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REV DEPARTMENT

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Proceedings of the Madras Government, Public Works Department,
25th August 1876. *No.* 2,253.

No. 590. Read the following endorsement of the Chief Engineer for Irrigation, dated Ootacamund, 2nd August 1876, No. 146-W :—

From Major J. O. HASTED, R.E., Superintending Engineer, 1st Division, Kistna District, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, Madras, dated Camp at Nizampatam, 25th April 1875, No. 13.

I HAVE the honor to forward herewith copy of correspondence with the Collector on the subject of the damage done last year to river embankments.

From Major J. O. HASTED, R.E., Superintending Engineer, 1st Division, Kistna District, to G. D. LEMAN, Esq., Collector of the Kistna District, dated Camp at Kommalapad, 12th February 1875, No. 196.

I HAVE the honor to forward copy of notes made by me after inspection of the river embankment, Eastern Delta, and to request that you will be good enough to favor me with your views on the different points referred to therein, for submission to the Chief Engineer for Irrigation.

Notes on Damage done to River Embankment, Eastern Delta.

1. The breaches in the upper part of the river embankment or above Iyaloor have not scoured out very deeply, and will be closed for a small amount. It is not quite clear how they were caused ; the bund that is left is sufficiently strong to stand such a flood, as I was able to see after having had the flood mark shown by pegs put down by a Surveyor. The breaches must, I think, either have occurred at crossings which were worn down, or the bank must have been cut by the villagers. At Walloorpollem it seemed to me most probable that the bund had been cut by the villagers, the village is wholly on the river side of the bank, and I know that the common idea is when the river water rises to a dangerous height on the lunka, relief may be obtained by breaching the bank and allowing the water to spread inland.

2. It is essential I think for the preservation of the bank that the village here should be removed to inside the bank ; there is no direct set of the river against the village site, but in high freshes the water must rise into the houses to the danger of human life, and in an extraordinary flood much damage to property must be done. Were the village situated on the land side of the bund, it would be to the interest of the villagers to maintain the bank, and even if water rose to the top of it they would contrive to keep the water out as was done by the villagers between Ebrampatam and Bezwarah who, during the flood, had to live outside the bank. I believe the Zemindar of Walloor is prepared to give land of a new village site outside the bank, but I do not think the villagers would like to move.

3. From Iyaloor to Lunkapalli the bank is good, and the water did not rise anywhere apparently to within 18 inches of the top. At the latter village there was a small breach, the village was inside the bank, but at the time of my visit appeared deserted, and I understand the Zemindar has given land outside on which to rebuild the houses. There is a good tiled house inside the bank, the owner of which I am informed is unwilling to move, and no doubt it will be an expensive move for him, but I think inducement should be held out to him to make it.

4. Below Stricacolum there is a breach, though the village is outside the embankment and the villagers had evidently prevented other breaches by raising the bank in low portions ; a channel is here led from the river to fill a tank near the pagoda, and it is probable that the bank having been cut to admit the water was not properly filled in. Channels from the river should not be allowed ; they are always a source of danger and seem to be quite unnecessary when the river water is so near the village as it is at Stricacolum.

5. From Stricacolum to Nadacuduroo there are no breaches, but at Nadacuduroo there are three very large ones ; the village is inside the river bank, and the water did not apparently top the bank. The Zemindar is anxious to have a new bund erected nearer the margin of the river,

so as to enclose the pagoda; this is not to be thought of, as it would cost more than to close the breaches another way, and to take the bank nearer the river would be to expose it to danger of being encroached upon and render Government liable to expenditure to protect it hereafter; moreover, the bank canal cannot be carried round by the line the Zemindar wishes the bank to go, and there would therefore be two banks required when the canal is cut. The village should be moved outside the bank, and the Zemindar should protect the pagoda at his own expense if he thinks it desirable. The Zemindar's son told me that he wanted the villagers to move outside the bund; but the villagers told me they wanted to move, but the Zemindar would not give them land. I have directed the breaches to be closed by ring-bunds on the land side, and after the holes which have been scoured under the line of the present embankment are somewhat silted up, I propose to throw the bank back so as to bring the canal into its proper line.

6. Below Nadaculdurroo there are one large breach and several small ones; these are being filled in.

7. Opposite Nadaculdurroo lunka, grass has been planted on the river margin, I believe by the villagers, with the object of protecting the village; this grass will be extended; planting has already been undertaken near Stricacolum.

8. At Kottapollem the river has cut away the margin of the river and is still encroaching, though I do not think the encroachment will long continue. It is proposed to throw the bank back through the village; this will have the effect of placing part of the village inside the bank and, if possible, these villagers should be induced to remove their houses to outside the bank; at present they are in rather a dangerous position.

9. From Kottapollem the river throws off a branch towards Masulipatam, running between the main land and the island of Bobburlunka, which again is separated from Divi by another branch of the Kistna. The Bobburlunka branch is nearly silted up and can only receive water during freshes; the bank runs outside of it from Kottapollem to Mopedavy, and was quite riddled by breaches; but whether by water breaching it towards the land or from water which had passed through the breaches above, breaching back into the river, I could not quite determine. This part of the bank is being thoroughly repaired, the top of the new bank being 2 feet above this flood mark.

10. From Mopedavy to Callapally the bank has been washed away in places all along, but was very weak formerly. It protects Zemindari land almost exclusively, the only exception being, as I am informed, 100 acres of Government land in the village of Viswanadhapalli on the opposite side of the river to the village; near the village of Ayodiah there are evidences of considerable former breaches, and the present breaches are very numerous. It is proposed now to throw back the bank so as to cut off a corner in the old bank, and by so doing several houses or rather huts will be left inside the bank which should be removed to the outside. I have received a petition from these villagers, requesting that the old bank should be repaired, but after personally examining the spot and seeing the old ring-bunds which they want strengthened, I consider the new bank should be raised. Below Callapally there is no bank at all, the river about opposite the village turns and runs out sea-wards; the bank will now be continued to the bund and after that the water will be allowed to spread over the swamps towards Masulipatam. In time of floods it stands up to the Masulipatam canal bank, but it does no harm in that direction, the land being all swamp.

11. The whole of the embankment described above is in Zemindari land, and the question arises how far Government are called upon to erect and maintain the embankment. From the limits of Zemindari land near Bezwarah to Kottapollem, it is certainly to the interest of Government as well as of the Zemindars that there should be a bank capable of keeping out floods, and therefore it may be considered that Government should erect and maintain the bank. It would seem, however, to be fair that the Zemindars who will benefit greatly by the embankment should contribute to some extent towards its erection at all events; the only contribution I would

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propose that they should be called upon to make, is to make over the land required for the embankment and excavation to form it, to Government free of charge. The east bank canal will be carried parallel to the river embankment, and the earth excavated to form it will make the bank; the land required for the canal and bank should therefore, I think, be contributed by the Zemindar, the repairs of the bank being undertaken by Government. I would also stipulate that the Zemindars should remove all villages now situate on the lunka between the bank and the river margin to outside the bank.

12. From Kottapollem to Callapally, the case is somewhat different as the bank is for the protection of Zemindari land almost exclusively, and Callapally Zemindar (before the flood) claimed the bank as his own property, and stated he was willing to keep it up. I think, however, it would be more satisfactory, as the Zemindar is very unlikely to maintain the bank properly and life as well as property may be endangered, that Government should here also undertake to erect and maintain the bank, the land required and old bank being contributed by the Zemindar.

13. The estimates for the repair of the bank throughout, closing all breaches caused by the flood, amount to Rupees 18,070; the work has in most part been already completed, but some delay has been caused by its being necessary to raise the counterbanks referred to above, and the proposals of the Range Officer having been objected to by the Zemindar, I have now personally examined all these places, and after having had surveys made of them, have determined the best line for the embankment to take. I do not think that Government should be called upon to pay compensation for land thus taken up, but villagers will be compensated wherever it is necessary to remove their houses.

14. The Chief Engineer for Irrigation has already remarked on the fact that the expenditure incurred in erecting and maintaining the river embankment has been charged entirely to irrigation. The irrigated area is but a small proportion of the land protected by the bank, and therefore it would seem to be fair that only a small proportion of the expenditure on it should be charged to irrigation; where, however, there is a bank canal, as will be the case from a little below Bezwarah to Kottapollem, it will be absolutely necessary, in the interests of irrigation and navigation, that the bank should be maintained, and the excavation for the canal will furnish nearly all the earth required for making the bank. I think, therefore, that the repairs of this part of the bank may be charged as they have been hitherto. Below Kottapollem, the bank has nothing to do with irrigation, and expenditure on it should certainly not be charged to irrigation; but, looking to the fact that at some time irrigation may be so extended in the Zemindari that the upkeep of this bank will be a matter of importance to it, it may be well to contribute a small proportion of the cost from irrigation, I would say one-sixth, as it is not likely that more than 100 acres per square mile will be irrigated here. The cost of the present repairs from Kottapollem to Callapally will be Rupees 12,825; of this, therefore, Rupees 2,137 is all I think should be charged to irrigation.

15. The river embankment in the Western Delta forms for the most part one bank of the western bank channel, and therefore should be dealt with as the upper part of the embankment, Eastern Delta. The upper part of the bank only from Seetanagram to Vallabapooram is at a distance from the bank canal, but its maintenance is of so much importance to the canal, that I think it may be considered in the same light as the remainder of the embankment.

From G. D. LEMAN, Esq., Collector of Kistna District, to Major J. O. HASTED, R.E., Superintending Engineer, 1st Division, dated Masulipatam, 3rd April 1875, No. 458.

With reference to your notes on damage caused to river embankment in the Eastern Delta, I have the honor to offer the following observations:—

Para. 1. Breaches above Iyaloor.—I concur in thinking that the breaches at Walloorpollem were made by the villagers. The same of those in Chowdavaram. These are the only ones I have seen in these parts.

Para. 2. Removal of Walloorpollem.—The Chowdavaram villagers are moving outside the bank, those at Walloorpollem refuse to move. It will be necessary, if they still continue to live inside, in the event of another great fresh, to send watchers to protect the bank.

Para. 3. Breaches at Lunkapally.—I think if the villagers generally move, there will be ample security that they will keep the bank up if possible. I do not fear loss of life by future floods. A good substantial house will stand, and the owner's property probably not be lost; but, if it is, it will be his own look out.

Para. 4. Breach at Valloor.—It is not possible to prevent the Srikakolum people from making the channel in question. The danger is ordinarily so remote that the Penal Code cannot apply.

Para. 5. Breaches at Nadacuduru.—I concur fully and have directed the Zemindar to have the land at once pointed out to people which he proposes to give them for their houses.

Para. 8. Removal of Kottapollem.—Immediate steps will be taken to give a place for the villagers of Kottapollem, who will be left within the bank to build upon.

Para. 10. Removal of Iyodhya.—I will see that the Iyodhya people, left inside the bank, have the opportunity to move their houses if they will avail themselves of it.

Para. 11. Zemindar's Contribution for strengthening Embankment.—By direction of the Government, I have already called upon the Zemindars to say whether they will contribute to the cost of the bank. The Walloor Zemindar has offered a contribution of Rupees 1,000, and I have no answer from the Davarscotta Zemindar. I think with you that the land for the embankment and the excavation of the bank channel should be given free of charge, and in consideration of this that the Government should keep the bank up and absolve the Zemindars of any charge for its upkeep in future. As for the bank beyond the line where it is useful to Government, I am inclined to think that there is still [illegible] to keep it up. And I think it should be done on the same principle as that advocated for the rest of the bank.

Paras. 14 and 15. Liability of Irrigation Fund.—Your proposals in regard to the distribution of the cost have my concurrence.

In concluding this, I would request your attention to the fact that the parts of the embankment nearest the sea and those of Divi Island require the first care, lest by banding the river above we bring down a body of water to those places, such that the embankment there cannot stand.

Such a catastrophe would be most disastrous as you know; for every soul in Divi would be washed out to sea.

So far as regards Divi; but there are many other islands that are utterly unprotected, and on which there are villages that require notice.
They are—

Bandar Taluq.

Villages.

1. Mopedavi Lunka.
2. Cheruvole do.
3. Yedla do.
4. Merakanapalli Lunka.
5. Bobbar Lunka.

Hamlets.

1. Kotigirivani Lunka
2. Pochigani do.
3. Nagayatippa.
4. Davisettivaripollem.
5. Ballaleti Gollapolem.
6. Yedurumandi.
7. Yelachettadibba.
8. Natsuguntu.

Rapalley.

Villages.

1. Pesara Lunka.
2. Peda do.
3. Peda do.

Hamlets.

1. Purvadavari Lunka.
2. Yepuri do.
3. Chilumur do.
4. Annavaram do.

Zemindari of Davarakottah.

Villages.

1. Popen Lunka.
2. Gazul do.

Hamlets.

1. Amudal Lunka.

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These must all be protected, if not the village lands then at least the villages themselves; they must also be protected before the Government by these improvements to the present bank produce such a state of things as to endanger the lives of their people.

The matter of embanking villages was discussed some time ago in reference to the liability of the Local Fund to pay what was necessary in similar cases, and they ruled in my opinion rightly that they could not spend their funds for the purpose, and I am quite clear that the Government, now that they are increasing the danger, must provide the escape.

It is not open to the Government in my opinion to compel those people to come and live on the main land, for that would be a virtual compulsion on them to throw up their lands, which again the revenue to Government is too great to be sacrificed.

The floods come just in the season for cultivation, which would be impossible if ryots were continually being prevented access to the fields by them.

The cost must, I suppose, come out of "Agricultural." I think the embanking of villages is the least thing to be done, hamlets must be brought together, and the erection of scattered houses be forbidden for the future, and so the cost be brought down to the minimum possible, but I fear half a lakh of Rupees will not cover the expense.

I have the honor to request your views in the matter before I address Government.

I have arranged to move all the people who now live in danger within the river on Divi Island (proper) into safety except one old man at Viswanadhapalli, who thinks death preferable to leaving his house; but I also wish to see the river embankment carried from Puligadda to the head of the Surnamukhi Channel, it is a very small piece and will secure the triangle formed by the river on one side and the channel on the other within which Puligadda and its hamlets lie. The erosion of the banks has been very extensive about here: as an instance, a ryot whose triangular field with the base line on the river bank measured last year 10 cents. less than an acre, has now but 10 cents.

From Major J. G. HASTED, R.E., Superintending Engineer, 1st Division, Kistna District, to G. D. LEMAN, Esq., Collector of the Kistna District, dated Camp at Nizampatam, 25th April 1875, No. 17.

With reference to your letter No. 458, dated 3rd instant, I have the honor to observe that the villages you mention as requiring to be embanked for the safety of the inhabitants are, for the most part, those mentioned in your letter to the Board of Revenue, No. 2,291, dated 4th September 1872, in paragraph 6 of which you state your opinion that Government should secure the safety of these people "by giving building sites to the villagers who desire to move to the other side of the western bank channel." You now say that "it is not open to Government to compel those people to come and live on the main land."

2. Since the date of your former letter, there has been no change of circumstances, and I can only conclude that the occurrence of a higher fresh than has ever been before experienced has led you to change your opinion on the subject. I cannot myself see that Government is under any greater obligation to embank the villages now than in 1872. It is assumed that our embankments will stand in any fresh, and I have always maintained that people who construct houses on islands in the river must risk their property if not their lives at times.

3. I observe, however, that you infer the inhabitants of the lunkas would give up their lands; rather than move their houses, and you state that the revenue to Government is too great to be sacrificed. This is a view of the case which has not been brought forward before, and I am disposed to doubt if the people would carry out this threat. It appears from your letter of 4th September 1872, that the villagers who promised to pay half the cost of embanking their villages were not prepared to pay anything when "the danger was not so pressing," and probably the same argument would be used concerning giving up lands.

4. I maintain that permanent dwellings should not be recognized on the river lunkas the risk to property must always be considerable, and it is not the duty of Government to spend a large sum of money to lessen the risk to people who wilfully expose their property. If it can be shown that it is necessary for people to reside on any lunkas during the season of freshes for the purpose of cultivating the land, risk to life can be averted by providing a boat at each of those places, and these boats might be provided at Government expense.

5. The embankment round Divi will be made as strong as the embankments on the mainland higher up; the flood does not rise so high here as up above, and it is hoped Divi may be preserved, but in a high flood such as that of last year there are some villages, the sites of which are well below high water mark, which run a great risk of being washed away should a breach occur.

6. The breached banks will all have been made up before next freshes, and I have sanctioned the maintenance of a conservancy establishment during the season of freshes, which I hope will be the means of preventing breaches.

No. 502.

MEMORANDUM.

THE undersigned has the honor to make the following remarks on the correspondence transmitted with the letter No. 13 of the 25th April 1875, from the Superintending Engineer, Kistna.

The views of the Superintending Engineer and Collector as to the advantage of removing villages from the river to the land side of the flood embankments are entirely concurred in.

When such removal may not be practicable it will be necessary to obviate the risk of the flood banks being cut in high freshes by patrolling them, and, if necessary, hutting members of the conservancy establishment on the banks at such times.

The channel referred to in paragraph 4 of No. 196 which it is believed led to a breach should have a head sluice at the flood bank; without such a work there will always be danger, and it appears from the Collector's No. 458 that the channel cannot be entirely closed unless the villagers can be induced to abandon this source of supply. It may not be difficult to get them to do this if the pagoda tank is commanded by any of the canals.

No. 168, paragraph 5.—Much care will have to be taken in fixing on a proper alignment for the river embankments. They must not be so near the river as to be endangered, and they should be fairly parallel to the axis of the river. Every part of the embankments should be laid down on the charts, and all new work should be carried out as far as possible on the permanent alignment.

Paragraph 9.—The margin above the flood of 1874 should not be less than 4½ feet after the banks have thoroughly settled.

Paragraph 11.—If the Zemindars concerned will make over free of charge the land required for the Bank canal, Eastern Delta, and for the flood embankment therewith to be carried out, the undersigned will be prepared to recommend that the Government pay for the construction of the embankment and provide for its up-keep. Otherwise it will be necessary to recommend that, as in the case of the Polaram Island embankments in the Godavery, all constructive cost should be borne in proportion to the interests involved by the estates and the Government respectively, and failing agreement by the Zemindars to pay their shares, it would follow that wherever embankments are not absolutely required for the protection of Government lands, as is the case it is believed over the greater part of the delta between the Masulipatam canal and the Kistna, the embankments would not be constructed.

Paragraph 13, latter part.—Where the new land required for embankments belongs to Government, the Puttahdars will have to be compensated out of agricultural funds. Where they are Zemindary it will depend upon the arrangements made with the Zemindars. Houses removed for works will have to be paid for. With the expenditure involved in transferring villages for their safety, this department has nothing to do.

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Paragraph 14.—So far as flood embankments can be constructed with no or but little extra expense in cutting canals, the charge may be borne by Irrigation, but where this cannot be done the cost is properly chargeable to Agricultural Miscellaneous, and the estimates should be separate from those of the delta irrigation. The debit of expenditure for repairs should be determined on similar principles, which are stated in G.O., No. 2,003, dated 24th July 1874, on the way in which charges should be made to Capital, Revenue, and Miscellaneous.

Paragraph, 15, latter part.—The embankment above its junction with the Western Delta Bank canal is clearly a miscellaneous work. Collector's concluding remarks on the need of flood embankments. It by no means follows that the embankments which have been or are about to be constructed or improved for the protection and advantage of the principal parts of the delta will raise the flood levels in the river and consequently increase the danger from floods at the various unprotected islands. Divi for instance will not, as Mr. Leman supposes, be materially affected. The water kept to the river channel by the embankments will, with the improvements in the way of river conservancy which have to be carried out and which will increase the discharging capacity of the river by making the axis of the current approximate to that of the river instead of diverging at places greatly from the latter, tend to secure the discharge of floods, not by raising the surface level, but by lowering and equalizing that of the bed. Of course particular cases must be decided on their merits, but the undersigned does not think that the means of generally embanking islands or island villages hitherto unprotected, will be forthcoming for many years. The population is semi-aquatic, and its safety must, it is thought, always depend more on boat than on embankments on the occurrence of extraordinary floods.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

12*th May* 1876.

From Major J. O. HASTED, R.E., Superintending Engineer, Kistna, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, dated Masulipatam, 19th July 1876, No. 43.

WITH reference to G.O., No. 2,783, dated 29th September 1875, and also your memorandum No. 502, dated 12th May 1875, I have the honor to forward herewith a statement showing the proportion of maintenance of river embankment in the Eastern Delta that would be chargeable to Government and Zemindaries whose lands are protected by it.

2. The areas have been ascertained as accurately as possible, and have been checked by the Collector, whose letter on the subject is enclosed.

3. As all the different estates do not border on the river, contributions in proportion to the length of estate protected could not be asked for. I have therefore confined myself to considering the question with reference to the area protected.

4. It will be seen that the Collector is of opinion that the proportion shown as chargeable to Government is insufficient, on the ground that Government has an interest in all Zemindary irrigated lands, which pay water assessment at the rate of Rupees 4 per acre; but this is not all that can be said against charging Government in proportion to the area. It is true that the Government lands directly protected by the embankment are at a distance from the river and would not probably be much damaged by floods, but the Masulipatam canal and its side channels for irrigation are also protected, and when the embankment gives way as it did in the great flood of 1874, the canal is very seriously damaged, and irrigation as well as navigation is hindered until the breaches can be repaired. If the Zemindars concerned declined

to assist in maintaining the river embankment, and it was likely to fall into disrepair, it would be necessary for the west bank of the west side channel to be enormously strengthened at the expense of Government.

5. My own views on the subject are given in "Notes on damage done to river embankment, Eastern Delta," dated 12th February 1875, which to save reference I extract here.

* * * * *

11. The whole of the embankment described above is in Zemindary land, and the question arises how far Government are called upon to erect and maintain the embankment. From the limits of Zemindary land near Bezorah to Kottapollem, it is certainly to the interest of Government as well as of the Zemindars that there should be a bank capable of keeping out floods, and therefore it may be considered that Government should erect and maintain the bank. It would seem, however, to be fair that the Zemindars who will benefit greatly by the embankment, should contribute to some extent towards its erection at all events; the only contribution I would propose that they should be called upon to make, is to make over the land required for the embankment and excavation to form it, to Government free of charge. The East Bank canal will be carried parallel to the river embankment, and the earth excavated to form it will make the bank; the land required for the canal and bank should therefore, I think, be contributed by the Zemindar, the repairs of the bank being undertaken by the Government. I would also stipulate that the Zemindar should remove all villages now situate on the lunka between the bank and the river margin to outside the bank.

12. From Kottapollem to Callapalli the case is somewhat different, as the bank is for the protection of Zemindary land almost exclusively, and the Sallapalli Zemindar (before the flood) claimed the bank as his own property and stated he was willing to keep it up. I think, however, it would be more satisfactory, as the Zemindar is very unlikely to maintain the bank properly, and life as well as property may be endangered that Government should here also undertake to erect and maintain the bank, the land required and old bank being contributed by the Zemindar.

* * * * *

6. As regards the head to which repairs to the bank should be charged. From Bezorah to Yanamalacuduroo the bank is also a bank to the Masulipatam canal, here a navigable Irrigation canal. Its maintenance should therefore, I think, be chargeable to irrigation. From Yanamalacuduroo to Kottapollem the bank will be also the bund of the East Bank canal, for which estimates have been submitted, and its maintenance will also be chargeable to irrigation. If my views expressed in the latter part of paragraph 4 of this letter are accepted, it should now be maintained from irrigation. Below Kottapollem, the bank has at present nothing to do with irrigation and should be classed as "Miscellaneous." If eventually a branch from the Bank canal for irrigation should be carried parallel to this branch of the river, the maintenance of the bank would become chargeable to irrigation.

7. On the understanding that some of the Zemindars have already paid contributions towards the repair of the embankment, I have had all breaches closed under the head "Revenue Repairs," and have taken steps to have the embankment maintained during the present flood season.

From G. D. LEMAN, Esq., Collector of Kistna, to Major J. O. HASTED, R.E., Superintending Engineer, Kistna, dated Masulipatam, 5th July 1876, No. 1,125.

With reference to your letter, No. 183, dated 7th March 1876, I have the honor to return herewith the list* of the villages protected by the eastern embankment of the Kistna. Where the areas given therein do not tally with the figures in my office, I have given the correct areas in the remark column in red ink. When only portions of villages are included, it is not possible for me to verify them.

* With abstract.

2. With regard to the contribution to be given by the several Zemindars, it seems to me that, in estimating the charge on villages by their assets, the Government are charging themselves with a less sum of money than they ought.

3. The bank is a protection to the canal, a most valuable work; the repairs to which cost Rupees 34,484 in this instance alone, and it is also the protection to the water-rate which the Government charge at Rupees 4 per acre on all irrigated land. The water-rate which Government get is more valuable than the sist which the Zemindars do.

Abstract of lengths of River Embankment in Eastern Delta in several Zemindaries, &c., together with area therein and proportionate Costs to be contributed from Zemindaries, Government, &c.

Particulars.	Length of River embankment miles.	Area. Acres.	Area. Square Miles.	Deduct on account of Islands attached to certain villages. Acres.	Deduct on account of Islands attached to certain villages. Square Miles.	Net. Acres.	Net. Square Miles.	Proportion of maintenance debitable in proportion to the Area protected by embankment.
1	2	3	4	5	6	7	8	9
Government	...	22,584	35·3	...	...	22,584	35·3	13·57
Valloor Zemindary ...	16½	25,335	39·1	3,840	6·	19,585	30·6	11·76
Noorad do. ...	7	27,000	42·2	3,320	5·2	23,680	37	14·22
Challapalli do. ...	29½	106,662	166·7	11,320	17·7	95,342	149	57·24
Chavandra Mutah	...	2,509	3·9	...	...	2,509	3·9	1·50
Proprietory	...	2,066	3·2	...	...	2,066	3·2	1·24
Agraharams	...	784	1·2	...	...	784	1·2	·47
Total ...	43	184,940	289·9	18,480	28·9	166,550	260·2	100

(Signed) W. R. NORRIS, C.E.,
for *Superintending Engineer, Kistna.*

Submitted for the consideration of Government with reference to G.O., 29th September 1875, No. 2,783.

2. The undersigned recommends that, if the several Zemindars whose estates will be protected will make over free of charge the land required for the Bank canal and the river flood bank Eastern Delta, the construction and maintenance of the flood bank should be undertaken by Government. There has been a flood bank for many years past, but land will still be required to bring it to a proper section.

3. With regard to the incidence of charge of Government expenditure upon the construction and maintenance of the flood bank, the undersigned would submit the following remarks for consideration :-

1st.—The Bank canal will from [a]bout 13 miles below the anicut run close to the flood bank and will provide for 23 or [2]4 miles the greater part of the soil required for making the embankment of the full dimensions required.

2ndly.—The anticipated ultimate area of irrigation in these Zemindaries under the Bank canal is estimated by Lieutenant Campbell at 15,000 acres, or 168¾ acres to the square mile being a little more than one-fourth of the whole area. This estimate is in excess of that framed by the Board of Revenue, and in the order as per margin it was directed that the Bank canal estimates should provide water for 8,300 acres only; irrigation is therefore interested only to the extent of about ½th of the area which the flood embankment will protect, but on the other hand the water-rate on irrigated land may be taken to be double the assessment of dry land.

G.O., No. 434, dated 17th February 1876.

3rdly.—It would appear to be reasonable therefore that the cost of the construction of the flood bank, where this cannot be provided for in conjunction with the formation of the Bank canal, should be charged in the proportions below mentioned to—

The Delta system, one-third.
Ordinary Agricultural, two-thirds.

And that in the same proportions the cost of maintenance hereafter should be distributed.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

No. 591. ORDER THEREON, 25th August 1876, No. 2,258.

IRRIGATION, No. 62-A.

THESE papers will be referred to the Board of Revenue through the Revenue Department, and they will be asked to report what would in their opinion be an equitable arrangement to be made with the Zemindars interested in the river flood embankment on the left bank of the Kistna.

2. The Superintending Engineer, Kistna, will be instructed to prepare a tracing showing clearly the extent and position of the Zemindaries affected, and the Government lands above Divi which would be similarly protected by an embankment. On this tracing should also be indicated the course which the flood waters took on the breaching of the present flood banks in 1874, and recently at the end of July last. Information as to the damage done to the Masulipatam canal, its side channels, and to channels, roads, and cultivated lands, whether Government or Zemindary, should likewise be afforded so far as may be practicable.

3. It is further desired with reference to the proposals of the Chief Engineer for Irrigation, for distribution of construction and maintenance charges, that the Superintending Engineer should report—

1*st.*—What the cost of the intended flood bank, irrespective of the portion which will be formed without additional expense on the [con]struction of the Bank canal will be

2*nd.*—What the maintenance charges throu[gh]out are likely to be.

(True Extrac[t]

W. Harcourt Colonel,
C[o]g. Under Secy. to Govt., P.W.D.

To the Revenue Department.
„ Superintending Engineer, Kistna.
„ Chief Engineer for Irrigation.

Exd. W. H. French.
Exd. E. C. Shunker.
2 Spare Copies

No. 3978
Rev. 1576. Dept.

Govt. of (1876) Madras.

PUBLIC WORKS.

To

The REVENUE DEPARTMENT.

&c., &c., &c.

Dated August 25th.

Issued

Read. Sept 26th

Encl.

G. O., 25th August 1876, No. 2,208.

AUGUST.

Nos. 590-591.

River Flood embankments on the left bank of the Kistna.—Passing orders on papers relating to the arrangements to be made with the Zemindars interested in the — for their construction and maintenance charges.

Communicated to Revd Dept Revd who will report to Govt.

Sept 26 1876

MADRAS RECORD OFFICE