or bar, since the survey of 1820.

The entrance between the rocky shore on the west and the sandy point on the east is about 3000 feet wide, but a small rocky island called Entrance Island stands in this passage at a distance of about 300 feet from the west side. The west channel has a depth of 72 feet; the east is shallow, varying from nine feet to nothing at the eastern beach. The water in flood and ebb flows through both channels, but far the greater quantity through the western one. The bar is about 4000 feet outside of Entrance Island, and a channel to it is bounded by sand-spits on either side with 5 to 7 feet of water on them.

I found 8 feet 6 inches of water on the bar at low-water spring tides, but when the rivers have more water in them there is generally about two feet more water than this. The bar is composed of fine sand, and looking at the bottom I saw that waves of 3½ feet high caused a disturbance below which raised the sand in clouds.

The bar is not very long, and close outside of it the sea deepens to five fathoms, increasing to 11 at a mile and a-half from the bar. In rough weather the sea breaks a long way outside the bar, so that it is thus sheltered from the worst seas.

The inner channel from Entrance Island to the deep water of the harbour winds among the sand-banks with generally 18 feet of water, but there are a few places with only 12 and 15 feet (all depth quoted being at low-water spring tides), and these places are capable of improvement by training walls, as shown on the plans herewith. To get, however, more than 18 feet through these channels would require more extensive works than I have contemplated in my estimate.

From the light movable sands and powerful currents which prevail near the bar it is capable of being deepened to a very considerable extent; and if the currents were confined by breakwaters there is no apparent obstacle to obtaining a depth of over 25 feet.

It has been suggested that the depth on the bar might be improved by dredging or by dragging a rake over it. I consider such operations as useless for any permanent object: and the temporary effect is doubtful, that is to say, a considerable expense will certainly be incurred, but the gain will be transitory and uncertain. The bar being considered as the balance of the forces in operation, *i.e.*, of the sea on one side and the tidal currents on the other, nothing will alter it unless a change of conditions is brought about; the usual method being to confine the tidal currents between breakwaters, so as to bring a heavy scour to bear on the bar.

The breakwaters shown on this plan have a width of 20 chains between the ends, but they splay out towards the shore with the object of reducing the waves which enter between the ends. They are formed of rubble stone in the form of a mound or embankment, with heavy rock on the slopes to protect them from the force of the waves, and the larger the rock placed on the slopes the steeper they will stand, and the more safe the structure will be. The rock at the Heads appears of the best quality; but before undertaking this work a quarry should be opened, and the suitability of the rock for getting a fair proportion of large stone should be tested by exploding a trial tunnel in it.

The east breakwater is shown to end in 9 feet of water, and it is in such a position that it can be extended if required in the future. This breakwater would prevent the sand of the north beach and spit from being carried into the harbour. The west breakwater would similarly protect the entrance from the sands on the west spit; and the two will so contract and direct the strong currents flowing in and out that the sand on the bar will be washed to sea, and must be driven by the north-west waves behind the east breakwater and on to the beach.

To straighten and improve the channel from the entrance up to the deep water of the open harbour and secure 18 feet of water, certain training walls are shown. Opposite Round Point a straight channel half a mile long must be cut through the shoal, and the present crooked channel partially blocked up by the walls, as shown. A very little dredging would establish the new channel across the shoal, as there is at present a channel of about 8 feet deep in the direction shown on plan as to be dredged. The existing channel between Mount Wellington and Round Point is, I consider, too crooked for long vessels, and has only 12 feet of water or less.

To be able to get stone for the east breakwater it would be necessary to erect a temporary bridge over the entrance channel, as there is no stone to be had on the east shore. This bridge would require a swing opening for the passage of vessels, the swing opening to have a span of 80 feet, and constructed in timber in a temporary manner on piles in the channel. When the work is completed the piles in the navigable part of the channel to be drawn out, and the superstructure of the bridge removed throughout.

To prevent the bare sand of the eastern point from blowing into the harbour, it would be advisable to plant the sandy point with some binding grass to secure the sand from blowing about.

The approximate estimate for the works as shown on the plan would be as follows:—

East and West Breakwater—Design completed.	£
East and west breakwater	98,415
Training walls	19,278
Dredging	4968
Bridge	8305
Railway rails, plant, buildings, cranes, &c., after resale	18,270
	£149,236

NOTE.—If the construction of west breakwater were delayed until the completion of the east one the above sum for railway and plant would be about £4000 less.

For present requirements it might be sufficient to construct the east breakwater only, and the training wall on the east side of Entrance Island. This would confine the currents over the bar between the breakwater and the west spit, and prevent them from spreading out over the great expanse of the east spit. The effect would be a deepening of the bar, which might be quite sufficient for the trade of the port for some years to come.

The approximate cost of this would be—	£
East breakwater	61,990
High water training wall	3730
Bridge, as above	8305
Railway and plant after resale	14,325
	£88,350

Before any works are undertaken it will be necessary to survey the entrance and lay down the islands with accuracy. No plan at present exists which is not merely the old Admiralty survey of 1820 enlarged; and to enlarge a small chart is a most inaccurate process. I had to do this myself, as I had no time to make a re-survey of the locality, but the plan so produced cannot be relied on, except in a general way.

I have the honor to be,
Sir,
Your most obedient Servant,

C. NAPIER BELL, *M. Inst. C.E.*

To the Honorable the Minister of Lands and Works.

WILLIAM THOMAS STRUTT,
GOVERNMENT PRINTER, TASMANIA.

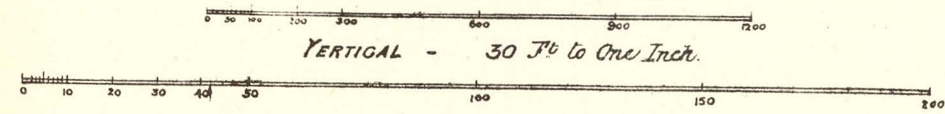
MACQUARIE HARBOUR

Plan attached to Mr. C. Napier Bell's report ~ April 1890.

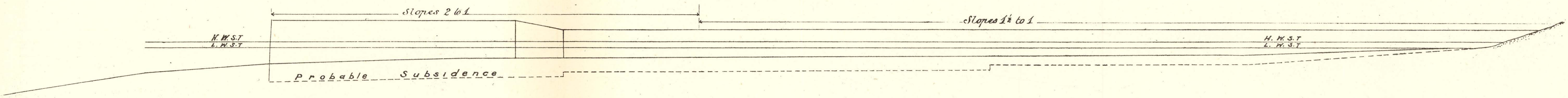
SCALES

HORIZONTAL - 300 Ft. to One Inch

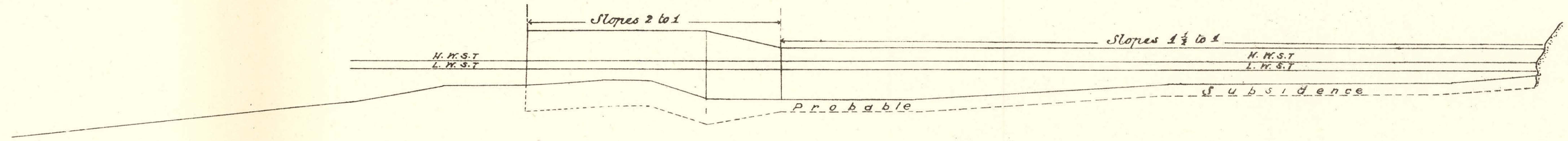
VERTICAL - 30 Ft. to One Inch



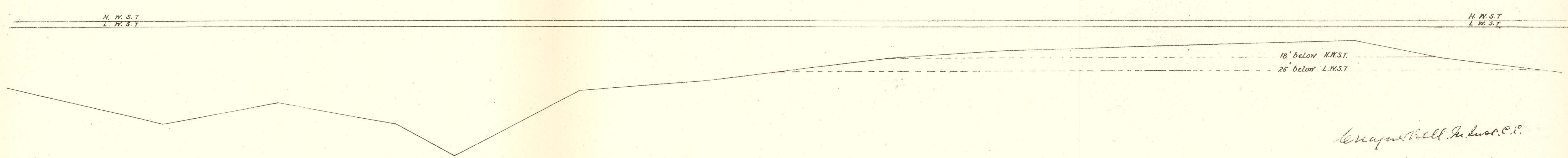
SECTION OF EAST BREAKWATER



SECTION OF WEST BREAKWATER



SECTION ALONG CHANNEL ACROSS THE BAR

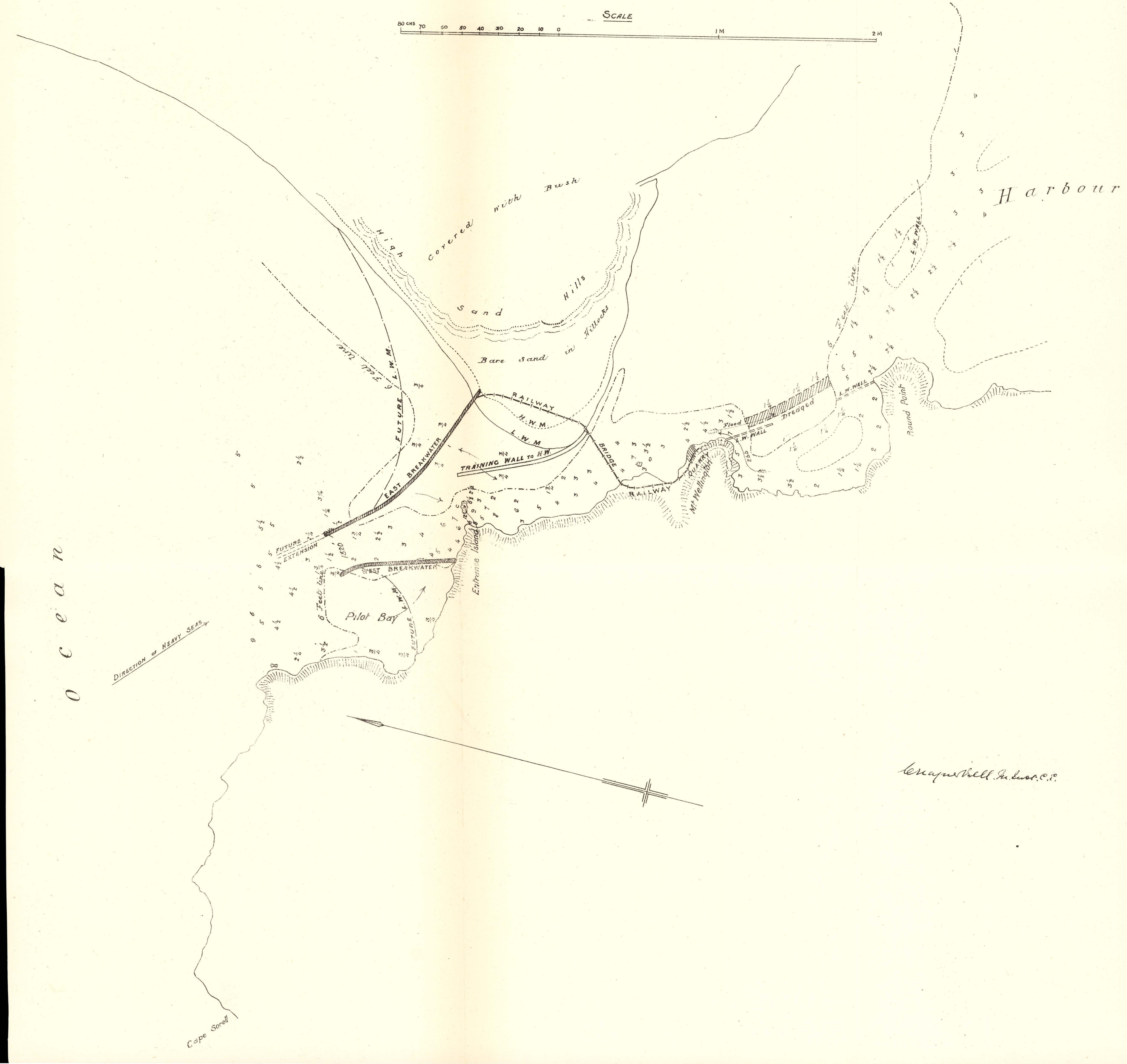


C. Napier Bell M. Inst. C.E.

PLAN

ENTRANCE TO MACQUARIE HARBOUR

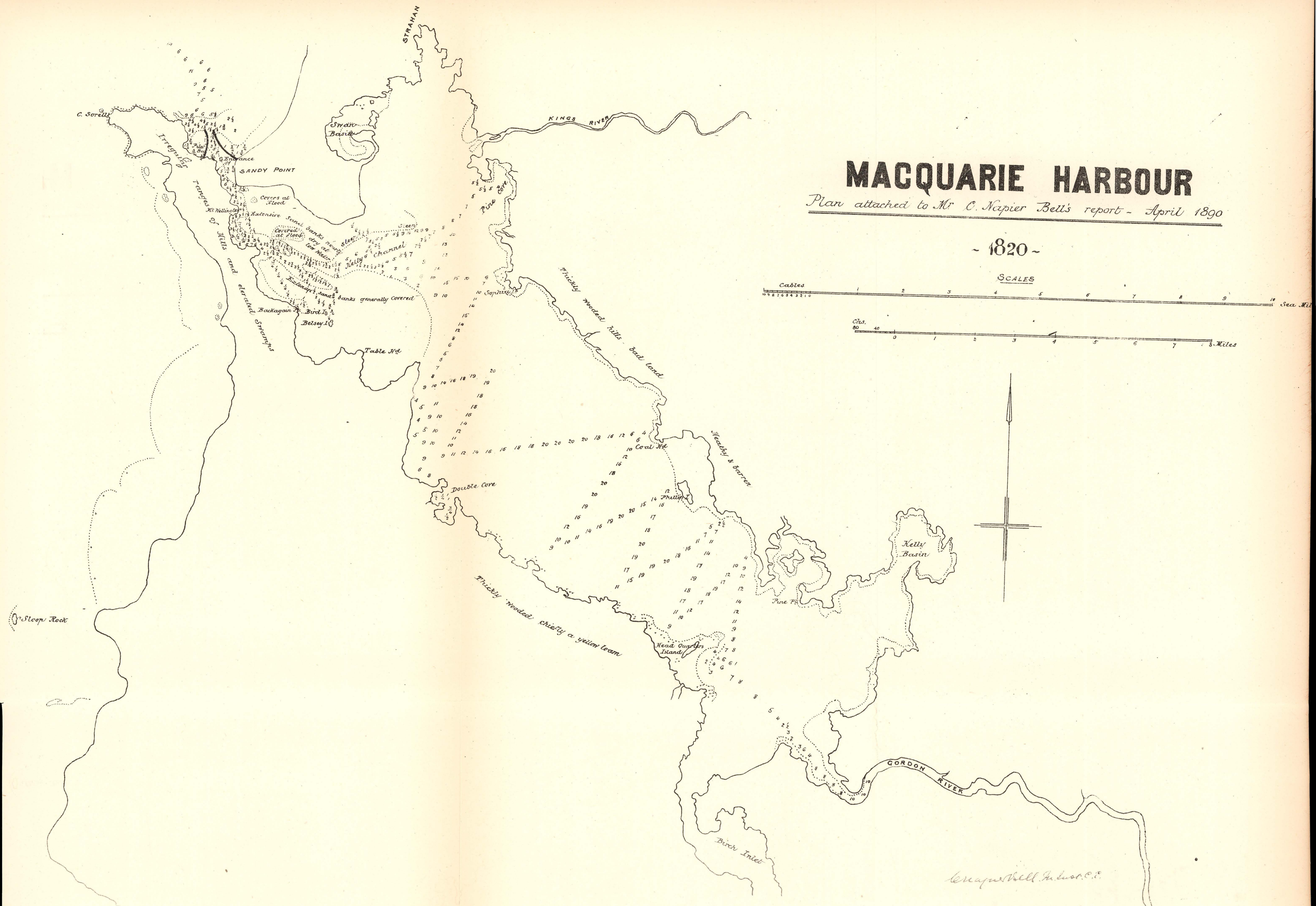
Attached to Mr C. Napier Bell's report - April 1890.



MACQUARIE HARBOUR

Plan attached to Mr C. Napier Bell's report – April 1890

~ 1820 ~



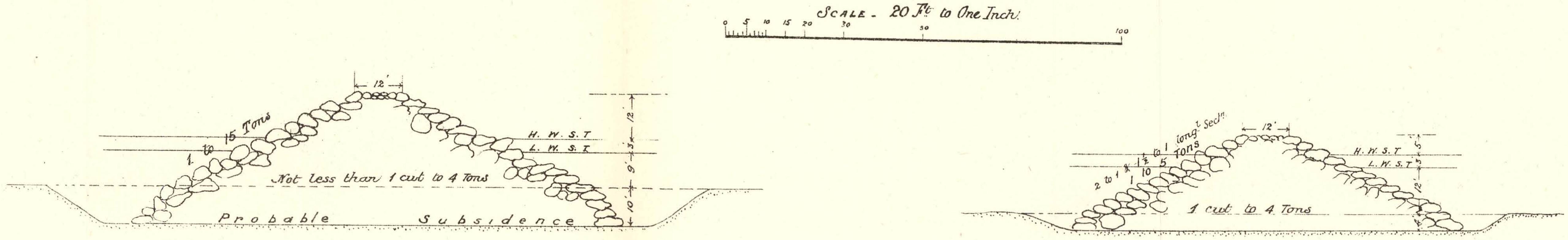
SCALES
Cables
Sea Miles
Chs.
Miles
C. Sorell
Irregular ranges of hills and elevated swamps
Entrance
SANDY POINT
Swan Basin
STRAHAN
KINGS RIVER
Covers at flood
Extensive sand banks nearly dry at low water
Covered at flood
Kelly's Channel
banks generally covered
Backagain Pt
Bird Is
Betsey I.
Table Hd
Pine Cove
Sophia Pt
Thickly wooded hills bad land
Coal Hd
Double Cove
Phillip I.
Heathy & barren
Kelly Basin
Pine Pt
Thickly wooded chiefly a yellow loam
Head Quarters Island
GORDON RIVER
Birch Inlet
Sloop Rock

MACQUARIE HARBOUR

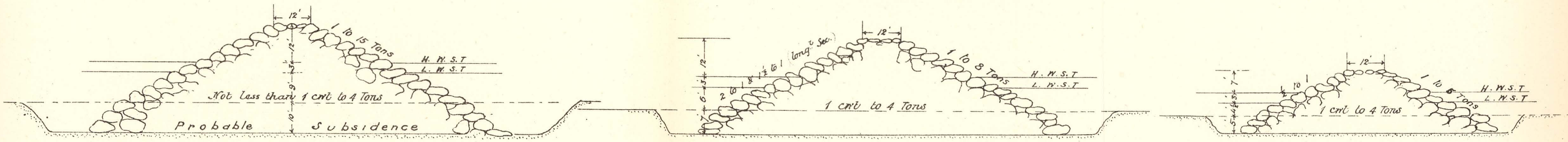
Plan attached to Mr C. Napier Bell's report, April 1890

WEST BREAKWATER

Scale - 20 Ft to One Inch



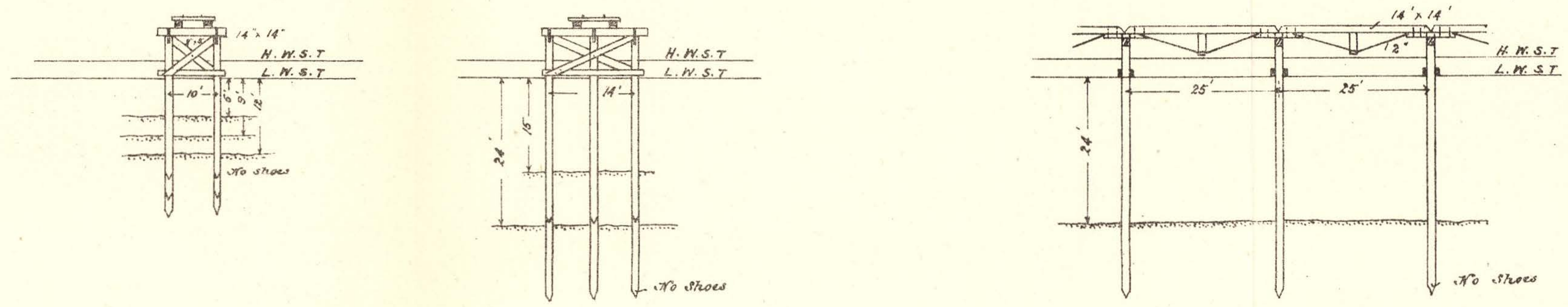
EAST BREAKWATER



BRIDGE OVER HARBOUR

Scale - 20 Ft to One Inch

In 6 feet to 12 feet of Water — In 15 Ft to 24 Ft of Water



C. Napier Bell M. Inst. C.E.