(1) பக்கங்களின் எண்ணிக்கை 18

(2) புதுக்கித் திருப்பிய நாள் 6-8-92

(3) ஆதார்ங் குறிப்பவர் சுருக்கொப்பம்

தமிழ்நாடு ஆவணக் காப்பகம்.

தமிழ்நாடு அரசு

பொதுப்பணித் துறை

அரசாணை எண்.
மு. கோப்புத் தாள் எண். 357/13

அச்சகம்
பலவகை

நாள் : 22-12-1892 199

மடிக்கவோ கண்டபடி கையாளவோ கூடாது.

ஆவண. கா. 1—18,006—6-9-90.

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

READ—again the following paper:—

G.O., dated 28th July 1892, No. 2103 W., Public Works.

Read—the following Despatch from the Right Honorable 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, 16th June 1892, No. 3 P.W.

I forward herewith, for the information of your Excellency's Government, copy of a despatch * which I have recently addressed to the Government of India enclosing a report by Mr. F. N. Thorowgood on the measures which he proposes for improving the harbour of Vizagapatam.

* No. 27 of 16th June 1892 and enclosure. (The plans referred to in the enclosure have been sent to the Government of India.)

ENCLOSURES.

Despatch from the Right Honorable Her Majesty's Secretary of State for India, to His Excellency the Most Honorable the Governor-General of India in Council, dated India Office, London, 16th June 1892, No. 27 P.W.

With reference to my Public Works Despatch, No. 62, dated the 15th October 1891 I forward herewith, for your Excellency's consideration, copy of a report* which has been submitted to me by Mr. F. N. Thorowgood on the results of his investigation into the condition of the harbour at Vizagapatam.

* Report, dated 25th May 1892, and two plans.

2. The measures proposed by Mr. Thorowgood for the improvement of the port are (1) the construction of a groyne from the shore north of the river mouth; (2) the excavation of some reclaimed land, with the object of increasing the tidal capacity of the estuary; and (3) the dredging of the mouth of the channel. The total outlay involved in these improvements, which need not be carried out at once to the full extent proposed, is Rs. 6,11,271.

3. A larger scheme, estimated to cost Rs. 43,27,272, is also proposed by Mr. Thorowgood, with the object of forming a deep sea harbour, enclosed by piers constructed from the shore north and south of the entrance to the river.

4. I [illegible] request that I may be furnished with your Excellency's views, after consulting the Madras Government, on the suggestions made in this report. I have already, in a previous despatch, expressed my opinion that the connection of the port of Vizagapatam with the Indian railway system, on the construction of the East Coast Railway, will add new importance to the question of improving the harbour.

From F. N. THOROWGOOD, Esq., M. INST., C.E., to the Under-Secretary of State for India, dated Wimbledon, 25th May 1892.

[*Vizagapatam Harbour.*]

I have the honour to submit herewith my report upon forming a harbour at Vizagapatam, together with two plans (Nos. 1 and 2), in accordance with orders and instructions given in your letter of 8th October 1891, No. 1779 P.W.

2. *Arrival at Madras and Vizagapatam.*—I arrived at Madras on 25th November 1891, and at once reported myself to the Chief Secretary to Government, and had interviews with the Public Works Member of Council and Colonel Pennycuick, R.E., Chief Engineer, Public Works Department. I received a very large and most interesting batch of papers containing

all that had been written on the subject of Vizagapatam Harbour, commencing at the year 1858, together with plans and sections of the port and backwater. At Madras I was detained till 30th November, the coasting steamer being very late, and I arrived at Vizagapatam on the morning of 4th December.

3. *Previous opinions on the Harbour.*—I shall have to refer in some detail to the opinions of others who have advocated the construction of a harbour at this port, as the features of the coast are rather peculiar, and it is certainly curious to see what conflicting decisions have been arrived at. It is unnecessary for me to describe the town and situation of the port of Vizagapatam, as these are sufficiently indicated on Drawings Nos. 1 and 2. It differs, however, from any port on the Coromandel coast in this, that on the south side of the river mouth instead of a low flat sandy shore, there are almost precipitous cliffs, reaching a maximum height of 536 feet above high-water, the highest and boldest being known as the "Dolphin's Nose." This headland projects 1,500 feet eastward of the narrow entrance to the river or backwater, and thus protects it from the swell of the south-west monsoon. The water round this headland is deep, and more free from sand in suspension than is the case where the shore is low and flat.

4. *General features of Vizagapatam Port.*—At first sight it is impossible not to be struck with the natural advantages that the place possesses for making a harbour, the backwater offering a fine sheltered area hemmed in by hills, and capable of being made into docks, quays, wharves, &c., to accommodate a large trade. And it is absolutely distressing to see this fine backwater almost cut off from the sea by the long spit of sand which blocks the mouth, and is generally called the bar. On this sand spit or bar, except at high-water, on the smoothest day, there is a constant and most dangerous surf ever breaking. (See Drawing No. 1.) The removal of this bar has been the problem on which so many opinions have been offered, and I am obliged to come to the conclusion that many of these opinions have been arrived at on insufficient evidence.

5. *Other opinions as to methods of improving Port.*—In September 1858 Lieutenant Vertue, R.E., reports to the Government of Madras that "the bar is formed by material brought down by the river, and is composed of soft mud, not of sand," and that, "by means of a groyne of rough stone projecting seaward from the northern side of the river's mouth, ... the loose material of which the bar consists would be swept away."

6. Mr. E. T. Thomas, C.S., has taken a great interest in the port, and he describes it in a memorandum to the Madras Government, 24th September 1872, as "the most natural and the most easily formed port on the East Coast Peninsula;" and further says, "if the bar were removed, the harbour would be made."

7. Captain Waters, Master Attendant at Vizagapatam, proposes in 1873 a groyne, 700 feet long, run out from the *south* side of the river as the only means to render Vizagapatam a safe port.

8. Major Beatty, R.E., has gone into the matter very fully, and his proposal was a groyne on each side of the river mouth. On the north side 1,200 feet long, and on the south (from the Dutch battery) 1,000 feet long.

9. In 1880 Major-General R. H. Shankey, R.E., investigated the matter very thoroughly, and has placed on record that he does not believe in the efficacy of any groynes to scour away the bar, which would probably only be thus put further out to sea, and that "we should not only incur useless outlay, but do perhaps irreparable mischief," by such works.

10. The late Captain I. H. Taylor, Master Attendant of the Madras Presidency, advocated no artificial works at Vizagapatam, because he believed that close beneath the surface of the sand or mud was hard, uncompromising rock. There are numerous other opinions and suggestions on record which need not be noticed, except one which I refer to in paragraph 36, viz., the proposal of Mr. W. J. Addis, submitted to the Secretary of State for India, 23rd November 1891, and handed to me by the Government of Madras.

11. I have carefully considered all that has already been put forward on the subject of this harbour, and I commenced my investigation without prejudice in any direction.

12. *Bar removed by heavy floods.*—The bar or sand spit is occasionally removed by heavy rains, and I find an undoubted record of a series of soundings taken a few months after the cyclonic storm of 1876, on which is shown a channel from the Dutch battery up to the bridge (called now Turner's bridge, as shown on the Drawings Nos. 1 and 2), with from 18 to 27 feet of water at low-water throughout. It is most important to bear this in mind, as where there was in 1877 a depth of 16 to 18 feet at low-water there now stands the "Sand Island" shown plainly in Drawing No. 1. This "Sand Island" was formed mostly while I was at Vizagapatam.

13. But these scourings out by heavy rain are uncertain, and there has been no such action now for more than three years. The present state of the river mouth is most lamentable, being one mass of broken water, through which I can from experience state it is not only disagreeable, but very dangerous to pass. Yet this present state of things may go on for a further indefinite period and be a serious obstacle to any trade.

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14. I have therefore come to the conclusion that in submitting any design for improving the port, the river Maonderu (as I find it called on former plans) must be regarded only as a tidal backwater, and the question of rainfall or catchment area may be disregarded, except in so far as to suggest no work that may be damaged by one of these heavy rain floods.

15. As a matter of fact the river is tidal for a distance of nearly eight miles from the mouth, and it is to the tidal ebb and flow that we must look for the active force moving sand outward or inward. The scour of a heavy rain is an occasional event which must not be reckoned on if a useful harbour is desired.

16. In his letter to Sir Juland Danvers, dated 8th July 1891, Sir A. M. Rendel says, speaking of the river at Vizagapatam, "small as its forces are, the river seems even now to be only just unable to cope with those of the sea, for the depth on the bar diminishes from its deepest to its shallowest limit but slowly." Nothing can better represent the truth of this than the survey I have lately made, and which I shall have to refer to in detail. With everything against it, the river has still been able to maintain an exit to the sea through which boats can pass at high-water.

17. *Conflicting opinions about Bar.*—My first aim on arrival was to try to ascertain, first, what was the cause of the bar; secondly, from what source did the material composing it come; and thirdly, was it easily moved from its position. With regard to the last point it is evident that conflicting opinions had been held many years ago, for I find that the District Engineer, writing officially on 9th March 1859, says, "that there is strong evidence that the depth of water on the bar has not varied, nor has its size and position during the recollection of the oldest inhabitant," while on 8th March 1871, Major Beatty, R.E., writes making proposals "in order to remedy the constant fluctuations that the bar is subject to, both with regard to the depth of water upon it and the position of the deep channel." I therefore approach the matter of the so-called bar with much caution, but with the belief that the conclusions I draw are correct.

18. *Sand supply to the Bar.*—I find that the chief source of sand supply is due to wave action during the period from October to February, when the wind and littoral current are both from the north of east. If there were no river at all the sand would be heaped up against the rocky coast on the south side of the mouth of the estuary. By reference to the detailed survey of December 1891, on Drawing No. 1, it will be seen that the one-fathom line (one-fathom below low-water spring tides) runs out as a spit of sand for a distance of 640 feet to the east of the old Dutch battery. Before the state of the sea would permit me to take any soundings, I observed this *state of things by frequently ascending the Dolphin's Nose* headland and looking at the sand through the clear water at flood tide. A careful survey confirms the opinion I inclined to from mere ocular observation.

19. There is also another source of sand supply to the so-called bar, and that is a movement of sand when the southerly winds set in from seaward in towards shore. This I believe to be common to all ports on the Coromandel coast, and at Madras it was very conspicuous during the construction of the harbour piers.

20. The sand in the neighbourhood of the Vizagapatam harbour mouth is very easily moved. The slightest change in wind will make a change in the disposal of the sand, and as a matter of fact it became extremely difficult at this spot to get a survey of the bottom of the sea which might be called accurate for two consecutive days during the time of general change of wind from north to south.

21. *Fresh-water springs disturb sand.*—This extreme mobility of the sand I find to be very greatly due to the fact that the bottom of the sea is pierced by numerous fresh-water springs, which when intercepted on shore by wells form the water-supply of the place. Of these wells there are no less than 22 within one-eighth mile of high-water mark, and in one mile of coast, and the level of the surface of water in them all is about the same at the same minute of time, being about three feet above low-water level. These springs, when not intercepted, percolate up from the sandy bottom of the sea and render the sand very unstable, as may be plainly seen at such times as the water is smooth and clear.

22. These two sources of sand-supply, one from the north, due mostly to wave action, and one directly towards shore, also mostly due to wave action on the sea bottom, form the serious obstruction known as the bar.

23. By again referring to Drawing No. 1, it will be seen that in February 1892, on repeating the survey of the sand spit with wind and current from the South, the contour line of one-fathom is driven backward a distance of 320 feet. I therefore come to the conclusion that the bar is and always has been caused by sand brought, as I have suggested, during the north-east monsoon, and afterwards flattened back over the mouth in the south-west monsoon.

24. The direction of the crests of the breaking waves hardly varies at all, being throughout the year as indicated on Drawing No. 1. I am supported in this belief by some most useful information given me by Captain Winckler, for many years Master Attendant at Vizagapatam, and now at Cochin.

25. *Currents outside mouth of river.*—With regard to tidal and littoral currents outside the mouth of the harbour, they vary so much and so frequently, but always with so low a velocity, that I think they may be passed over. I have shown on Drawing No. 1 how, on two days in February, the ebb tide, as observed with floats sunk very deep, took two quite opposite directions, the velocity, however, was never more than 44 feet per minute. In the Bay of Bengal the flood tide comes from the south, yet I found in December, with a northerly wind, the current at flood tide set distinctly towards the south, as recorded on Drawing No. 2. On several occasions I have been unable to detect any current in seven-fathom water when the tide has been running rapidly into or out of the river. I therefore discard currents, outside the immediate neighbourhood of the river mouth, as having no general effect on the sand spit or bar.

26. *Evil done by the reclamation work.*—There seems to be no doubt whatever that the depth of water in the river and its mouth within the one-fathom line has diminished since the year 1870, when the reclamation of some swamp land was commenced. To quote Major Beatty, R.E., again, on 24th December 1873, he writes to the Collector of Vizagapatam,—"that from the date when the bunds for reclaiming were constructed, the bar has been rising at an average of two feet per annum;" and, indeed, it is impossible to doubt that the excluding of 2¼ square miles of lands from the tide, even if this area were only covered to a depth of six inches, would make a serious difference in the scour of the tide at the mouth of the estuary, for it would cut off nearly 38 million cubic feet of water. In March 1874 Colonel W. Farewell, Deputy Chief Engineer, Public Works Department, wrote on this subject,—"there can be no doubt that the deterioration of the harbour is due to the reduction of the tidal estuary . . . . . that Government should repossess themselves of the swamp, so essential to the existence of the harbour." And Major-General Sankey, R.E., drew serious attention to this in his note of 13th August 1880 to the Madras Government.

27. As will be seen later on, I do not advocate handing the reclaimed swamp back again to the tide, because in the last 18 years, by cultivating portions of it, by using it for grazing buffaloes, by occasional flooding and silting, the level of the general area is hardly appreciably below high-water spring tides, as found by numerous levels and sections I had taken upon it. But I most strongly advocate some measures for increasing the tidal capacity of the river, and this to be done by excavating into the reclaimed land.

28. *Borings on the Bar.*—Much anxiety seems to be felt at Madras as to whether there is rock to be found in such positions as to prevent the forming of a harbour, and I have no doubt that locally disappointment was caused by my inability to take borings on the bar. As a matter of fact this is impossible without most elaborate and costly plant, such as the occasion did not justify my demanding.

29. *Rock.*—The question of rock in the backwater (except where the rock can be seen) need not be considered, as the soundings after the storm of 1876 already referred to in paragraph 12 sets that at rest. From two borings I took, shown on Drawing No. 1, it is very evident that there is nothing in the way of rock to prevent the making of an excellent harbour with 18 feet of water at low-water. I certainly discovered a solitary rock or boulder at three fathoms deep (at low-water spring tides) off the entrance of the river (marked *r* on Drawing No. 1), but by probing down round it two or three feet deeper I got no more rock, so I think it to be an isolated stone.

30. *Proposals to improve the Harbour. Dredging.*—Having now briefly described the state of affairs at Vizagapatam, I venture to put forward my proposals for improving the port. I first strongly urge the use of a sand-pump dredger to clear a channel as shown in Drawing No. 1, with a depth of 10 feet at low-water, and to dredge away the sand island, which is doing such harm to the port. The application of dredging has been found so beneficial to the neighbouring port of Cocanada (similarly hampered by silt from the north) that I would very strongly recommend the use of a dredger at Vizagapatam, to be worked during the smooth season, to remove the present obstructions to traffic, which are truly distressing to see. I do not put the cost of this dredger down in the estimate for a harbour, as I have good reason to believe the port of Cocanada are willing to share the cost of a dredger with Vizagapatam, and allow the machine to work at the latter port in January and February. I simply wish to draw attention to what I believe to be the simplest and most direct way of improving the port at present, so as to be better able to carry on its trade. The dredger "Wenlock" was to have been sent from Tuticorin to Vizagapatnam while I was there, but it had to go to Bombay for repairs, and so could not have arrived at Vizagapatam till the smooth season had passed.

31. The dredger when working should remove the point of sand at the river mouth, and indicated on the plan as "point to be removed." The removing of this point seems to me to be of great importance, as the very narrow channel at that place produces at spring tides an abnormal velocity of flood tide (nearly always aided by wind and wave), amounting to as much as 208 feet per minute. This rapid tide through a sandy channel carries material with it, and ultimately forms and increases the sand island inside.

32. The ebb tide is retarded by wind and wave and does not achieve so great a velocity as the flood, but I often measured 180 feet a minute by observation, and by calculation from the present tidal capacity of the backwater passing through the narrow section of exit the result would be 176 feet per minute.

33. *Cost of dredging.*—To dredge a channel as shown on Drawing No. 1 from near the two-fathom line at sea up to and beyond Sand Island, with a minimum depth of 10 feet at low-water, would involve the removal of about 28,000 cubic yards of sand, at a cost of not less than Rs. 14,000. A very heavy rain flood might do more than this without any expenditure at all, but who can say when the next heavy flood will come, and what is to be done if it be postponed for two years more? In the appendix A to this report I give a detailed estimate of work to be done, so arranged that this sum of Rs. 14,000 may be included or omitted.

34. *Construction of a groyne.*—The only work of actual construction that I propose is a groyne, not less than 1,420 feet long from the low-water line, as shown on both plans in red colour; and I should prefer to extend it 130 feet further, at an additional cost of Rs. 35,675, to ensure no sand passing round the end of it. The position and direction of this groyne have been carefully considered, and I do not think that any other situation or direction would attain the desired two-fold object of keeping back sand from the river mouth and allowing sufficient beaching ground for waves to brake upon. A good extent of beaching ground is absolutely necessary, and while the proposed position of the groyne affords this, it at the same time will interrupt many of the breakers which now disperse themselves on the shore near the ice house.

35. *Construction of groyne.*—The first 870 feet of the groyne, and the whole of its base, I propose to form with large rubble stone taken from one of the neighbouring hills. The outer 550 feet is to be surmounted with a wall of concrete block, 24 feet in width, similar in size and shape to those used at Madras harbour subsequent to the year 1885. I do not think that any less substantial work should be attempted in so exposed a situation, and there is evidently not a long enough period of smooth water to justify an attempt at building with concrete *in situ*. I have supposed that to build this concrete wall plant will be available at a low cost from Madras, as indeed is hinted by Sir Alexander Rendel in his letter of 8th July 1891. The concrete blocks can be made at the spot indicated in Drawing No. 1 as "site for concrete block ground." Stone can be brought easily by the Railway to the site of the groyne and to the block-yard at a rate of less than one anna per ton per mile, and excellent sharp coarse sand is obtainable along the shore.

36. *Mr. Addis' scheme.*—If a solid groyne or pier were run out straight to sea from the corner of the river mouth, as indicated in the design of Mr. W. J. Addis, referred to in paragraph 10, the result would, I fear, be to convey the breakers right up to the Port Office of Vizagapatam, and to undermine the railway now under construction.

37. *Excavation of the reclaimed land.*—To add to the tidal capacity of the estuary, I propose to cut away the foreshore of the reclaimed land eventually right up to the inner bund on the south side of the reclamation. This, however, may be done by instalments, and need not be undertaken as a whole to begin with. In Appendix A I give two estimates — one for the whole excavation, and one for half of the ultimate quantity proposed to be moved. This excavation is to be carried to ordinary low-water level by cooly labour. If a dredger is available subsequently, the water may be deepened in place by degrees, and gradually the shore may be used as a landing place for cargo. But the first object is to add to the tidal capacity of the estuary by removing land that lies between high and low water level, the subsequent deepening being a matter for future consideration. The material excavated is to be levelled up on the reclaimed land within the bund.

38. *Tidal capacity of estuary.*—I calculate the present tidal capacity at spring tides of the estuary at only 67 million cubic feet, and this calculation agrees almost exactly with what should be the capacity theoretically according to a formula which proportions the tidal ebb and flow to the low-water section at a river's mouth. By excavating into the foreshore, as shown on Drawing No. 2 to the full extent, an addition of over 19 million cubic feet will be achieved, or nearly one third more. But this will be at a cost of Rs. 1,93,200. But half this amount of excavation might be carried out at first at a cost of Rs. 96,000, and the result watched. The whole work may be progressive, and in the estimates in appendix A, I endeavour to make this clear.

39. *Cost of the different works.*—At present, for the full work proposed, including dredging and excavating, the cost would be Rs. 6,11,271, as shown in Appendix A (1). Or if the dredging be postponed, and only half what I propose be excavated, the total would be Rs 4,78,541 — see Appendix A (3). If the groyne alone be built, and no addition made to the tidal capacity by excavation, the cost would be Rs. 3,62,751 — see Appendix A (4).

40. *Pier on the south side not wanted.*—There is one more point in this scheme that I ought not to pass over, and that is the necessity or otherwise for a short pier on the south of the river mouth. I have given this most careful consideration, especially as such a work was mentioned by Sir Alexander Rendel in his letter of 8th July 1891. I found by close examination on the spot that the line of broken water hardly varies at all in direction in either monsoon, and is as indicated on my Drawing No. 1. Further, I find that the old Dutch battery, close to the water's edge on the south corner of the river mouth, is only built of bricks and mortar, and it is impossible to believe that this would have stood so many years if it were attacked by heavy

seas. I have, therefore, arrived at the conclusion that no work on the south side is necessary for a small inner harbour. If any further work be required, it will be the extension by 100 or 150 feet of the northern groyne.

41. *Comparative surveys of* 1883 *and* 1892.—Another point I wish to call special attention to is this:—It has sometimes been urged by many who have taken up the question of a harbour at Vizagapatam that any work short of a very large one will be sure to silt up. My belief is that never until now has the matter been thoroughly considered, and I think it will be admitted that we can now see that the sand trouble at the river mouth is very local, and is covered by my proposed groyne of 1,420 feet from low-water. On Drawing No. 2 I have shown the contour lines at sea taken from Commander Falle's exquisite survey of 1883, and in my own survey of 1892. I have, as nearly as I could, followed Commander Falle's traversing lines. So we have, I may say, for the first time, two accurate surveys at nine years' interval, showing that in this interval, and with the bar now in an extremely bad condition, there is practically no change whatever in depth from the nine-fathom to the one-fathom contour. With the bottom of the sea so constant as this, I do not fear that the groyne now proposed will silt up or do otherwise than keep the river mouth clear.

42. *Deep harbour.*—I have now to refer very briefly to a larger design shown in blue lines on Drawing No. 2. This gives a magnificent outer harbour with a 900 feet entrance in nearly nine-fathom water, and with a distance of 2,100 feet shoreward under cover of the south pier up to the four-fathom line. And, with regard to this design, it must be borne in mind that the bar is not the only obstacle for working cargo at Vizagapatam, but that the ground swell often interferes with discharging cargo from ships.

43. If this larger plan were to be carried out, there would be safe anchorage for certainly 20 ships in the outer harbour, and the backwater might then be converted into docks and quays, which would compare favorably with any port in India except Bombay. The groyne thrown out for the smaller design would be extended as shown for the larger one, and I again suppose that cranes and plant from Madras might be utilized here. In this case I would propose a railway along the foot of the Dolphin's Nose headland, and a concrete block ground on the plateau above the Dutch battery, with a wire rope incline down to the railway along the shore. I give in Appendix B an estimate of the cost of this, which of course is great, amounting to Rs. 43,27,272.

44. In conclusion, I should like to be permitted to record my thanks to all those with whom I came in contact officially during my stay at Vizagapatam, which ended on 22nd February 1892. To Mr. Willock, to Mr. F. B. Walker, Chief Engineer of the East Coast Railway, and his staff, to Captain Woodhouse, Port Officer, and to Mr. Gardiner, of the firm of Stuart, Hall and Co., my thanks are specially due for having given me all assistance possible, and indeed more than I ought to have expected.

APPENDIX A.—Estimate of cost of the four alternative plans for improving harbour, referred to in Report and Drawings Nos. 1 and 2.

	Rs.
(1) The full work proposed :—	
Groyne—	
Rubble stone in commencement and in base to end of groyne, 70,338 tons, at Rs. 1-8-0	1,05,507
Concrete blocks in outer portion, 7,822 cubic yards, at Rs. 10-8-0	82,131
Setting ditto in position, 7,822 cubic yards, at Rs. 2-8-0	19,555
Excavation in swamp to full extent— 19,320,000 cubic feet, at Rs. 10 per 1,000 cubic feet	1,93,200
Dredging mouth of channel— 28,000 cubic yards, at 8 annas	14,000
	4,14,393
Add plant and preliminary work	80,000
Block ground	15,000
	5,09,393
Contingencies at 10 per cent.	50,939
Establishment and office at 10 per cent.	50,939
Total for whole plan (1)	6,11,271
(2) Work as above omitting dredging and proportional part of contingencies, &c.	5,94,471
(3) Work as above (1), omitting dredging, and only doing half proposed excavation	4,78,641
(4) Construction of groyne alone	3,62,751

APPENDIX B.—Estimate for Deep Sea Harbour referred to in paras. 41 and 42 of Report.

	Rs.
Plant and preliminary work, supposing cranes are available from Madras	1,50,000
Approach to south pier	28,560
Block ground and incline, south side	30,000
Additional to north block ground	15,000
Complete south pier, 3,300 feet, at Rs. 500 per foot	16,50,000
" north pier, 3,465 feet, at Rs. 500 per foot	17,32,500
	36,06,060
Add contingencies, 10 per cent.	3,60,606
Establishment and office, 10 per cent.	3,60,606
Total cost	43,27,272

Order—dated 28th July 1892, No. 2103 W., Public Works.

Recorded.

2. The orders of the Government of India will be awaited.

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
Secretary to Govt., P.W.D.

READ—also the following papers :—

From C. VINCENT, Esq., Under-Secretary to the Government of India, Public Works Department (Civil Works—Miscellaneous), to the Secretary to the Government of Madras, Public Works Department, dated Simla, the 29th August 1892, No. 328 M.

With reference to Lord Cross' despatch No. 3 P.W., dated the 16th June 1892, to the address of the Government of Madras, I am directed to request that the Government of India may be favoured with an expression of the views of His Excellency the Governor in Council on the measures proposed by Mr. F. N. Thorowgood, M.I.C.E., for improving the Vizagapatam harbour.

2. The chart and plan referred to in Mr. Thorowgood's report are herewith forwarded. They should be returned to the Government of India when the views asked for in para. 1 above are furnished.

Note by the Acting Chief Engineer, Public Works Department.

There is no reasonable doubt that an excellent fine-weather outer harbour for large ships could be made at Vizagapatam on the general lines of the Madras harbour, and for such a work Mr. Thorowgood's proposals appear suitable; whether the rough estimate in appendix B of his report gives a reliable idea of the cost is a different matter; I do not think it does.

2. Vizagapatam lies in a track much affected by cyclones, and the seas which at such times roll in upon the proposed site for the harbour, are as violent as any along the whole east coast of the Presidency; the harbour walls would therefore have to be as well founded, as massive, and as well protected from wave action, as those at Madras. The Madras harbour with a total length of sea wall of somewhat under 8,000 feet was estimated to cost 49 lakhs, but will really cost upwards of 123 lakhs; Mr. Thorowgood's Vizagapatam harbour wall would have a total length of 6,765 feet and his estimated cost for the harbour is 43·27 lakhs; it seems not improbable that it would really cost at least half as much again.

3. The Vizagapatam harbour would, however, have this great advantage over the one at Madras; it would have in connection with it a natural inner harbour available for boats and small craft, and affording exceptional facilities for the construction of wharves and jetties suitable for landing and shipping all kinds of cargo, and in connection with the railway.

4. When railway communication with the Central Provinces is opened it is not unlikely that an enormous quantity of their produce may seek its outlet at Vizagapatam, and then the construction of a ship harbour such as one under consideration may become imperative; but as matters now stand, they do not appear to warrant an expenditure of certainly not less than 43¼ lakhs and probably more than 65 lakhs.

5. Passing now to the minor scheme dealt with by Mr. Thorowgood of merely improving the entrance to the backwater, or tidal estuary; he proposes to effect this at a cost of Rs. 6,11,271, by—

1*st. Dredging* a channel with a minimum depth of 10 feet at low-water from the two-fathom line to about 660 feet west of the landing stage (see paras. 30, 31 and 33 of report).

2*nd. Constructing a groyne* 1,420 feet (preferably 1,550 feet) long, north of the mouth of the estuary, in the line shown on the plans (see paras. 34 and 35 of report).

3*rd. Increasing the tidal capacity of the estuary* by excavation of some of the land "reclaimed" in recent years (see paras. 37 to 38 of report).

6. Taking these proposals *seriatim*, I would remark that the cost of the *dredging* is put down as only Rs. 14,000, exclusive of "contingencies" and share of "Establishment"), and does not provide* anything for cost, or share of cost, of the "sand pump dredger" which it is recommended should be used. Such a dredger, or indeed any dredger, suitable for the place (it would have to be of the "hopper" self-propelling type) would certainly cost† not less than 1¾ lakhs. It is possible that the dredger "Wenlock" already possessed by the Madras Government might do the work, but most certainly to form a channel 1,000 *yards* long by 50 wide "as shown on Drawing No. 1, from near the two-fathom line at sea up to and beyond the Sand Island with a minimum depth of 10 feet at low-water," would require the removal of many times the 28,000 cubic yards put down by Mr. Thorowgood as the quantity to be dredged, whilst to *maintain* such a channel would require frequent, if not constant, dredging, so that a special dredger would have to be kept at the place. Even if the proposed groyne did cut off all accumulation of sand from the north, the ceaseless action of the surf or breaking waves, the general direction‡ of which is from the south-east, would certainly fill in the excavated channel from the expanse of sand surrounding it. Mr. Thorowgood himself notes in his para. 20 that the sand "in the neighbourhood of the Vizagapatam harbour mouth is very easily moved. The slightest change in wind will make a change in the disposal of the sand and in para. 21 he notices "the extreme mobility of the sand" and how "very unstable" the sandy bottom is at the place. It is certain that no channel there dredged to some feet below the surrounding plain of easily moved sand, which is for ever disturbed and swept along by the action of waves, would maintain its form or depth for any length of time without frequently recurring, if not constant, clearing; whilst there would be in every year long periods during which heavy seas would render such clearance impossible and after such periods there would be but little trace left of the excavated channel. Probably Mr. Thorowgood considers that the increased tidal scour resulting from the increased tidal capacity which he proposes to give to the estuary would keep his channel clear, but it may be accepted as an absolute certainty that this would not be the case. Before the

* The provision of Rs. 80,000 for plant and preliminary work appears to refer only to the plant, &c., required in connection with the construction of the groyne.

† The "Wenlock" cost [illegible] delivered at Pamban.

‡ See para. 24 of Report.

reclamations the tidal capacity of the estuary was greater than that to which Mr. Thorowgood proposes to now restore it, but even then it was not able to keep the entrance to half the depth of Mr. Thorowgood's proposed channel. The entrance was at times scoured out by violent land floods to a greater depth even than that now proposed by Mr. Thorowgood, but was always before long* again levelled up to its previous shallow state by the natural forces perpetually at work.

By the flood resulting from the cyclonic rainfall of May 1877 the "bar" was scoured out to a depth of between 9 and 10 feet at low water; in June of the following year the Master Attendant, Madras, reported that the bar was in a worse state than he had ever "known or heard of before" (see his letter No. 4684, with Proceedings of the Madras Government, No. 337, dated 27th June 1878).

7. As regards the proposed *groyne*, which is estimated to cost about Rs. 2,18,630,† I would submit that there is no evidence as to its probable efficacy. Mr. Thorowgood apparently had no opportunity of making observations on the movement of the sand at the place during the south-west monsoon, which has a very important bearing on the question. Granting that the groyne would arrest the travel of sand from the north and that more sand travels from that direction than from the south, there is nothing to show that there is not also a considerable movement of sand from the south and east which the groyne would also arrest, causing at times a deposit on its south side in the very place which it is wished to deepen; indeed, in para. 19 of his report, Mr. Thorowgood himself says "there is also another source of sand supply to the so-called bar, and that is the movement of sand when the *southerly* winds set in from seaward towards the shore;" such experience also as we have on the Coromandel coast points to the extreme probability that the proposed groyne will greatly aggravate the evil which it is intended to remedy. (I may here mention that the training walls or groynes at Cocanada are under totally different conditions from those at Vizagapatam, being at the head of a deep bay on a foreshore, free from heavy surf and quite sheltered from all seas from the south).

			Rs.
Rubble	...	...	1,06,507
Concrete blocks	...	...	82,131
Setting do.	...	...	19,555
Share of contingencies	...	...	20,719
Do. establishment, &c.		...	20,718
Total		...	2,48,630

8. The proposal to *increase the tidal capacity of the estuary* is undoubtedly based on thoroughly sound principles. For the last 20 years or so, every officer of this department who has had to deal with the matter has pointed out the injury that would be and has been caused by the "reclamation" of land which used to be covered by the tides. To the "reclamation" is undoubtedly due some deterioration of the entrance to the backwater, and the nearer the capacity of that tidal basin is brought back to what it was originally, the more nearly will the "bar" return to its former state. That state was by no means excellent, though somewhat better than it now is, and I do not for one moment suppose that the increase in tidal capacity proposed by Mr. Thorowgood would keep open an unenclosed channel to a depth of 10 feet at low water, but it might probably add a very important foot or two in depth to the worst places, and any work carried out in that direction would be useful, whatever might be the way in which it is hereafter decided to treat the outer harbour question.

9. It may, I think, be safely asserted that the conditions which obtain at the surf-beaten mouth of Vizagapatam backwater are such that with the small range of tide available for creating tidal scour no permanent improvement to the extent anticipated by Mr. Thorowgood from his scheme can be achieved until the place receives thorough protection from the never-ceasing action of the surf and from the effect of violent storms; such protection can only be given by long and massive sea walls and they would, of course, be most advantageously disposed so as to enclose an outer harbour; not till that is made, I fear, can the inner harbour have an entrance channel with anything like a minimum depth of 10 feet at low water, except for comparatively short periods after great land floods, which are of infrequent occurrence, have swept through the mouth of the estuary and scoured it out.

(Signed) G. T. WALCH.
Acting Chief Engineer, P.W.D.

27th October 1892.

Endorsement by the Under-Secretary to the Government of India, Public Works Department (Civil Works—Miscellaneous), dated Simla, 17th October 1892, No. 428 M.

The following, with copy of the letter referred to and of its enclosure, is forwarded to the Secretary to the Government of Madras, Public Works Department, for information with reference to the correspondence ending with Public Works Department letter No. 328 M, dated the 29th August 1889.

ENCLOSURES.

From the Government of India, Public Works Department, to the Executive Engineer, Public Works Department, Railway Branch, dated 17th October 1892, No. 427 M.

I am directed to acknowledge the receipt of your letter, dated the 21st September 1892, and of the memorandum therewith forwarded on the subject of improving the Vizagapatam harbour and to say that a copy of those documents has been forwarded to the Government of Madras for information.

From G. E. MOORE, Esq., Executive Engineer, Public Works Department, Railway Branch, to the Secretary to the Government of India, Public Works Department, dated 21st September 1892.

Understanding that the subject of improving the harbour of Vizagapatam is under the consideration of the Government of India, I have the honour to forward a memorandum embodying proposals which I venture to think are worthy of consideration.

2. The result aimed at is to allow of the substitution of large cargo boats and steam launches in the place of surf boats without in any way interfering with a larger scheme should it at any time be requisite.

3. The works that I propose to effect this are, first, a breakwater to protect the entrance from the sea and surf; secondly, a groyne or groynes to arrest the movement of the sands on the north side.

4. I have no hesitation in saying that however much opinion may vary regarding the position and details of construction of these works, that they are primarily essential to any improvement scheme and for reasons given in my memorandum how disastrous to the town would be the effect of any attempted improvement by a contraction of the entrance.

5. Believing it premature I have not attempted to give either detailed plans or estimates although I have prepared them.

Vizagapatam Harbour.

The construction of the East Coast Railway makes the improvement of the port accommodation at Vizagapatam an urgent necessity.

2. At present the only communication between ships and the shore is carried out by surf boats, expensive and dangerous.

3. The difficulty lies in getting over the bar at the entrance to the river which at times has as little as 3 feet of water on it and is always subject to a dangerous surf.

4. If the bar could be so protected from the surf that there should be smooth water on it, cargo boats could, without any further improvement, be used in the place of surf boats.

5. This can only be effected by the construction of a breakwater about 800 feet long on the south side, from the Dutch Fort on the Dolphin's Nose ending in about 12 feet of water.

6. Sir A. Rendel in his report suggests piers running out from one or both sides of the river with the idea of effecting a scour.

Considering the narrow range of tides and restricted area of the tidal backwater, this could have little effect unless made dangerously narrow when the probable effect would be the formation of a new bar just outside the piers. Besides no contraction of the entrance is permissible on account of periodic river floods, which occur every few years, flooding the lower parts of the town. These floods would be far more destructive were it not that they gradually enlarge the outlet by scouring away the sands accumulated since the previous flood. In the case of a groyne narrowing the entrance, it would have no more effect in improving the channel in ordinary years than the present sand bank, while in years of cyclonic floods, unless itself destroyed by the flood, the result to the town would be most disastrous.

3512/13

7. In another paragraph he states "that it must not be forgotten that a bar is also a breakwater protecting the area within it from the sea." This bears out what I have always maintained that no scheme can be effectual that does not provide protection to the entrance from the south, the only exposed quarter. Only his proposed length of 200 feet does not go far enough.

8. Having protected the bar it can then be dealt with as required. No difficulty would be experienced in deepening it by dredging if considered necessary.

9. It is not enough, however, to clear away the bar without taking steps to prevent its reforming.

10. The bar consists of pure sea-sand, a considerable movement of which takes place up and down the coast varying according to winds, tides and currents, the greatest movement being between high and low water mark. The usual result of placing an obstruction on the shore of this coast is for the sand to slowly creep round it.

11. On the south side of Vizagapatam, owing to the peculiar rocky nature of the coast, there is no supply of sand available. On the north side, however, there is a stretch of sandy beach 3 miles in extent to Waltair point beyond which again the coast is rocky. This stretch of beach is broken up by five or six natural barriers of rock which, to some extent, impede and limit the movement of sand up and down.

12. During the south-west monsoon the movement is northwards, but has little effect close to the town owing to the protection afforded by the Dolphin's Nose. During the north-east monsoon the sand gradually shifts back again till arriving at the river mouth further progress southwards being stopped, it is forced up the river filling a large portion of the backwater opposite the Customs House, remaining then till washed out again by the aid afforded by the river after rain.

13. That this destructive movement of sand southward during the north-east monsoon which continues as long as north-east winds prevail up to January and February can be stopped there is no reason to doubt as we have shown that the supply of sand is limited.

14. Regardless of expense this could be effected at once by running out a breakwater into deep water. As, however, the movement of the sand is gradual and is almost entirely confined to between high and low water, it would be as effective and much less costly to throw out a groyne to just outside the line of surf into about 12 feet of water, and as the sand crept round the head to keep on lengthening the groyne so as always to keep the end in [illegible] feet of water.

15. As this groyne would be at right angles to the wave line, it might be cheaply formed of large rubble only. In support of the practicability of this proposal, I would state that nearly fifty years ago the sea threatened the sea wall in front of the town, when three or four rubble groynes were at the suggestion of Sir Arthur Cotton thrown out to protect it at a cost of about Rs. 20,000. These have been entirely successful.

16. As regards the position of this groyne, it should not be too near the river entrance and I would suggest the lengthening of the first of Sir A. Cotton's groynes, which might be supplemented by the construction of one or two shorter groynes as might be thought necessary after careful local examination.

17. These two works being carried out, the breakwater on the south side to protect the entrance from the waves and surf, and the groyne on the north shore to stop the shifting of the sand, the effect would be that the bar, instead of deteriorating after the end of the ensuing south-west monsoon, would remain at the same depth all the year round, and, instead of perpetual surf, would have smooth water, rendering the port safe and practicable for cargo boats and steam launches in ordinary weather at all tides and times.

18. My estimate of the cost of these proposals is Rs. 95,000 or Rs. 1,45,000 according to the design of breakwater adopted.

Further note by the Acting Chief Engineer, Public Works Department.

It will, I think, be seen from my "note" written before the receipt of Mr. Moore's memorandum that I am in accord with him as well as with some other engineers who have considered the subject as to the absolute necessity for thoroughly protecting the entrance to the backwater from "the action * of the surf and from the effect of violent storms" before any permanent improvement is possible. Mr. Moore, however, anticipates that this can be effected by a "breakwater" some 800 feet long to the south of the entrance and a "groyne" to its north, both ending in "12 feet of water," whilst I have no doubt that the

* Para. 9 of note.

length of the protecting barriers would have to be much greater and that to be permanent they would have to be massively constructed "sea walls." I do not † believe that a "groyne" of "large rubble" even if carried out only to 12 feet depth of water at low tides would stand the seas to which it would be exposed during cyclones, or even in ordinary heavy weather; and if such a structure were destroyed its ruins would be heaped about the anchorage and the backwater entrance.

† See also para. 35 of Mr. Thorowgood's report.

2. Possibly it would not be necessary to construct a complete outer harbour to efficiently shelter the backwater entrance from the forces which now prevent its improvement, but I am convinced that the protective works required would be most advantageously disposed so as to form at all events part of a possible future harbour.

3. It has been suggested that the groynes or walls might be so constructed that they would enable the tidal scour and land water to keep a deep channel always open. This suggestion has received consideration at various times; it did so in 1873, see Captain Beatty's report with Proceedings of the Madras Government, No. 603, dated 25th February 1873, and again in 1880, see Colonel Chrystie's report with Proceedings of the Madras Government, No. 749, dated 22nd March 1880. I entirely agree with the views on the subject expressed in paras. 36 and 46 of Colonel Sankey's note with Proceedings of the Madras Government, No. 1939 W., dated 13th August 1880, and also with what Mr. Moore says in para. 6 of his memorandum.*

4. In connection with this I would point out that for the greater part of every year there is absolutely no land water falling into the backwater, and often there are intervals of years during which the discharge of the river, even during the rains, is inconsiderable. As, however, the whole catchment basin of the little river lies within the influence of all cyclones which strike the coast in the neighbourhood, the discharge is at times very heavy.* At such times the amount of silt brought down would probably cause some trouble in an enclosed outer harbour, necessitating dredging and the provision in the southern wall of powerful scouring vents to be kept open when the river was in flood.

* See marginal remark at end of para. 6 of "note" and end of para. 9.

MADRAS,
28th November 1892.

(Signed) G. T. WALCH,
Acting Chief Engineer, P.W.D.

ORDER—dated 22nd December 1892, No. 3512 W., Public Works.

Ordered that the Government of India be addressed.

[Here enter No. 3513 W., Public Works, dated 22nd December 1892.]

(True Extract.)

(Signed) G. T. WALCH,
Ag. Secretary to Govt., P.W.D.

To the Superintending Engineer, I Circle.
" Marine Department.

Exd. S. J. Pereira.
Spare Copies

5128/7

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of {1892} Madras.

PUBLIC WORKS.

Dated December, 22nd.

Read. *Encl.*

G.O., 22nd Dec. 1892, No. 3512 W.

DECEMBER.

Vizagapatam Harbour

Ordered that the Government of India be addressed on the subject of the improvement of the — with special reference to Mr. F. N. Thorowgood's proposals.

3512/93
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Appendix to G.O., No. 3512 W., dated 22nd December 1892.

Precis.

In 1861 and 1862, two portions of the swamp at Vizagapatam, aggregating 79 acres in extent, were granted to a Mr. Warfield subject to the payment of an assessment of Rs. 12. Mr. Warfield sold this land to a native who resold it to the Right Rev. Dr. Tissot, the Roman Catholic Bishop of Vizagapatam. In 1868, Dr. Tissot applied for an additional piece of land which, together with that already purchased by him, he wished to convert into a model farm for the orphanage attached to his mission. This was granted subject to the payment of an assessment of Rs. 22 (G.O., dated 11th March 1868, No. 636). The extent of the land was not specified, but as it was proposed to assess it at the same rate as the lands granted to Mr. Warfield, the area has been calculated to be acres 145. In 1869, Dr. Tissot applied for a further grant of 1,000 acres of the swamp which he considered absolutely necessary to ensure success in the trial he was making to establish a model farm. This was also granted subject to the payment of an assessment of Rs. 88 and subject also to the condition that 100 acres should be reclaimed every year, one year being allowed for preparations (G.O., dated 17th March 1869, No. 722).

2. On a representation from Dr. Tissot, the Government modified its order of March 1869 so far as to allow him to hold the land (1,000 acres) free of assessment during the first ten years, and observed that he should still [illegible] which bound him to reclaim at least 100 acres of the swamp every year (G.O., dated 22nd November 1869, No. 3007). In 1871, he applied for an extension of the time allowed for reclamation from 10 to 40 years and for the remission of assessment for the whole period, but the Government passed the following order:—

"The free grant for 10 years will be altered for a free grant for 21 years. A certain portion of the swamp (to be fixed by the Collector with the sanction of the Board) to be reclaimed triennially, in default the grant to lapse to the Government" (G.O., dated 7th July 1871, No. 1169 A.) Later on in the same year he applied to the Board to obtain a modification of these terms, but in its Proceedings, dated 30th October 1871, No. 4539, it declined to take further action observing "it is not to be supposed that the Government will show any rigour in the enforcement of the penalty of resumption if it can be proved that the Bishop has done his best at every triennial inspection of the undertaking by the Collector."

3. In 1874, the Collector and the District Engineer were of opinion that Dr. Tissot had not observed the terms of the grant, as only acres 13½ had been brought under cultivation and that as his action was prejudicial to certain proposed harbour works, the grant should be cancelled. The Advocate-General was consulted as to whether the land might be resumed, and, on his advice, the Board was directed to inform Dr. Tissot that the grant had been cancelled. The Government also expressed its willingness to consider favorably any fair claims for compensation (G.O., dated 8th May 1874, No. 567). Dr. Tissot protested on several grounds, one of which was that he undertook only to drain the lands and that he had reclaimed the whole swamp in the sense of rescuing it from the water. The Advocate-General, who was again consulted, advised an amicable settlement. The order of resumption was held in abeyance and Captain Taylor, Master Attendant at Madras, was directed to report on the effect which the reclamation had or was likely to have on the harbour (G.O., dated 17th October 1874, No. 1341). Captain Taylor's report was in favour of the reclamation and Dr. Tissot was, therefore, permitted by Government to proceed with his work (G.O., No. 509, dated 2nd April 1875).

4. In 1890, the Collector of Vizagapatam, understanding the word reclamation in a different sense, reported that Dr. Tissot's enterprise had proved a complete or almost complete failure, and that it was necessary, therefore, to cancel the grant. He observed "a little land along the upper or northern edge of the swamp has been brought under cultivation and a purposeless tank or two has been dug, but this is all that can be reasonably called reclamation. It is true that more or less effective bunds have been thrown up to prevent the tidal water from spreading across the lower portion of the swamp, and that it is less subject to inundations and becoming water-logged than it was, but this does not fairly fall within the meaning of the word." He accordingly proposed to call upon Dr. Tissot's successor to prove that the conditions under which the grant was made had been fulfilled. The Government, however, was of opinion that the word "reclamation" used in the correspondence relating to the grant of 1869 simply meant "drainage" and that the grant could not be cancelled, the conditions thereof having been fulfilled. The term of 21 years, for which exemption from assessment was conceded, having expired on the 28th December 1890, after allowing for the period of suspension of the work in 1874 and 1875, the Collector was directed to inform Dr. Tissot's successor that the land (1,000 acres) granted in 1869 was liable to assessment from fasli 1300 (1890–91) and to ascertain whether the mission was willing to retain possession of the land on payment of assessment (G.O., dated 13th April 1891, No. 305). Reverend J. M. Rossat (Dr. Tissot's successor) has intimated that the mission wishes to retain possession of the land and paid the assessment forthwith (G.O., dated 23rd July 1891, No. 4171). From the Collector's report submitting his letter it appeared doubtful whether the swamp was really drained as the Government supposed. A report on this point was therefore called for and is still awaited.

22ND DECEMBER 1892, No. 3513 W., PUBLIC WORKS.

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PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

LETTER—from

G. T. WALCH, Esq.,
Acting Secretary to the Government of Madras,
Public Works Department,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
PUBLIC WORKS DEPARTMENT.

SIR,

In continuation of my letter No. 3450 W., dated 17th December 1892, I am directed to forward herewith, for the consideration of the Government of India, the accompanying collection of papers on the subject of the improvement of the Vizagapatam harbour with special reference to Mr. F. N. Thorowgood's proposals.

2. It will be seen from the note of the Acting Chief Engineer, Public Works Department, that, in his opinion, the proposals of Mr. Thorowgood will not effect the improvement of the entrance to the backwater can be secured unless the place is efficiently protected from the action of all heavy seas and surf.

3. I am also to forward a *précis* of the correspondence which has taken place on the subject of the scheme of land reclamation at the mouth of the river referred to by Mr. Thorowgood; also copies of the undermentioned Proceedings of Government quoted in the notes by the Chief Engineer:—

G.O., No.	603,	dated 25th Feb.	1873.
" "	337,	" 27th June	1873.
" "	749,	" 22nd March	1880.
" "	1939 W.,	" 13th Aug.	"

I have the honour to be,
Sir,
Your most obedient servant,

(Signed) G. T. WALCH,
Ag. Secretary to Govt., P.W.D.

FORT ST. GEORGE,
22nd December 1892.

X
3450W of 17.12.92
To the Govt of India.

Exd. S. J. Pereira.
Spare Copies

I am directed to acknowledge the receipt of your reminder No. 328 W. of 1.12.92 on the subject of Mr. Thorowgood's report on the Vizagapatam harbour & to say that the matter is receiving attention. The proceedings of this Govt will it is expected be shortly laid before Govt of India.

Shew to G.O.W
Pl
W.

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of {1892} Madras.

PUBLIC WORKS.

Dated December, 22nd.

Read.

Encl.

22nd Dec. 1892, No. 3513 W.

DECEMBER.

Vizagapatam Harbour

Forwarding for the consideration of the Government of India a collection of papers on the subject of the improvement of the — with special reference to Mr. F. N. Thorowgood's proposals.