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MADRAS RECORD OFFICE.

Government of Madras.

PUBLIC DEPARTMENT.

G.O. No. Press Mis.

Dated 18

Not to be folded or roughly handled

No. 243. Read the following letter from the Acting Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Public Works Department, dated Madras, 18th August 1870, No. 50 :—

I HAVE the honour to submit, for the information of Government, a report as per margin from the Chief Engineer of the Madras Irrigation and Canal Company to the Agent of serious damage to the Main Canal from heavy floods on the night of the 6th instant. The fall of rain between 10 P.M. on the 6th and the same hour next morning is reported to have been very nearly 12 inches, while the greatest fall in the same number of hours previously recorded was 4 inches, and the greatest fall in one month 13¾ inches. The result was that the canal was subjected to a sudden and most severe test, which was followed by several breaches, four above and three below Kurnool, the most important of which are one just below the Hindry Aqueduct, and the other at the junction of a high wall in the 24th mile and the bank. The Chief Engineer has promised a further and fuller report, in which I have requested him to mention the depth of the water at the head-sluice as gauged throughout the night of the 6th instant, as also at what hour those sluices were closed and the water shut off; and also to furnish a description of the section as exposed by the breach adjoining the Hindry Aqueduct, for as the calingulahs or waste weirs in the 1st Section, that is for 17 miles from Soonkasala, have an aggregate waterway of 2,547 feet or nearly half a mile, it might be expected that even such an unprecedented fall of rain would pass safely over them if the river water had been shut off in proper time. Moreover, the depth of water reported to have passed over No. 1 Calingulah is 18 inches, and over No. 9 Calingulah 12 inches, which is equivalent to a depth of water of 9 feet 6 inches and 9 feet above bed level where the ordinary full depth is 8 feet, not a greater extra depth than a work of the kind should be capable of bearing without injury, unless there was something faulty in the original design or defective in the work of construction.

No. 1,206, dated 9th August 1870.

From the Chief Engineer, to the Agent and Manager of the Madras Irrigation and Canal Company, dated Kurnool, 9th August 1870, No. 1,206.

Floods and damage of 7th August 1870

I HAVE the honour to report a casualty to the Company's Canal as sudden and unexpected as it might have been easily provided for had such a contingency been thought possible.

2. The heaviest rainfall in Kurnool in any one day of which I have any reliable record are 10th September 1862, when 3½ inches fell between 1 and 6 A.M., and the nights of 24th and 25th *idem* when 4 inches fell; in that *month* 13·77 inches fell. In no other *month* (omitting the year 1866 of which I have no record at hand) has more than 7¾ inches fallen, that was in August 1865. Since the 1st January 1868 the rainfall has exceeded 2 inches in twenty-four hours four times only, as

shown on the books of the Government Meteorological Observatory, Kurnool, under the able charge of the Civil Surgeon, namely,—

30th August 1868	2·625	inches between	10 A. M.	and	4 P. M.
	0·052	,, ,,	4 P. M.	,,	10 P. M.
Total...	2·677				
29th September 1868 ...	2·275	,, ,,	10 P. M. (28th)	,,	10 A. M.
10th October 1869 ...	1·746	,, ,,	10 A. M.	,,	4 P. M.
	0·307	,, ,,	4 P. M.	,,	10 P. M.
Total...	2·053				
7th August 1870	11·811	,, ,,	10 P. M. (6th)	,,	10 A. M.
	0·198	,, ,,	10 A. M.	,,	4 P. M.
Total ..	12·009				

3. The rainfall caused the disasters to the canal. It commenced about 10 P. M. on the 6th and continued till a little after 10 A. M. on the 7th. The rain came up from the south-west, and therefore moved in the direction from source to mouth of the streams passing under or into the canal. On the morning of the 7th the rain was so heavy that the Collector could not feel certain, even with a good glass, whether one of the leaks in the canal bank, which he could see from his verandah just on the other side of the river, was merely the pattering of the rain or no.

4. The calingulahs and culverts of the canal in the 4th and 5th Sections were calculated for a depth of a quarter inch of rainfall per hour running off the country. All recent ones have been built for double that amount. The number of calingulahs in the first 24 miles is sufficient for a greater discharge, and not only the late Consulting Engineer, Major Mullins, but even the Secretary to Government, Department Public Works, Colonel Orr, have on their inspections commented on the subject of their unusual number and length. They proved, however, wholly insufficient to pass this immense mass of water over the canal. No. 1 Calingulah is reported to have had 18 inches of water pouring over it, No. 9 had 12 inches, as observed by Mr. Crawford, and since it is 400 yards long, even if we take a very low co-efficient, this discharge exceeds the full discharge of the canal. At the Hindry Aqueduct the water rose so high as to flow over the coping of the wing-walls of the aqueduct.

5. There are four cases of partial or total breach reported by the bankers above Kurnool, and three breaches are known to have occurred below Kurnool. Of these the important ones are one on the lower side through the masonry revetment close below Hindry Aqueduct, and the other between the high wall in the 24th mile and the bank, which last has carried away about a chain of the wall and four chains of the banks. In both cases the neighbouring aqueducts of Hindry and Kaderbagh respectively became waterfalls of tremendous violence. In the former the masonry revetment below was injured, and all the paved slope removed. In the latter a few coping stones were removed from the body wall of the protective weir and some shingling carried over, but no other damage is perceptible. These works are best described from Mr. Dodson's report for February 1865, dated 14th March 1865. "From the aqueduct to the end of the 18th mile the canal runs between masonry retaining walls backed by earth embankment. These walls are nearly vertical, and in parts are 25 feet high."

* * * *

"Owing to the rocky nature of the country the surface soil is in many places so shallow that it "was found almost impossible to find sufficient material for the embankment. This difficulty has "been met by building walls of masonry across some of the valleys. In the 24th mile one of these "walls is, in the deepest part, 48 feet high, and lower down there are two others of nearly the same "height. In some places double dry rubble walls filled with clay have been substituted for masonry "walls."

Masonry revetment.—Mr. R. Smith, in his report for November 1864, says,

"*Hindry Aqueduct.*—The masonry revetment on the north of the aqueduct has been "built on one side to the full height, on the other 7½ feet above bed of canal. The masonry revet-

"ment on the south of the aqueduct, with the exception of a very short distance, is completed to "6 feet above bed of canal."

And Mr. Dodson, who took charge from Mr. R. Smith in January 1865, in his report for that month, says,

"Mile 18th, the earthwork is nearly completed, the slopes are being formed, the hollows "behind the masonry revetments filled in, and where the leakage was considerable a roadway of "clay has been formed to weight the toe of the embankment and check the filtration."

"(Signed) J. A. DODSON."

"*9th February* 1870.

"The trimming of the bank above the masonry revetment was on the principle recommended by Captain Mullins in paragraph 6 of his Inspection Report, No. 70, of 10th October 1866, and recommended by the Madras Government to the attention of the Company's officers in G. O., No. 3,474, of 31st idem, paragraph 2, for ordinary revetment. According to that recommendation the dry rubble revetment would stop at a height of 2 feet 6 inches above full water level, where a level berm 5 feet broad would be formed, and outside that the bank would be raised to full height making 6 feet height above water as sanctioned for such banks, and given a top breadth of 4 feet. In the case of the masonry revetment, the masonry was carried up only 2 feet above full water, that being the height sanctioned for side wall of canal elsewhere as well as for dry rubble walls (G. O. No. 321, of 4th February 1865,) and a berm made sloping towards the canal in order to prevent lodgment of water, and outside that a broad-raised bank 2 feet higher. As the bank settled this was continually made up. But as the revetment was not considered overstrong, (see Mr. R. Smith's report for December 1864,) care was taken never to pile up a weight of earth close to the back of the revetment, but rather to keep making it up to the level of coping, or a few inches only over it, yearly, as the bank settled.

The leakage underneath these banks had been so far stopped by the filling in of the sandy bed of the canal, sanctioned in G. O., No. 3,195, of 15th October 1867, that Captain Mullins did not allude to it while pointing out the places requiring attention on account of leakage in paragraphs 3, 5, and 6 of this Report No. 68, of the 26th September 1868, passed by G. O., No. 3,586, of 17th November 1868.

I cannot state further details till I have accurate levels and surveys which Mr. Crawford is now taking.

21th mile wall.—Mr. R. Smith, in his Report for December 1864, dated 10th January 1865, says,

"24th mile wall in deep gully. With the exception of 200 feet this wall has been raised "to the required height, and will be completed next month. Work executed, 195 cubic yards rubble "masonry and 640 cubic yards dry rubble centre filling."

Mr. Dodson is busily engaged in preparing a particular report and making personal inquiries. He expects to maintain irrigation in the *first* section. Meantime he is securing the work generally from chance of further damage.

The simple means of defending the canal against such another casualty is to have the upper foot or 18 inches of the calingulahs removed, and the height made up with boards easily removable during the wet weather when field water is never needed. These boards may be removed, or they may be made to open by merely moving a pin. But the truth is that to have avowedly provided for such a rainfall would have been considered an extravagance. Indeed, in the 4th Section, when a sluice was inserted into one of the sanctioned calingulahs, Government sanctioned a corresponding reduction of its length.

Extract from Chief Engineer's letter, dated Kurnool, 12th August 1870, No. 1,220.

"In reference to my letter of the 9th instant, reporting the damage done by the flood of Sunday, (7th instant,) I have the honour to mention an immaterial error, which I cannot correct. I described No. 9 Calingulah as 400 yards long. This, I think, is the length over all, and the length of opening is perhaps 720 feet."

Proceedings of the Madras Government, Public Works Department, 14th September 1870.

No. 351.

Copy forwarded to the Consulting Engineer for information.

Madras,
15*th August* 1870.

(Signed) F. H. HENSLOWE,
Agent and Manager.

No. 244. Order thereon, 14th September 1870, No. 2,213.

IRRIGATION, No. 14.

The Government greatly regret to learn from these papers that a fall of rain of unprecedented severity at Kurnool on the night of the 6th instant filled the Madras Irrigation and Canal Company's Canal to such an extent as to cause its embankments to give way in several places and to produce, it is to be feared, considerable damage in other respects besides emptying the canal of water at the height of the cultivating season. The Government believe that ample provision has been made for the escape of all flood waters from local rainfall over the numerous surplus weirs placed in the embankment for the purpose, and they are inclined to think that the canal could scarcely have filled to the depth reported from the effects of local rain had the head-sluices at Soonkasala been closed in proper time.

2. On this point, however, the Government will await the further report promised by the Consulting Engineer, but meanwhile they desire to know to what extent the repair of the injuries the Company's works have sustained, and the loss of the season's returns which will in all likelihood be the result, will affect the financial aspect of the Company's affairs as respects the probability of the funds still at their disposal being sufficient to complete their undertaking and to meet the cost of its conservancy.

(True Extract.)
(Signed) CHARLES A. ORR, Colonel, R.E.,
Secretary to Government.

To the Consulting Engineer for the Madras Irrigation and Canal Company.

Exd. E. C. Shunker

Consulting Engineer's Office
Irrigation & Canal Company
Madras, 18th August 1870.

No. 50.

Sir,

Colonel Cuppendale
Acting Engineer &c &c.

To
The Secretary to Government
Department of Pub: Works.—

Sir,

I have the honor to submit for the information of Government a report as per margin from the Chief Engineer of the Madras Irrigation and Canal Company to the Agent of serious damage to the Main Canal from heavy floods on the night of the 6th instant. The fall of rain between 10 P.M. on the 6th and the same hour next morning is reported to have been very nearly 12 inches, while the greatest fall in the same number of hours previously recorded was four inches, and the greatest fall in one month 13 3/4 inches. The result was that the Canal was subjected to a sudden and most severe test which was followed by several breaches, four above and three below Kurnool the most important of which are one just below

206-9th Aug. 70.

below the Windy Aqueduct, and the other at the junction of a high wall in the 24th mile and the bank. The Chief Engineer has promised a further and fuller report in which I have requested him to mention the depth of the water at the head sluice as gauged throughout the night of the 6th instant, as also at what hour those sluices were closed and the water shut off, and also to furnish a description of the section as exposed by the breach adjoining the Windy Aqueduct, for as the calingulahs or waste weirs in the 1st Section, that is for 17 miles from Soontiwala, have an aggregate waterway of 2547 feet or nearly half a mile it might be expected that even such an unprecedented fall of rain would pass safely over them if the River water had been shut off in proper time. Moreover, the depth of water reported to have passed over No 1 Calingulah is 10" and over No 9 Calingulah 12" which is equivalent to a depth of water of 9' 6" and 9' above bed level where the ordinary full depth is 8 feet, not a greater extra depth than a work of the kind should be capable of bearing without injury, unless there was something

P. W. Dept.

faulty in the original design or defective in the work of construction.—

I have the honor to be,
Sir,
Your most obedient servant
J. Ashmead Lt. R.E.
Engineer for L.B.C. Comp.

P. W. Dept.

No 2213

Proceedings of the Madras Government

Under date the 14th August 1870

Read the following

From the Ag Cons Engineer for I & C. No 60 of 18 August 1870.

I am prevented at present from

The Government greatly regret to learn from these papers that a heavy fall of rain at Kurnool on the night of the 5th instant filled the Madras Irrigation and Canal Company's Canal to such an extent as to cause its embankments to give way in several places and to produce it is to be feared considerable damage in other respects besides emptying the Canal of water at the height of the cultivating season. The Government

No 242

Ag Cons Engr's Office
Guntur 16th Aug 1870

Public Works Dept
Sir Proddatur 13th Aug 1870

The Collector of Kurnool
& the Secretary to Govt P.W. Dept

Submit herewith the information called for in Govt. Lr. No 2213 dated 9th inst from the Chief Engr. P.W.D.

The Collector of Kurnool reports damage to the Main Canal from the breach of the Guneru Vagu on the night of the 5th instant.

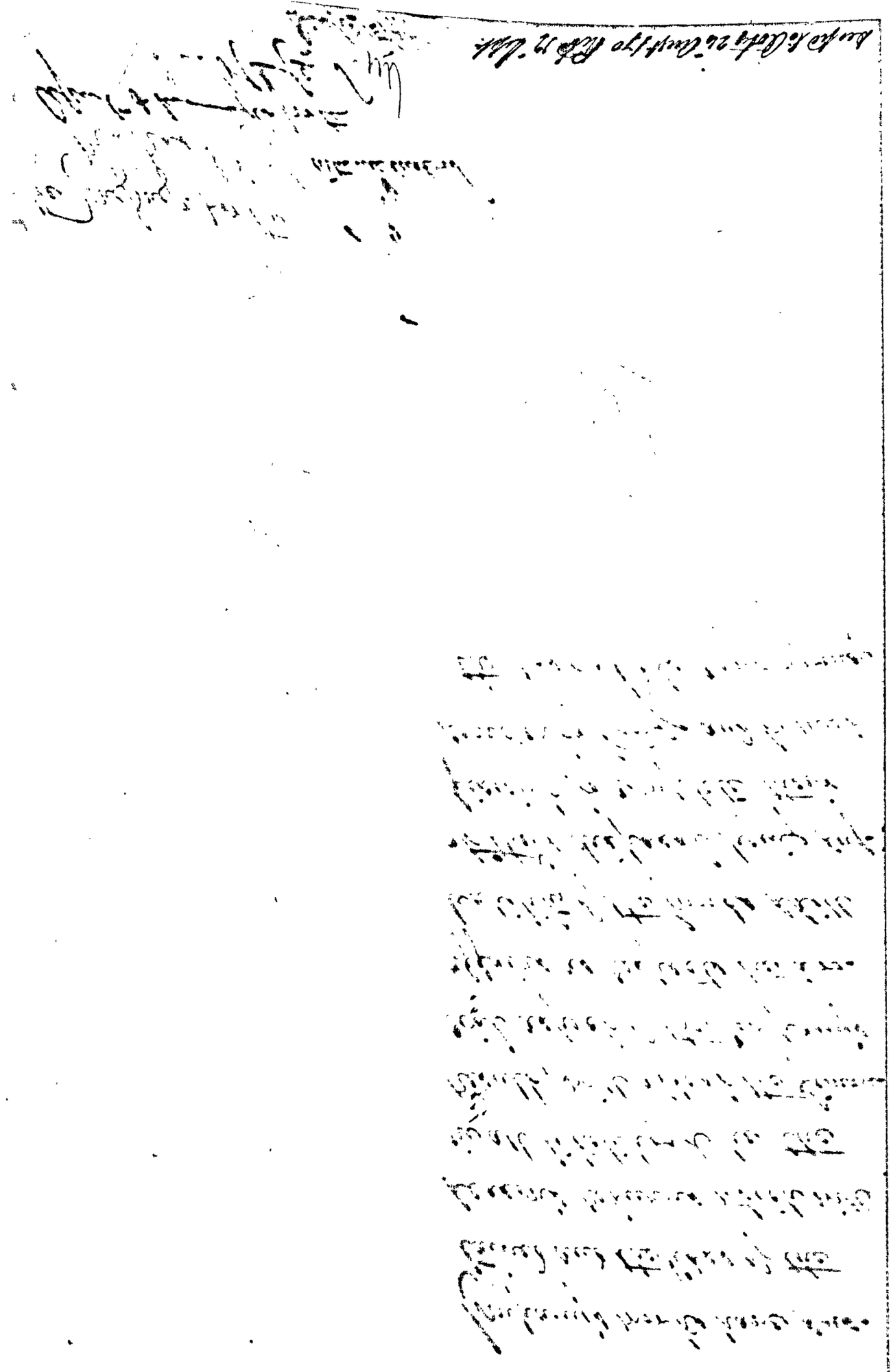
No 2242-14-9-70.

believe that ample provision has been made for the escape of all flood waters from local rainfalls over the numerous surplus weirs placed in the embankment for the purpose, and they are inclined to think that the Canal could scarcely have filled to the depth reported from the effects of local rain had the Head Sluices at Soonkasala been closed in proper time.

On this point however the Government will await the further report promised by the Chief Engineer, but meanwhile they desire to know to what extent the repair of the injuries the Company's works have sustained and the loss of the season's returns which will in all likelihood be the result, will affect the financial aspect of the Company's affairs as respects the probability of the funds still at their disposal being sufficient to complete their undertaking and to meet the cost of its conservancy

16

To the Managers for the
Madras Irrigation & Canal Co. with the enclosure
Agent & Chief Engineer
Dr. Hall Esq
Dec. 15th 1858



No 3243

Govt. of Bihar Orders.

PUBLIC WORKS.

To The Consulting Engrs for the Madras Irrigation and Canal Company

Dated

Read

Exd

No. 14 Sept. 2213

Nos. 243-744

Main Canal

Passing orders on the letter from the Asst Engr for the Madras I & C. Co reporting the damage occasioned to the Company's Main Canal by heavy rains on the 3. August last.

Sanctioned by Govt 24 Aug 1870 Rec'd 12 Sept