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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

P-W DEPARTMENT

G.O. No.	857-W	Press.
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Ch. Govt

Not to be folded or roughly handled.

A BRIEF HISTORY OF THE CRUZ MILAGRE DAM, COMPILED FROM
THE RECORDS OF THE CHIEF ENGINEER'S OFFICE.

In September 1868, when passing orders on a report submitted by the Consulting Engineer for Railways on the general question of the extension of the railway system in this Presidency, the Government remarked that "the recent action of the sea near Cochin and the protective measures which have in consequence been rendered necessary suggest the propriety of a deliberate professional opinion being obtained on the capabilities of the Cochin backwater as a harbour, and the value and prospects of that port, as well as of the anchorage at Narakal." The Government accordingly requested the Master Attendant of Madras, the Consulting Engineer for Railways, and Mr. Anderson, Chief Engineer of the Madras Railway Company, "to investigate the present circumstances and future prospects of the port."

2. The report of the Committee thus appointed was submitted in December 1868, and, among other matters, the "Cruz Milagre Gap," near Cochin, was reported on. In 1862 the sea, which had for some years been making gradual inroads upon the coast to the north of the town of Cochin, broke through into the backwater at a point called "Cruz Milagre" (or the Miraculous Cross, from a church of that name which formerly stood there, but which had been submerged) about a mile and-a-quarter to the north of the Cochin channel,* and the gap then formed, though it had varied in size from year to year, had never been closed.

* Old mouth of the backwater.

When examined by the Committee the width of the gap was nearly 300 yards and the depth of the water at low-tide exceeded twentyone feet in some places. The Committee recorded their unanimous opinion that there could be no question "as to the danger with which the very existence of the port of Cochin is threatened so long as this gap remains open."

3. Although the depth of water in the greater portion of the Cochin channel † and river harbour had not been affected by the gap, nor had there been any sensible diminution of water over the bar the

† Old mouth of the backwater.

effect of the escape to the sea, through the Cruz Milagre Gap, of a large volume of water, which would otherwise have contributed its force to scour the Cochin channel, had become manifest by the gradual silting up of the southern margin of the channel. The Committee therefore urged the necessity of at once closing the gap in the manner suggested by Mr. Dalrymple, the Master Attendant of Madras, namely, by the construction of two groynes, one being run from the north and the other from the south side of the gap.

4. In submitting the Committee's report for the orders of Government, the then Secretary to Government, Public Works Department, Colonel Orr, remarked that it appeared to him doubtful whether groynes placed as recommended would effect what was expected of them to the extent of causing a sufficient accumulation of sand to close the gap. He thought that they would only make the opening tortuous and deeper—to say nothing of the cost of the groynes, which would be heavy. Colonel Orr considered that an attempt should be made to accomplish the desired object, in the manner practised in Tanjore and other localities for closing breaches in river and channel banks, by means of "modussils" made of palmyra or cocoanut trees, and by brushwood, grass and earth.

5. In disposing of the Committee's report the Government accepted Colonel Orr's recommendation and directed that "before adopting the more costly expedient of constructing stone groynes, the simple

G.O., No. 453, dated 11th February 1869.

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and inexpensive method by which breaches in river and channel banks are closed in Tanjore by means of 'modussils' should be tried."

6. In October 1870 an estimate, amounting to Rs. 31,500, for closing the Cruz Milagre Gap in the manner above mentioned was sanctioned; and the Cochin Sirkar shortly afterwards consented to contribute towards the cost. The work was commenced, but in January 1871 the

G.O., No. 2543, dated 25th Oct. 1870.
" 2767 " 17th Nov. "
" 147 " 19th Jan. 1871.

Government were informed of the arrival from England of an Engineer who had been deputed by the Secretary of State to examine and report on the harbours of India. It was therefore directed "that

G.O., No. 587, dated 28th February 1871.
all further outlay on the operation of closing the Cruz Milagre Gap be suspended until Mr. Robertson, the Harbour Engineer, has had an opportunity of inspecting that gap and of affording the Government the benefit of his advice."

7. In April 1871 Mr. Robertson communicated his opinion that the gap might be closed, without much difficulty and a little expense, by throwing out a groyne from the inner northern angle of the gap, so that the current might be diverted sufficiently to cause comparatively still water in the opening. This, Mr. Robertson thought, would allow the natural action of the sea and the incoming tide to do spontaneously what could only be accomplished artificially at a great expenditure of labor and money. He considered that the sand brought in from seaward would soon diminish the depth of the breach sufficiently to permit of its being finally closed by manual labor.

8. The Government thereupon directed the Superintending Engineer to put construction of the groyne in hand, and to take the necessary steps for protecting opposite angle of the gap with a revetment of stakes and stones. It was observed the groyne need not be formed entirely of stone, but could be constructed of leaves, or grass and clay, strengthened necessary, with loose stone. An estimate amounting to Rs. 8,662-8-6, was sanctioned for the work in June 1871.

G.O., No. 1567, dated 12th June 1871.

9. It was soon found impossible to face strong current running through the with a groyne constructed of the specified materials, and a revised estimate of Rs. 24,824 for a substantial stone groyne was therefore sanctioned by the Government in December 1871.

In May 1872, the Superintending Engineer reported that the groyne had been a length of 115 feet, and that, although it was an experimental one, hope of its terminating successfully. He submitted a further estimate, Rs. 15,277, for the extension of the groyne for 80 feet and for the southern bank. The Government were, however, of opinion that it was too late in the season to make any further attempt to close the gap as river freshes might be expected shortly, and

G.O., No. 1125, dated 2nd May 1872.

therefore directed that the estimate lie over until fresh observations had been taken after the monsoon.

11. In accordance with these instructions the Superintending Engineer, in due course, inspected the gap, and found that, in consequence of the wind having blown freshly from the northwest for several days, the gap had been suddenly widened to a considerable extent. After carefully studying the action of the groynes, the Superintending Engineer recommended, in June 1872, that all further lengthening of the experimental stone groyne should cease; and, in lieu thereof, a sand-bag groyne, 100 feet in length, should be constructed parallel to the stone groyne. He thought that four parallel equidistant groynes would reduce the gap to damable proportions. The

G.O., No. 1757, dated 24th July 1872.

Government approved the Superintending Engineer's recommendations and sanctioned an estimate of Rs. 15,277 in order that they might be carried out.

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18 MARCH 1886, No. 857

GOVERNMENT OF DEAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

READ—the following paper:—

From the Superintending Engineer, IV Circle, dated 2nd February 1886, No. 80 C./E.W.

ORDER—dated 30th March 1886, No. 357 W., Public Works

Ordered that the annexed history of the Cruz Milagre Dam, which has been prepared in the Chief Engineer's office be recorded in the Proceedings of Government.

(True Extract.)

(Signed)

J.

STEWART, Colonel, R.E.,
Secretary to Govt. P.W.

To the Superintending Engineer, IV Circle.
" Chief Engineer for Irrigation.
" Marine Department.

Exd. E. Fernandez.
Spare Copies

BUI

Govt. of 1883

PUBLIC WORKS.

dated March, 30th.

Recd.

Enc.

G.O., 30th Mar. 1886, No. 857 W

MARCH.

Cruz Milagre Dam

History of the —, recorded.

12. On the completion of the first sand-bag groyne it was found that the actual result was not up to expectations, as the spit of sand deposited on the sea-face of the groyne did not extend beyond the head of the groyne. It was therefore necessary to construct an artificial base, from which the second sand-bag groyne could be projected; and this was done by laying a return of sand-bags—55 feet in length—at right angles from the head of the groyne running seawards. The second sand-bag groyne was then constructed; but precisely as the anticipated effect of the first sand-bag groyne fell short of what was realised by the experimental stone groyne, so the anticipated effect of the second groyne fell short of what was realised by the first sand-bag groyne.

13. With regard to the financial aspect of the question at this stage, it should be stated that out of the Rs. 15,277 sanctioned by the Government, no less than Rs. 7,309 had been expended in protective works to the gap and for maintenance during the monsoon of 1872; thus leaving Rs. 7,968 only for executing the actual closing of the gap by means of *echelon* sand-bag groyne. This sum, the District Engineer reported, had been largely exceeded already although the work had not approached completion. The first groyne, the return, and the second groyne had cost, respectively, Rs. 5,860, Rs. 1,330, and Rs. 8,400; or in all Rs. 15,590. From the foregoing data it was calculated that the second return would cost Rs. 3,300, and the third groyne Rs. 7,000; but there were large contingencies to be provided for, and the District Engineer was of opinion that the work would be completed for Rs. 15,000, which, added to the excess expenditure already incurred, brought the total to Rs. 22,550. This was the amount required for finally completing the work.

14. In passing orders on the report, the Government remarked that the sand-bag groyne *en echelon* had proved practically more expensive and less efficient than a sand-bag Dam directly across the gap would have been; and directed that, on completion of the second sand-bag return, sand-bags should be deposited in a direct line between its end and the nearest point of the opposite shore, so as to shallow the gap as quickly and directly as possible. The Government could not specially appropriate funds to cover the excess expenditure incurred, but the question of the provision of Rs. 15,000 stated to be necessary for the completion of the work would be considered in the Financial Department. The required amount was allotted in the following month.

15. Immediately on receipt of G.O., No. 1323, dated 13th May 1873, Colonel Farewell commenced the Dam across the Cruz Milagie Gap. It was completed to 2 feet above low-tide level by the 25th June, or within a month and a week. It was not perfectly water-tight, but the leaks were stopped as discovered. Colonel Farewell did not propose to protect the Dam by a roughstone revetment inside the bank, but he hoped that at least 8 or 9 feet of clay would silt on in front of it, by which the toe of the Dam would be well secured. Fresh sand-bags were to be added as required, to protect the contents of the old bags when they commenced to decay. It was hoped that with due care the front of the Dam would be silted straight within two months.

16. In reporting the satisfactory completion of the work, Colonel Farewell stated that the total cost of closing the gap (876 feet in width) including maintenance and expenditure from first to last amounted to Rs. 83,827. The actual cost of the Dam was Rs. 24,614, and of the entire work as completed Rs. 59,230, while establishment, contingencies, &c., cost Rs. 24,597. Of this sum a certain portion was defrayed by the Cochin State, the closing of the gap being one of the "coast defensive works" towards the cost of which the Cochin State contributed Rs. 30,000.

17. In December 1873, a revised estimate for the work, amounting to Rs. 72,320,* was submitted for sanction. The excess was owing to the Dam having sunk considerably, and Colonel Farewell reported

* Exclusive of establishment, contingencies, &c.

that he had authorised the District Engineer to thoroughly secure the Dam by adding sand slopes outside and sand-bags. The revised estimate was as follows:—

	RS.	A.	P.
Total additional amount required for strengthening the Dam.	10,080	6	3
Amount actually expended on the work before the original estimate was submitted, but which was inadvertently omitted	2,999	9	9
Amount of original estimate	59,240	0	0
Total	72,320	0	0

18. During the next two years various estimates for minor works and repairs were sanctioned, and sundry bills on account of actual expenditure on the maintenance of the Dam were passed.

19. In November 1875, the District Engineer, Malabar, submitted a report on the beneficial results of the closing of the gap. Among other improvements reported may be noticed the fact that at low-tide there was a foot more water over the bar at the mouth of the Cochin harbour than there had been during the preceding year. The Government ordered the report to be recorded "with the renewed expression of the satisfaction of His Excellency the Governor in Council at the success with which the operations of closing the Cruz Milagre Gap and guarding against erosion of the coast at Cochin has been attended."

G.O., No. 3450, dated 6th December 1875.

20. From this time until the middle of 1878 no important alterations or repairs to the Dam were carried out; but several estimates for minor works and bills for maintenance were sanctioned. An estimate of Rs. 8,260 for widening the Dam to 50 feet at the top was sanctioned in September 1878.

G.O., No. 3682 W., dated 19th September 1878.

21. There is nothing else important on record in connection with the Dam until August 1881, when the Government approved the undermentioned arrangements for future guidance in connection with the Cruz Milagre Dam and groynes at Cochin—

G.O., No. 1883 W., dated 1st August 1881.

- (a) That the Dam, groynes, &c., should be in the charge of the Port Officer, Cochin, who should, under the Marine Department, carry out all necessary repairs to them which did not exceed Rs. 1,000; and even repairs exceeding that amount under special arrangement. That the Public Works Department should, when called on, give their advice regarding the repairs, &c., and should also occasionally inspect the works; and, if necessary, report on their state and recommend any action they considered necessary.

During the same month the Superintending Engineer brought to notice that the eastern side of the Dam required protection as the shingle revetment had sunk below high-tide level and consequently the earth was being gradually washed away. The Port Officer recommended a permanent protection of stone for the thorough repair of the Dam. It amounted to Rs. 1,350 and was sanctioned in May 1882.

G.O., No. 1802 W., dated 1st May 1882.

23. The question of the incidence of the charge of maintaining the Dam in good repair having been again brought forward, and it having been represented that the Cruz Milagre Gap was closed in the interest of the port of Cochin, viz., for increasing the scour on the Cochin bar, the Government directed that all such charges should be debited to Port Funds.

24. The next paper on record in connection with the Cruz Milagre Dam is a note by the Chief Engineer, dated 16th February 1883. Having been at Cochin in the early part of the month, he took the opportunity to examine the works at the gap. These he found in fair order, and in the memorandum referred to said: "From information on the spot it would seem that on the setting in of last monsoon the sea after reducing the sand spit in front to some 90' in width bowled freely over at high-tide and caused a rather heavy wash against the east face of the bund, flattening the slope on that side. It would be well to have the edge of the revetment of the bund on this side dealt with in the same way as the west, i.e., with larger material; and, again, that the whole of the top of the bund should be covered with rabbit wort to hold better together the sandy surface. A few small trees, in themselves perhaps harmless, have been allowed to grow on the top of the bund but should be cut away, and all kept quite clear of trees as the roots may displace the stones of the revetment. I could not well ascertain whether any erosion is going on the side of the backwater during flood, and think it will certainly be necessary to have a sufficient number of cross sections taken and recorded after every monsoon so as to help future reference on this point. The sections should extend to 60' or 80' on both sides of the bunds, and embrace the whole work from south to north. These should be regularly submitted yearly to the Chief Engineer." These remarks were communicated for the information and guidance of the Superintending Engineer.

No. 460 C., dated 21st February 1883.

25. In November 1883 the Superintending Engineer submitted an estimate, amounting to Rs. 1,920, for revetting the east or lagoon side of the Dam, and covering the top with "rabbit wort" in the manner directed by the Chief Engineer in his memorandum above quoted. The estimate was sanctioned for early execution, and the necessary allotment made from Port Funds.

26. In February 1885, Colonel Beatty reported that the works ordered by the Chief Engineer had been fully carried out; but as the sections showed a tendency towards the deepening of the river bed on the side of the backwater, he recommended that to prevent the toe of the revetment on the backwater side of the Dam from slipping, about two cubic yards of stone per running yard should be dropped in along the toe of the revetment. It was at the same time reported that the lagoon was apparently being gradually filled up by silt brought in through the escape by the river floods, and also by drift sand from the sea-beach.

G.O., No. 605 W., dated 13th March 1885.

" 1613 W., " 13th July "

The Government directed that the work recommended by the Executive Engineer should be carried out; and the estimate which amounted to Rs. 2,190, was sanctioned in July.

27. It having been reported by the Superintending Engineer that the planting of cocoanut trees on the lagoon side of the sand-bank that lies between the Cruz Milagre Dam and the sea would greatly tend to strengthen the bank and protect the Dam, the Cochin Government was addressed on the subject. In reply, the Cochin Government stated that there was no objection to the measure, but it was desirable that the land should be parcelled out to different persons who would expend capital and who were either natives or permanent residents of the State. It was requested that arrangements might be made for the payment of rent for the land. The Superintending Engineer was instructed accordingly.

G.O., No. 2245 W., dated 28th Sept. 1885.

28. The latest cross sections of the Dam were taken in May 1885; they show that the lagoon is silting up gradually, and that there is a slight scouring action going on at the backwater face of the Dam. If this continues it will become necessary to specially protect the Dam on the backwater side.

29. The entire cost of the work, up to the end of 1885, has amounted to about Rs. 1,20,000.

CHEPÁK.

1st April 1886.