

- (1) பக்கங்களின் எண்ணிக்கை 16 + 1 Map.
 (2) புதுக்கித் திருப்பிய நாள் 5/89
 (3) ஆதாரங்குறிப்பவர் சுருக்கொப்பம் low

தமிழ்நாடு ஆவணக் காப்பகம்.

(17)

தமிழ்நாடு அரசு

P. W. D. துறை

அரசாணை எண். மு. கோப்புத் தாள் எண்.	1737	அச்சகம் பலவகை
நாள் :	1 - 7 - 1889	198

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மடிக்கவோ கண்டபடி கையாளவோ கூடாது

(8+1) 9 Sheets
 ஆவண கா-1-18,000-15-6-87.

1737

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

READ—the following paper:—

Despatch from the Right Honorable Lord CROSS, Her Majesty's Secretary of State for India, to His Excellency the Right Honorable the Governor in Council, Fort St. George, dated India office, London, 23rd May 1889, No. 7, Public Works.

I have received your Excellency's Public Works letter No. 7, dated 2nd March 1889, reporting the proceedings taken by your Government in connection with my Public Works despatch No. 2, dated 24th January 1889.

2. I now forward, for your Excellency's consideration, copy of a preliminary report * which has been drawn up by Sir Alexander Rendel, K.C.I.E., stating his views with regard to the reconstruction of

* Dated 16th April 1889.

Madras Harbour and the position of the entrance.

3. It will be seen that Sir Alexander Rendel considers that greater precautions should be taken to strengthen the whole structure, and suggests important modifications in the method of completing the works. He further expresses an opinion in favor of retaining the eastern entrance, and of providing dock accommodation and wharfage inside, or in extension of, the present harbour. His report will no doubt receive the most careful consideration from your Government, who should communicate their views on the important recommendations made in it to the Government of India, who will then address me on the subject. It should be understood that the question of Sir A. Rendel's visiting Madras will be taken up hereafter, and that, so far as his present suggestions are accepted, further detailed instructions will be drawn up in due course.

ENCLOSURE.

From Sir ALEXANDER RENDEL, K.C.I.E., to Sir JULAND DANVERS, K.C.S.I., dated 8, Great George Street, Westminster, S.W., 16th April 1889.

I have read and considered the papers on the subject of Madras Harbour forwarded to me with your memorandum of the 27th March, and beg to make the following observations upon them.

2. The papers sent to me comprise a despatch from the Government of Madras to the Secretary of State, dated 2nd March 1889, forwarding correspondence and an Order, dated 2nd March 1889, which seems to be the result of the correspondence. Para. 4 of this order to which you specially direct my attention is as follows: "The Government approve of the Board's proposal to continue the extension of the north pier, sanctioned by the Secretary of State, with 28 feet of wavebreaker protection only for the present, but on no account are wavebreaker blocks to be put down on the north pier at the place where the north pier would have to be taken up, should Mr. Parkes' proposals be carried out."

3. The sanctioned section for the eastern faces of both north and south breakwaters appears to be a wall formed of large concrete blocks laid diagonally on a rough rubble substructure at the level of 20 feet below low water, and carried up to 15 feet above low water, or 12 feet above

high water, its bottom width being 28 feet and its top width 24 feet. This wall is protected from wave action by concrete blocks, weighing about 30 tons each, thrown into the sea in front of it to a section measuring roughly 40 feet along the high-water line, whence they are assumed to fall naturally at a slope of 1 vertical to $1\frac{1}{4}$ horizontal down to the rubble substructure. The surface of the substructure inside the wall is also covered at its foot with large bags of concrete to prevent the disturbance of the rubble and the consequent movement of the wall.

4. This section was apparently that fixed upon by the committee of 1883, modified in some respects subsequently by Mr. Parkes. It may be presumed that it was adopted by the committee in consequence of a desire to interfere with the original plan of the breakwaters in the least possible degree. I say so because I find that one member of the committee, Sir J. Hawkshaw, has constructed the Marmagoa breakwater on a section measuring 34 feet wide at the bottom and 30 feet wide at the top, and that another member, Sir J. Coode, has constructed the Colombo breakwater to a section measuring 36 feet at the bottom and 34 feet at the top, and I can find no breakwater section, bearing in mind that it is not monolithic, so slight as that adopted at Madras. I also find that the amount of wavebreaker at Marmagoa is very small, and that at Colombo it is entirely absent, being replaced at Colombo by a layer of concrete in large bags laid on the top of the rubble deposit, similar to that proposed for the inside of the Madras breakwaters. It may therefore, I think, be fairly surmised that the section advised by the committee was not the one which they thought the best that could be devised, but the one which they thought best under the general circumstances of the case.

5. In my opinion, a wall of this class, which depends for its existence on aid derived from something else, is an unsatisfactory structure. I should like to see the present section increased to that employed at Colombo, and, with such a section, I think that a wavebreaker measuring 10 or 15 feet on the high-water line would be found sufficient. The wavebreaker in that case would in fact be more a protector of the rubble substructure than of the wall, and it is a question whether, instead of throwing in the wavebreaker blocks at random, they should not be simply laid in orderly rows at the foot of the wall. This would be more in accordance with both the Colombo and the Marmagoa plans, and with that which, after a costly experience, has been found to give satisfactory results at the Tyne piers. If the present plan be adhered to, it would be well, I think, to fill in the vacant spaces between the wavebreaker blocks with rubble stone.

6. I attach the greatest importance to a solid concrete capping on the top of the pier. I observe that in the sanctioned plan it begins at the level of 6 feet above high water and is only 6 feet thick. I do not know what height of wave may be expected in Madras; but I do know that a thicker capping aided by a heavy masonry parapet was blown up at Wick, and I think it highly desirable, as well for its own sake as for that of the blocks below it, which it materially helps to keep in place, that it should be of a greater thickness. I do not see why it should not be commenced at about the level of high water. The wet concrete about that level might perhaps require some temporary protection; but this, at any rate in some seasons of the year, could be readily supplied. Many engineers, and myself amongst the number, have used wet concrete in breakwaters under worse circumstances than those which are encountered at Madras. If the capping cannot be commenced nearer the line of high water, it should, I think, be carried higher than 12 feet above high water in the form of a wide and lofty parapet. It should be remembered that in England these cappings commence near the level of low water, this being possible wherever the range of tide is material, and that thus a deep capping is obtained without raising the work very high above high water.

7. In respect to cost, although I have not gone into the question, for I am only dealing with the first consideration, security, still I doubt if the suggestions I have made would add to it if adopted in a very serious degree.

8. The heads of the breakwaters are apparently to be built to a much stronger section than the rest of the work, stronger even than I have suggested. They are also to be founded at a lower level. Both these modifications I think wise; but, before the heads are commenced, I should hope that some such plan as that adopted at Colombo, of iron caissons, will be considered. The entrance is now to be so narrow that an accident to the heads might seriously interfere with the access to the harbour, and the more nearly monolithic they can be made the less the risk of accident to them will be, and the greater the safety of the lighthouse which must be built on one at least of them.

9. Having made these remarks, I have now to say upon the first section of para. 4 of the Government Order that, inasmuch as the section of the wall is less than practice in other places justifies, it is in my opinion undesirable that the wavebreaker should be reduced from a length of 40 feet to a length of 28 feet, but I would rather see the wall strengthened from a top width of 24 feet to a top width of 34 feet, in which case I think the wavebreaker might be reduced to a high-water width of from 10 to 15 feet, or better still, replaced by blocks or bags of concrete laid in regular layers at the foot of the wall. I assume that the blocks will weigh not less than 30 tons, and should like them heavier if the tides by which they are set are of sufficient strength.

10. In respect to the second section of para. 4, if I understand it rightly, it means that a part of the north breakwater is not to be protected by a wavebreaker at all until the position of

the entrance is finally determined by experiment. If this be the meaning of the paragraph, then we must consider if the wall is strong enough alone to stand an exceptionally heavy gale. However temporary may be the existence of the wall, it must plainly from the first be made to a section that will stand under the worst possible circumstances. It seems to be supposed that the wall, as now designed, will stand under the worst circumstances without the aid of the wavebreaker. I confess that I have doubts on the subject, and should like to see the wavebreaker constructed, *pari passu*, with the wall.

11. This brings me to the vexed question of the position of the entrance; and here it appears to me that, so long as the question of its ultimate position remains undetermined, there will be vacillations and delays, and perhaps mistakes ending in disasters, and that it is highly desirable to set the question at rest as soon as possible. For my part, I cannot believe that the science of marine engineering is in so low a condition that a point of this kind can only be determined by an experiment which contemplates the possibility of our having to resort to the costly process of taking up several hundred feet of breakwater. And I feel it so necessary that the question should be settled at the earliest possible moment once and for ever, that, at the risk of being thought too ready to express an opinion upon it, I do not hesitate to say that, in my judgment, the eastern entrance as at present designed is a proper one, is a better one than any alternative which has yet been proposed, and is the best which, under present circumstances, can be devised.

12. To make a harbour secure at the expense of its accessibility, which to my mind is what the best of the north-east entrances yet proposed would do, is a worse fault than to make it accessible at the expense of its security, because we can as a rule improve the security by internal works, and we cannot improve the accessibility except by costly alterations which will diminish the security.

13. The simple fact, in my judgment, is that the present scheme for a harbour at Madras will make no harbour worth the name at all. What it does make is a satisfactory entrance to a harbour yet to be designed within it.

14. A harbour, it seems to me, is of little value to Madras unless it provides a quay wall alongside which ships may lie as in a dock, and take in or discharge their cargoes in perfect quiet and security, and there seems no difficulty in providing such a quayage at a cost which the result would fully justify. But, be the cost what it may, it seems to me that Madras is worth a safe and commodious harbour.

15. The type of harbour to which Madras belongs is very much that of Whitehaven, a copy of the chart of which I append to this report. Many years ago I was Consulting Engineer to this harbour, and I know it well. We have here an outer harbour, forming an approach, and nothing but an approach, to two inner harbours, each so enclosed by quays that ships lie undisturbed within them, with a space between them opening directly on to the outer harbour, and forming a beaching ground for ships and waves. It would be easy to devise a similar scheme for Madras, which would give it, say, 60 acres of enclosed dock (gates of course are not required), 9,000 feet lineal of wharfage, and 40 acres of quay space, enough to make it a first-class port for a very large trade. Or, if it be preferred, the adjacent shores outside the harbour might be utilised for the purpose, and of course a combination of both ideas is possible. I claim no priority in suggesting either plan. Mr. Parkes has, I believe, roughed out the latter idea, Mr. Thorowgood, the former, quite independently of me. But I may say, as a corroboration of their views more than anything else, that the first of the two schemes I have now suggested I broached when the harbour was first proposed; and I may add that, if it be adopted, the entrance might be kept at the width originally given to it of 500 feet, which is by no means more than it should be.

16. I would remark, in conclusion, that I have no exact information as to the quantity of cement employed in making the concrete and concrete blocks. I refer to the point here because my experience leads me to think that there has been a tendency on the part of engineers of late years to use too small a proportion of cement, the result of which has been some serious failures. The importance of making blocks as nearly water-tight as possible is now greatly increased by the discovery lately made that at least some Portland cements are, as at present made, slowly soluble in sea-water, which deposits its magnesia in the concrete, taking up in place of it the lime of the cement. So long, however, as the sea-water cannot readily penetrate the concrete, and the exhausted water cannot therefore be rapidly replaced by fresh supplies, that is to say, so long as the action of the sea is confined to the surface of the concrete, the dissolving action of sea-water may be neglected. But it is evidently of great importance that the concrete should be as water-tight as possible, and for this purpose the quantity of sand, and, as a consequence, the quantity of cement, employed must be ample. I suggest as a proper proportion three measures of broken stone or gravel to two of sand and one of cement, to which, after the mixture of the rest, one measure of large rough rubble may be added. But the subject is one for experiment with the sand and stone actually employed.

17. I am afraid that it may be considered that I have treated my instructions somewhat more broadly, and consequently at greater length than they actually required. My apology for so doing is that I have thought that it might be convenient to the authorities in India that, having

been appointed Consulting Engineer to the harbour, I should let them know as early as possible the general drift of my views on breakwater construction in general, and on Madras Harbour in particular; but I claim the privilege of modifying my proposals if on a fuller acquaintance with my subject I see reason to do so.

P.S.—The Colombo breakwater, like the Madras, is founded on a rubble substructure and generally 20 feet below low water, and is carried up to 12 feet above high water, with a concrete capping about 6 feet thick. The tidal range is trifling. The Marmagoa breakwater is founded on a rubble construction 18 feet below low water, and carried up to 7 feet above high water, the tidal range being 7 feet.—A.M.R.

ORDER—dated 1st July 1889, No. 1737 W., Public Works.

Communicated, with reference to G.O., No. 622 W., dated 2nd March 1889, to the Harbour Trust Board for an early expression of their views.

(True Extract.)

Captain, R.E.,
Under-Secy. to Govt., P.W.D.

To the Chairman, Harbour Trust Board, with plan.
„ Marine Department.

Exd. J. Henrious.
Spare Copies

1737

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of {1889} Madras.

PUBLIC WORKS.

Dated July, 1st.

Recd.

Encl.

G.O., 1st July 1889, No. 1737 W.

JULY.

Madras Harbour

Despatch from the Secretary of State for India communicating preliminary report by Sir Alexander Rendel, K.C.I.E., with regard to the reconstruction of the — and the position of the entrance, and desiring that the views of the Government may be reported to the Government of India, communicated to the Harbour Trust Board for expression of their views.

775

1737

10

India Office,
London, 23rd May 1889.

Public Works,
No. 7.

To His Excellency The Right Honourable The Governor
in Council, Fort St. George.

MY LORD,

*Madras Harbour: reconstruction works
and position of the entrance.*

* Dated 16th April 1889.

I have received your Excellency's Public Works Letter, No. 7, dated 2nd March 1889, reporting the proceedings taken by your Government in connection with my Public Works Despatch, No. 2, dated 24th January 1889.

2. I now forward, for your Excellency's consideration, copy of a preliminary report* which has been drawn up by Sir Alexander Rendel, K.C.I.E., stating his views with regard to the reconstruction of Madras Harbour, and the position of the entrance.

3. It will be seen that Sir Alexander Rendel considers that greater precautions should be taken to strengthen the whole structure, and suggests important modifications in the method of completing the works. He further expresses an opinion in favour of retaining the eastern entrance, and of providing dock accommodation and wharfage inside, or in extension of, the present harbour. His report will no doubt receive the most careful consideration from your Government, who should communicate their views on the important recommendations made in it to the Government of India, who will then address me on the subject. It should be understood that the question of Sir A. Rendel's visiting Madras will be taken up hereafter, and that, so far as his present suggestions are accepted, further detailed instructions will be drawn up in due course.

I have the honour to be,

My Lord,

Your Lordship's most obedient humble Servant,

18437. I. 1148.

A. [Signature]

ENCLOSURE.

Sir,

S, Great George Street, Westminster, S.W.,
16th April 1889.

Madras Harbour.

I have read and considered the papers on the subject of Madras Harbour forwarded to me with your memorandum of the 27th March, and beg to make the following observations upon them.

The papers sent to me comprise a Despatch from the Government of Madras to the Secretary of State, dated 2nd March 1889, forwarding correspondence and an Order, dated 2nd March 1889, which seems to be the result of the correspondence. Paragraph 4 of this Order to which you specially direct my attention is as follows:—"The Government approve of the Board's proposal to continue the extension of the north pier, sanctioned by the Secretary of State, with 28 feet of wave-breaker protection only for the present, but on no account are wave-breaker blocks to be put down on the north pier at the place where the north pier would have to be taken up, should Mr. Parkes' proposals be carried out."

The sanctioned section for the eastern faces of both north and south breakwaters appears to be a wall formed of large concrete blocks laid diagonally on a rough rubble substructure at the level of 20 feet below low water, and carried up to 15 feet above low water, or 12 feet above high water, its bottom width being 28 feet and its top width 24 feet. This wall is protected from wave action by concrete blocks, weighing about 30 tons each, thrown into the sea in front of it to a section measuring roughly 40 feet along the high-water line, whence they are assumed to fall naturally at a slope of 1 vertical to 1½ horizontal down to the rubble substructure. The surface of the substructure inside the wall is also covered at its foot with large bags of concrete to prevent the disturbance of the rubble and the consequent movement of the wall.

This section was apparently that fixed upon by the Committee of 1883, modified in some respects subsequently by Mr. Parkes. It may be presumed that it was adopted by the Committee in consequence of a desire to interfere with the original plan of the breakwaters in the least possible degree. I say so, because I find that one member of the Committee, Sir J. Hawkshaw, has constructed the Marimagao breakwater on a section measuring 34 feet wide at the bottom and 30 feet wide at the top, and that another member, Sir J. Coode, has constructed the Colombo breakwater to a section measuring 36 feet at the bottom and 34 feet at the top, and I can find no breakwater section, bearing in mind that it is not monolithic, so slight as that adopted at Madras. I also find that the amount of wave-breaker at Marimagao is very small, and that at Colombo it is entirely absent, being replaced at Colombo by a layer of concrete in large bags laid on the top of the rubble deposit, similar to that proposed for the inside of the Madras breakwaters. It may therefore, I think, be fairly surmised that the section advised by the Committee was not the one which they thought the best that could be devised, but the one which they thought best under the general circumstances of the case.

In my opinion, a wall of this class, which depends for its existence on aid derived from something else, is an unsatisfactory structure. I should like to see the present section increased to that employed at

Colombo, and, with such a section, I think that a wave-breaker measuring 10 or 15 feet on the high-water line would be found sufficient. The wave-breaker in that case would in fact be more a protector of the rubble substructure than of the wall, and it is a question whether, instead of throwing in the wave-breaker blocks at random, they should not be simply laid in orderly rows at the foot of the wall. This would be more in accordance with both the Colombo and the Marmagao plans, and with that which, after a costly experience, has been found to give satisfactory results at the Tyne piers. If the present plan be adhered to, it would be well, I think, to fill in the vacant spaces between the wave-breaker blocks with rubble stone.

I attach the greatest importance to a solid concrete capping on the top of the pier. I observe that in the sanctioned plan it begins at the level of six feet above high water, and is only six feet thick. I do not know what height of wave may be expected in Madras; but I do know that a thicker capping aided by a heavy masonry parapet was blown up at Wick, and I think it highly desirable, as well for its own sake as for that of the blocks below it, which it materially helps to keep in place, that it should be of a greater thickness. I do not see why it should not be commenced at about the level of high water. The wet concrete about that level might perhaps require some temporary protection, but this, at any rate, in some seasons of the year, could be readily supplied. Many engineers, and myself amongst the number, have used wet concrete in breakwaters under worse circumstances than those which are encountered at Madras. If the capping cannot be commenced nearer the line of high water, it should, I think, be carried higher than 12 feet above high water in the form of a wide and lofty parapet. It should be remembered that in England these cappings commence near the level of low water, this being possible wherever the range of tide is material, and that thus a deep capping is obtained without raising the work very high above high water.

In respect to cost, although I have not gone into the question, for I am only dealing with the first consideration, security, still I doubt if the suggestions I have made would add to it if adopted in a very serious degree.

The heads of the breakwaters are apparently to be built to a much stronger section than the rest of the work, stronger even than I have suggested. They are also to be founded at a lower level. Both these modifications I think wise, but before the heads are commenced I should hope that some such plan as that adopted at Colombo, of iron caissons, will be considered. The entrance is now to be so narrow that an accident to the heads might seriously interfere with the access to the harbour, and the more nearly monolithic they can be made the less the risk of accident to them will be, and the greater the safety of the lighthouse which must be built on one at least of them.

Having made these remarks, I have now to say upon the first section of paragraph 4 of the Government Order, that, inasmuch as the section of the wall is less than practice in other places justifies, it is in my opinion undesirable that the wave-breaker should be reduced from a length of 40 feet to a length of 28 feet, but I would rather see the wall strengthened from a top width of 24 feet to a top width of 34 feet, in which case I think the wave-breaker might be reduced to a high-water width of from 10 to 15 feet, or better still, replaced by blocks or bags of concrete laid in regular layers at the foot of the wall. I assume that the blocks will weigh not less than 30 tons, and should like them heavier if the titans by which they are set are of sufficient strength.

In respect to the second section of paragraph 4, if I understand it rightly, it means that a part of the north breakwater is not to be protected by a wave-breaker at all until the position of the entrance is finally determined by experiment. If this be the meaning of the paragraph, then we must consider if the wall is strong enough alone to

stand an exceptionally heavy gale. However temporary may be the existence of the wall, it must plainly from the first be made to a section that will stand under the worst possible circumstances. It seems to be supposed that the wall as now designed will stand under the worst circumstances without the aid of the wave-breaker. I confess that I have doubts on the subject, and should like to see the wave-breaker constructed *pari passu* with the wall.

This brings me to the vexed question of the position of the entrance; and here it appears to me that so long as the question of its ultimate position remains undetermined there will be vacillations and delays, and perhaps mistakes ending in disasters, and that it is highly desirable to set the question at rest as soon as possible. For my part, I cannot believe that the science of marine engineering is in so low a condition that a point of this kind can only be determined by an experiment which contemplates the possibility of our having to resort to the costly process of taking up several hundred feet of breakwater. And I feel it so necessary that the question should be settled at the earliest possible moment once and for ever, that, at the risk of being thought too ready to express an opinion upon it, I do not hesitate to say that, in my judgment, the eastern entrance as at present designed is a proper one, is a better one than any alternative which has yet been proposed, and is the best which, under present circumstances, can be devised.

To make a harbour secure at the expense of its accessibility, which to my mind is what the best of the north-east entrances yet proposed would do, is a worse fault than to make it accessible at the expense of its security, because we can as a rule improve the security by internal works, and we cannot improve the accessibility except by costly alterations which will diminish the security.

The simple fact, in my judgment, is that the present scheme for a harbour at Madras will make no harbour worth the name at all. What it does make is a satisfactory entrance to a harbour yet to be designed within it.

A harbour, it seems to me, is of little value to Madras unless it provides a quay wall alongside which ships may lie as in a dock, and take in or discharge their cargoes in perfect quiet and security, and there seems no difficulty in providing such a quayage at a cost which the result would fully justify. But, be the cost what it may, it seems to me that Madras is worth a safe and commodious harbour.

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I would remark, in conclusion, that I have no exact information as to the quantity of cement employed in making the concrete and concrete

blocks. I refer to the point here, because my experience leads me to think that there has been a tendency on the part of engineers of late years to use too small a proportion of cement, the result of which has been some serious failures. The importance of making blocks as nearly water-tight as possible is now greatly increased by the discovery lately made that at least some Portland cements are, as at present made, slowly soluble in sea-water, which deposits its magnesia in the concrete, taking up in place of it the lime of the cement. So long, however, as the sea-water cannot readily penetrate the concrete, and the exhausted water cannot therefore be rapidly replaced by fresh supplies, that is to say, so long as the action of the sea is confined to the surface of the concrete, the dissolving action of sea-water may be neglected. But it is evidently of great importance that the concrete should be as water-tight as possible, and for this purpose the quantity of sand, and, as a consequence, the quantity of cement, employed must be ample. I suggest as a proper proportion three measures of broken stone or gravel to two of sand and one of cement, to which, after the mixture of the rest, one measure of large rough rubble may be added. But the subject is one for experiment with the sand and stone actually employed.

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I return the papers, and am,

Yours truly,

A. M. RENDEL.

Sir Juland Danvers, K.C.S.I.

P.S.—The Colombo breakwater, like the Madras, is founded on a rubble substructure and generally 20 feet below low water, and is carried up to 12 feet above high water, with a concrete capping about 6 feet thick. The tidal range is trifling. The Marmagao breakwater is founded on a rubble construction 18 feet below low water, and carried up to 7 feet above high water, the tidal range being 7 feet.

A. M. R.

1590 W d/14-6-87
1765 W d/1-7-87
1898 W d/14-7-87
2978 W d/7-11-87
3484 W d/20-12-87
2335-6 W d/1-8-88
3068 W d/1-10-88
3573 W d/10-11-88
3644-45 W d/17-11-88
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3919 W d/13-12-88
174 W d/22-1-89
622 W d/2-3-89
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A d/6-6-89

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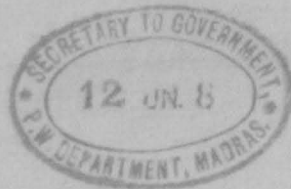
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6059

Public Works

23rd May 1889

The
Letter to Fort St George
No 7 + Enclosure



Rt 7.89 4 P

HM
13.11
Claims (+ 11/11/89)
17.37 11/11/89
Ked
26 June

Communicated, with
reference to G.O. 622 W of
2^d March 1889, to the
Harbour Trust Board for
an early expression of
their views.

Wm
1.7.89

Prods

25.6.89.

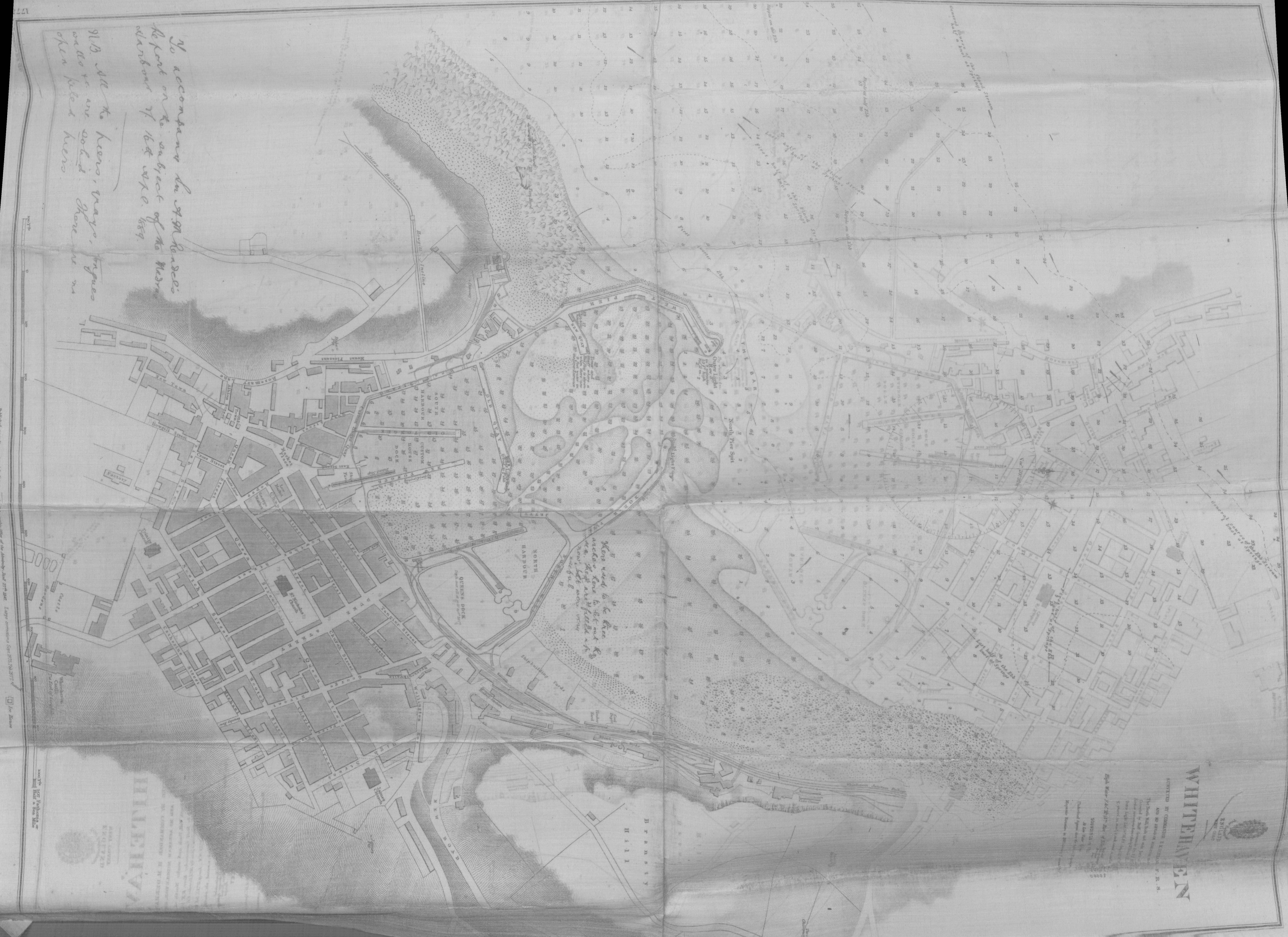
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The Ch. H. S. B. with plan
Marine Dept.

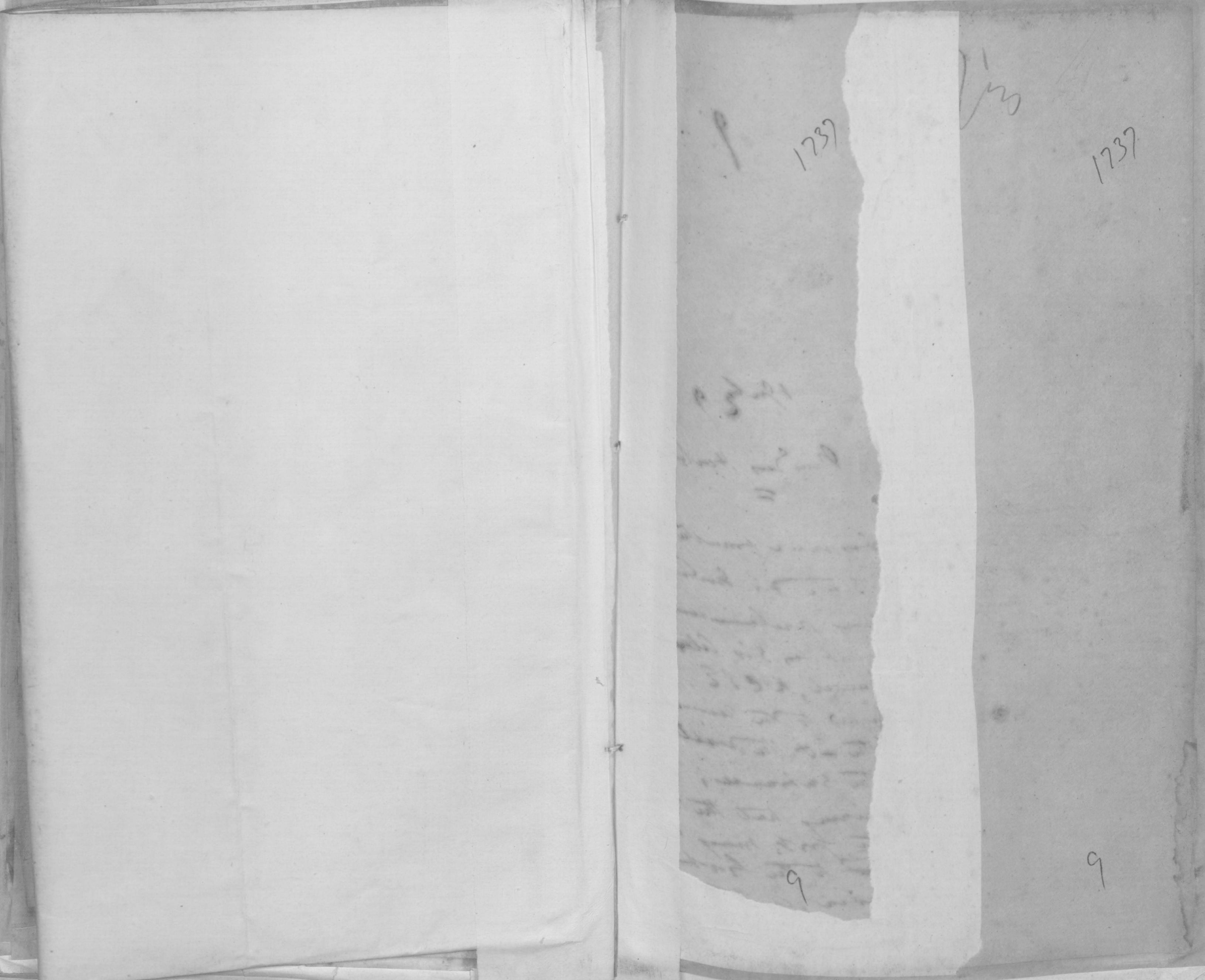
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with order

WHITEHAVEN
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Govt. of (1889) Madras.

PUBLIC WORKS.

2/7/89

G.O., 1 July 1889 No 17374

Madras Harbour

Memorandum from the Secy
of State for India
very preliminary
report by Sir Alexander
Randal, K.C.S.E., with
regard to the reconstruction
of the - & the position
of the entrance, &
desiring that the views
of the port may be
submitted to the Govt of
India, and to the
P. W. for consideration.

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