Public Works (1898) Department.

9502
1628

G.O., No. 2967 J
Dated 6th April 1898

[Despatch Abstract.]

Yenamaduru Drain: Ordered that a Copy of the Note by the Chief Engr for Irrign explaining certain points noticed by the Inspector General of Irrign in the estimate for a short cut on the — to Naidupalem Weir in the Godavari Western Dn be forwarded to the Govt of India.

Yenamaduru Drain: Forwarding Copy of Govt Order embodying a Note by the Chief Engr for Irrign explaining certain points noticed by the Inspector General of Irrign in the estimate for a short cut on the — to Naidupalem Weir in the Godavari Western Dn

Indexed.

[P. W. 96. 1,000—12-2-98.]

BACK PAPERS.

G.O. No.	Department.	Date.	G.O. No.	Department.	Date.
41-2					
8/98					

FURTHER PAPERS.

G.O. No.	Department.	Date.	G.O. No.	Department.	Date.

IRRIGATION.

Government {1898} of Madras.

PUBLIC WORKS.

Recd. } 1898. *Enclosures*

Regd. } *Spare copies*

G.O., Nos. 296, 297 I., 6th April 1898.

APRIL.

Yennamaduru Drain

Forwarding copy of Proceedings embodying a note by the Chief Engineer for Irrigation explaining certain points noticed by the Inspector-General of Irrigation in the estimate for a short cut on the — to Naidupalem yeru in the Gódávari Western division.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

Read—the following papers :—

From the Under Secretary to the Government of India, Public Works Department (Civil Works—Irrigation), to the Joint Secretary to the Government of Madras, Public Works Department, Irrigation Branch, dated Calcutta, 16th February 1898, No. 26 I.

I am directed to acknowledge the receipt of the Proceedings of the Government of Madras, No. 41 I., dated the 18th January 1898, requesting the sanction of the Government of India to the estimate, forwarded therewith, amounting to Rs. 1,05,500 (including establishment and tools and plant charges), of the cost of excavating a proposed short cut on the Yennamaduru drain to Naidupalem yeru in the Gódávari Western division, chargeable against the open Capital account of the Gódávari delta system.

2. In reply, I am to forward herewith, for consideration, copy of a note by the Officiating Inspector-General of Irrigation on the project, and to request that an explanation of the points noticed therein may be submitted to the Government of India at an early date.

3. The plans and estimates forwarded with the Proceedings of the Government of Madras are returned herewith, and I am to request that they may be re-submitted with the further information now asked for.

Enclosure.

Note by the Officiating Inspector-General of Irrigation on the estimate for excavating a short cut on the Yennamaduru drain to Naidupalem yeru, Gódávari Western division.

This estimate is forwarded to the Government of India for sanction in accordance with chapter V, paragraph 35V (*a*), Public Works Code, volume II, because the work is classed as unremunerative and the cost is over Rs. 10,000 for "Works." The reports and plans are forwarded to show that the construction of the work is justified from an engineering point of view. The estimate as submitted amounts to Rs. 86,300, or Rs. 1,05,500, including establishment and tools and plant charges. Before recommending the project to the Government of India for sanction there appear to be some discrepancies in the calculation and a few points connected with the scheme which require explanation.

2. The project is for a straight cut over 100 feet wide and about 4½ miles long, that it is said will reduce the length of the present drain by 10 miles, and relieve the flooding of a large area of irrigable land now caused by the old tortuous channel. According to the longitudinal section of the cut the surface fall in flood would be only 1 foot (+5·0 — +4·0) in a length of 4½ miles or under 3 inches a mile, but assuming that the water level would rise to +6·0 at the head of the cut, that at the tail remaining as before (+4·0), the fall would be less than 6 inches a mile. According to the discharge calculations forwarded with the project the surface slope of the present drain at the head of the new cut, with a flood level of +6·7 and discharge of 4,928 cubic feet per second, is given as 1·2 per mile. Again, with a gauge of 5·75 at the same point, calculated discharge 3,305 cubic feet per second, the slope is shown

as 1·25 per mile. Similarly in the discharge calculations for the drain in flood just above the Bhímavaram lock, which is about 3 miles in a straight line upstream of the head of the proposed new cut, the surface slope on 7th September 1895, with gauge 9·50, flood discharge 4,700 cubic feet per second, is given as 1·25 per mile; and at the same place on 10th September 1895, gauge 10·30, flood discharge 5,008 cubic feet per second, the slope is given as 0·9 per mile. The zero of the Bhímavaram lock gauge is —3·0 so that the reduced water surface level in the above two cases were +6·5 and +7·3, respectively. It is not understood how these comparatively high slopes can have obtained in the present tortuous channel for the gauges quoted above, seeing that the flood level during high tides stands at + 4·0 in the Naidupalem creek at a place 13 or 14 miles below the point where the proposed cut is to take out, and if the surface slopes given are correct, it is further not clear how a new cut with a surface of, at most, 6 inches a mile will effect any marked improvement in the existing conditions of flood levels. Even making full allowance for the tide range which at Musalapalam is, I believe, only about 4·0, it is not understood how the slopes given in the discharge calculations can obtain, unless it is that the whole country side near the head of the new cut becomes submerged once the floods rise to + 6·0 or + 6·7, which appears to be the case, and that then the direction of general flow is southwards across country, also that the water during high tides backs up the Upputeru river to a level of + 4·0 and maintains practically this level for several miles west of the point where the new cut tails into the old channel. If this is actually the case, the proposed cut would be effective only during periods of low tide, and it seems doubtful whether the improvement in drainage anticipated would be worth the expenditure involved by the proposal.

3. In paragraph 4 of the Chief Engineer's report it is stated that, according to the Tahsildar's rough estimate, over 14,000 acres of land would be protected from partial loss of crop and over 4,000 acres of new land brought under cultivation if the cut is made; but it is not mentioned on what data this estimate is framed. There is nothing in the papers to show the probable reduction in flood level the cut would effect in the locality where the land referred to is situated.

It is possible that the conditions of the case are more favourable in reality than represented by the figures given in the report and on the plans; but before according formal sanction to the project it appears desirable that the probable beneficial effect of the proposed cut should be further elucidated.

Calcutta,
2nd February 1898.

(Signed) J. S. BERESFORD,
Offg. Inspr.-Genl. of Irrigation.

No. 1 I.G.

Submitted to the Government of India.

Calcutta,
10th February 1898.

(Signed) J. S. BERESFORD,
Offg. Inspr.-Genl. of Irrigation.

No. 76 I.

Note by the Chief Engineer for Irrigation on the Inspector-General's note regarding the estimate for excavating a short cut on the Yennamaduru drain, Gódávari district.

The Inspector-General's note has been forwarded for consideration with Government of India letter, No. 26 I., dated 16th February 1898. I regret that the Inspector-General has been misled through the omission of this office to note that the gauge readings of flood levels, of which a list was attached to the estimate, were referred to mean sea. The Executive Engineer's report, which explains how the calculations were made, should have been forwarded with the estimate. A copy is now attached.

2. It is expected that the new cut will lower the level of high floods by about one foot and, which is of more importance, greatly reduce the duration of floods, as the capacity of the channels below the head of the new cut will, for a given surface level, be more than doubled.

3. It is not known on what data the Tahsildar estimated that over 14,000 acres would be protected from partial loss of crop. The Executive Engineer's estimate of the area, which can be brought under cultivation, is 1,000 acres.

(Signed) W. HUGHES,
Chief Engineer for Irrigation.

7th March 1898.

From D. MARSHALL, Esq., Assistant Engineer, Gódávari Western Division, to the Superintending Engineer, I Circle, dated 26th September 1897, No. 243 S.

With reference to your No. 2510 G.D., dated 28th February 1897, on the Chief Engineer's memorandum, No. I/28 G.D., of 16th February 1897, I have the honour to report as follows.

2. The levels have been checked and are found to be sufficiently accurate for all practical purposes. It so happens that the bed of the drain is scoured out at the point where the proposed straight cut takes off owing to a bend. A little lower down it becomes shallower, the bed level being about —3 or —4.

3. Cross sections have been taken at one or two points along the Naidupalem creek into which the straight cut falls. They show that the creek has a sufficient section except at the point of infall of the cut and again about a mile lower down where it is very shallow. At the point of infall the creek has a sectional area of about 500 square feet, but this increases to over 1,000 square feet in about a furlong. Were the vegetation on each side removed, this narrow portion would no doubt, in course of time, attain the required section. It would, however, be far more satisfactory to drop the straight cut into the creek about $\frac{3}{4}$ mile lower down. This could easily be done, without additional cost or materially altering the alignment, by giving the cut a slight "S" curve in the last 2 miles. The shallow portion of the creek is just below the bend and about a mile below the infall of the new cut. It extends for a little over a furlong, the average depth of water being about 2 feet below M.S.L. and the width about 200 feet, but with a flood level at +3 there is a section of 1,000 square feet which is very nearly the required area. It might of course be dredged out, but this seems unnecessary as the flow of drainage water will soon scour out the bed, besides if the cut is joined in at the head of the creek as suggested, the tidal flow will probably have more scouring effect owing to improved alignment.

This can be done.

(Intld.) J. C. L.

4. The next question raised by the Chief Engineer is one of flood levels and discharges. The Yennamaduru drain receives drainage from two distinct sources, namely, from the Yerra calva, an upland stream, and from a large area of wet cultivation in the delta. The whole of the flood water of the Yerra calva is discharged under the Nandamur aqueduct on Ellore canal. The water-way under the aqueduct is designed to discharge 14,580 cubic feet per second (*vide* G.O., No. 401 I., dated 21st June 1880), but the maximum discharge from the basin of the stream has been gauged at site of proposed Annumallanka reservoir at 22,500 cubic feet per second, so theoretically the water-way is not nearly sufficient. On the other hand, the highest flood on record (1872) was observed by Mr. Walch to discharge only 9,600 cubic feet per second under the aqueduct with a head of 10 inches. Apparently the rate of run off is greatly moderate by the flatness of the country after the stream reaches the plains or the discharge from the catchment basin has been overestimated. However this may be, the fact remains that the aqueduct has stood for

nearly 50 years and in that time the greatest flood passed under it was 9,600 cubic feet per second, so, the maximum discharge, as far as the Yerra calva is concerned, may safely be taken at 10,000 cubic feet per second. Next we have the drainage from about 100 square miles of the delta. The discharge from this area has been put down at *6,150* * cubic feet per second, being the total of the discharges from inlets and subsidiary drains taken from the old project estimates, &c. The figure certainly seems very high for the run off from a flat area. It will also be observed on looking at the statement that there is a good deal of variety in the co-efficients which have been chosen for the calculations and that some of the water is received from canal surplus weirs. The total cannot, however, be far out considering the duration of the flood in September 1895 which was chiefly from deltaic drainage; hence the total drainage to be carried by the Yennamaduru during heavy rain in upland taluks and in the delta may be taken at 16,000 cubic feet per second. It is needless to point out that this volume of water is far in excess of what the section of the drain is capable of carrying and, consequently, the lands bordering on the drain are submerged for long periods, especially these at the end about Bhímavaram.

* 2·28 inches off the entire catchment of 100 square miles.

5. In estimating the actual discharge at the end of the drain, calculations have been based on the flood levels recorded during the cyclone of September 1895, during which a maximum reading was recorded on Bhímavaram lock lower sill. Below this no gauges have been maintained. I have therefore had to accept flood marks pointed out by villagers or make approximate assumptions for some calculations.

6. A list of gauge readings and rainfall at a few stations for September 1895 is herewith enclosed. The gauge readings have been reduced to M.S.L. for ready reference. The first column of the statement shows the depth of water on Duvva weir, but the figures cannot be trusted, as I † am doubtful if all the boards could have been taken out although it is shown by the register that they were. The high readings are therefore possibly due to the obstruction on the crest of the weir and not to an exceptionally high flood in the Yerra calva. It will be noticed in the statement that there was only moderate rain registered at Bandacut in the Yerra calva catchment basin on the 4th and 5th. This, however, only indirectly affects the question under reference, and it is with the gauges lower down the drain we have to deal. The first of these gauges is at Pippera bridge, 14 miles above Bhímavaram lock, the second is at Gollalakoderu at the infall of the Gostanadi drain, 5 miles above the lock, and the third is at the lock. A glance at this statement of gauge readings shows pretty clearly the necessity of the straight cut. It will be observed that the cyclone burst in the delta on the 6th and water at once rose on all the gauges. On the 7th the maximum was reached on the Pippera and Gollalakoderu gauges and from the 8th both gauges showed a steady fall. On the Bhímavaram gauge water stood steady for three days, did not reach the maximum till the 10th and then began to fall slowly. Even during high floods the Bhímavaram gauge is slightly affected by the tide which may partly account for the slight fall on the 9th and the sudden rise on the 10th, otherwise the figures appear reliable and indicate the flooding of the country at the end of the drain for a long period owing to the insufficient outlet to sea.

† I have since seen a report in which it is stated that the boards could not be taken out owing to the sudden rise of water.

7. *Maximum discharge brought down by the drain above the new cut.*—To calculate the actual discharge at the end of the drain three cross sections just above Bhímavaram lock have been selected which give an average area of 1,944 square feet. Taking the fall between Gollalakoderu and Bhímavaram on the 7th at 1·25 per mile, the discharge arrived at is 4,700 cubic feet per second, again with the same sections taking the fall between the same two gauges on the 10th and making the necessary allowance for the increase in sections, &c., we get a discharge of 5,008 cubic feet per second. Therefore 5,000 cubic feet per second may be taken as the maximum discharge past Bhímavaram lock, or the maximum which has to be disposed of down the new cut and the old course into the Upputeru. The co-efficients chosen in the calculations assume the drain to be in good order which it is not at present.

8. *Present flood level at the head of the new cut.*—The maximum flood level at the head of the new cut (3 miles below the lock) is said to be +6·7. This was probably reached on the same day, as Bhímavaram gauge stood at 10·3. Now calculating the discharge through a section taken just above the head of the new cut where the drain banking stops* and allowing a fall between 10·3 at Bhímavaram and 6·7 at the head of the cut, we get a discharge of 4,928 cubic feet per second, or very nearly the same as at Bhímavaram lock on the same day. The level +6·7 may therefore be accepted as correct.

* *I.e.*, above the termination of the banks.

9. *Limiting flood level at the head of the new cut after the cut has been made.*—The level +5 at the head of the new cut, shown on the plans submitted, seems to have been assumed without calculation as that of a moderate flood. It is now proposed to assume this level limited to +5·75 after the cut is made, and the following calculations show that it cannot be reduced more. Taking gauge readings of 7th and assuming a uniform fall from Gollalakoderu +15·74 to the head of the new cut +5·75, we get a fall of 1·25 per mile and a discharge of 3,305 cubic feet per second through the section of the drain just above the head of the new cut. This is much less than the discharge fixed on (namely, 5,000) as the maximum, but it will be observed that one of the branches is silted up for about a mile, so all that has to be done is to clear out this portion of the drain to the required section as shown on the tracing, which will enable it to discharge 5,000 cubic feet per second. It may be objected that this section, in its present condition, could not carry the flood of the 7th without a much higher reading than 9·5 being recorded at Bhímavaram lock: this may, however, be explained by the fact that banking stops at the section, so a high velocity through it was possible as the flood practically discharged into open country without any water in front of it.

10. *Discharges down the new cut and old course into the Upputeru.*—There is considerable difficulty in calculating the discharges down the proposed cut and old course owing to the fact that the Upputeru is tidal and has not a fixed flood level; however +2 has been fixed as the mean flood level on the following considerations. By examining readings on the lower gauge of Mogalturru lock it has been roughly made out that the Gódávari datum to which all levels are referred and M.S.L. are nearly the same. From the infall of the Naidupalem creek to the sea, a distance of about 6 miles, the Upputeru is a wide open estuary and can only be slightly affected by floods. The mean range of tide for September 1896, shown at Mogalturru lock, is about 2½ feet. It may therefore be safely guessed that the mean flood level at the infall of the Naidupalem creek cannot be more than +2. On this assumption we have a surface fall down the proposed cut of ·5 per mile which, without altering the proposed section, gives discharge of 2,766 cubic feet per second. The level at the Bondada infall may be taken at +5 which will give a fall of ·31 per mile, and we have then a discharge down the old course of 1,396 cubic feet per second. Thus there is a total discharge of 4,162 cubic feet per second down the new cut and old course into the Upputeru against a maximum brought down by the drain of 5,000 cubic feet per second. The balance must be treated as spill and as it is proposed to throw the spoil along the left of the new straight cut in the form of a bank, no great harm can be done by it. There is bound to be spill unless the section is banked on both sides, which is not desirable or necessary; in fact, the section must be regarded as a tentative one. Judging by the scour, which must go on even in blind creeks to maintain their wide and deep sections, it may be safely prophesied that proposed section of the cut will enlarge, so much so, that I am almost inclined to recommend that the bottom width be reduced from 100 to 50 feet.

This gives a fall of 2¼ feet through new cut and 1½ feet through creek.

(Intld.) W. H.

As it has been shown that 100 feet bed width is now too great, so I cannot agree to this proposal: to be really effective a full section is required. I do not think there would be much increase of width due to scour.

(Intld.) J. C. L.

11. *Cost of Land.*—As regards the cost of land to be taken up, the Deputy Collector of Narsapur has informed me in his letter, No. 522, dated 14th June 1897, that the approximate value of the land is Rs. 25 per acre. There will be no difficulty in disposing of the spoil, as the land through which the cut runs is all Government waste except for about a mile at the beginning and quarter of a mile at the end. In these portions it has been proposed to take up a strip one furlong in width.

12. *Extension of Irrigation.*—At present the drainage water, in high floods on reaching the point where it is proposed to take off the new cut, flows across country in a south-easterly direction through the Dirusumarru village and finds its way into the Gunupudi south drain, flooding the country as far as the Muthunicodu channel. The land proposed to be irrigated lies in Dirusumarru to the south of the Yennamaduru irrigation channel: therefore by throwing up a bank for at least some distance along the left of the new cut, this village will be well protected. There is no question about the possibility of commanding the land, but I doubt if more than 1,000 acres can be irrigated until the distribution between canals in the upper part of the delta is improved. I refer to the construction of the proposed lock on the Kakaraparru canal just below the Gostanadi lock.

13. In conclusion, I may add that the Yennamaduru drain from Gostanadi, infall to the head of the new cut, is in great need of attention and a considerable sum will have to be spent on it. This reach of the drain runs in two parallel branches with a broad piece of land between them. The flow down the branches is obstructed by thick growth of nanul grass, and the land is cultivated and overgrown with tumma trees. The branches will have to be cleared and repaired. The land might be taken over by this department with advantage. It would of course be very costly to take up such a large area, but it might in a measure be made to pay by leasing it out for cultivation under certain restrictions. The estimate which is now being prepared for this will come under "Maintenance and repairs," and will be submitted for your sanction in due course.

No. 1222 G.D.

Copy submitted to the Chief Engineer for Irrigation in reply to his memo. No. I/28 G.D., of 16th February 1897. The questions do not admit of accurate demonstration but quite irrespective of any calculations which could be made, it can hardly be doubted, that the cut would prove most beneficial as pointed out in this office No. C./141 of 4th August 1896.

(Signed) J. C. LARMINIE,
Suptg. Engineer, I Circle.

1st October 1897.

Order—No. 296 I., dated 6th April 1898.

Ordered that a copy of the foregoing note by the Chief Engineer for Irrigation be forwarded to the Government of India, together with the plans and estimate for excavating a short cut on the Yennamaduru drain, Gódávari district.

[Here enter No. 297 I., dated 6th April 1898.]

(True Extract.)

(Signed) W. HUGHES,
Joint Secy. to Government,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, I Circle.
" Examiner, Public Works Accounts.
" Revenue Department.

ENDORSEMENT—No. 297 I., dated 6th April 1898.

Forwarded accordingly.

(By order.)

(Signed) W. HUGHES,
Joint Secy. to Government,
Irrigation Branch.

Ext. W. D'Moss.

Public Works (1898) Department.

5

CURRENT No. 2502 & 1625

From The Chief Engineer for Irrigation

Order

No. 769

Dated 7th March 98.

Received } 17-3-98

Registered }

Enclosures

Spare copies

SUBJECT.

Gennamaduwa Drain - Godaveri District - Estimate for excavating a short cut on the — E Is noted on that of the Inspector-General regarding the —

BACK PAPERS.

No.	Date.

FURTHER PAPERS.

No.	Date.

Yennamaduru Drain Godavary Dt
Estimate for excavating a short cut
on the — Note on the Inspector Genl's
note regarding the —

H. E.

PUBLIC WORKS DEPARTMENT,

IRRIGATION BRANCH.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the

READ the following

From the Government of India (H. E. No: 26 I, dated 16th Febry: 1898)
No 761 47 3.98

Note by the Chief Engineer for Irri-
-gation on the Inspector General's
note regarding the estimate for ex-
-cavating a short cut on the Yenna-
-maduru Drain, Godaveri District.

The Inspector General's note
has been forwarded for consideration
with Government of India letter No:
26 I, dated 16th February 1898. I re-
-gret that the Inspector General has
been misled through the omission of
this Office to note that the ~~guage~~ gauge
readings of flood levels of which a
list was attached to the estimate,
were referred to mean sea. The Execu-
-tive Engineer's report, which ex-
-plains how the calculations were
made, should have been forwarded with
the estimate. A copy is now attached.

2. It is expected that the new cut
will lower the level of high floods
by

by about one foot and, which is of more importance, greatly reduce the duration of floods as the capacity of the channels below the head of the new cut will, for a given surface level, be more than doubled.

3. It is not known on what data the Tahsildar estimated that over 14,000 acres would be protected from partial loss of crop. The Executive Engineer's estimate of the area which can be brought under cultivation is 1,000 acres.

Order thereon.

Ordered that a copy of the fore-going note by the Chief Engineer for Irrigation be forwarded to the Govt: of India together with the plans and estimate for excavating a short cut on the Yennamaduru Drain, Godaveri District.

Endorsement — No. 297 dd 6.4.98

Forwarded accordingly.

9.3.98.

To,

The Chief Engineer for Irrgtn:
,, Suptg: Engineer, I Circle.
,, Examiner, P.W. Accts.
,, Revenue Department.

Exec Engineer's office G.D.
No: 2435 dated 27.9.97
6/27.

From D. Marshall Esqr.
Assistant Engineer
Godavari Westn Dr.

To

The Superintending Engr.
I Circle

Sir,

With reference to your No: 2510 SD dated 28.2.97 on the Chief Engineer's memorandum No: I/2865 of 16/2/97 I have the honour to report as follows:—

2. The levels have been checked and are found to be sufficiently accurate for all practical purposes. It so happens that the bed of the Drain is scoured out at the point where the proposed straight cut takes off owing to a bend. At little lower down, it becomes shallower, the bed levels being about -3 or -4.

3

3. Cross sections have been taken at one or two points along the Naidupalem creek into which the straight cut falls. They show that the Creek has a sufficient section except at the point of infall of the cut and again about a mile lower down where it is very shallow. At the point of infall the creek has a sectional area of about 500 Sqft feet, but this increases to over 1000 Sqft feet in about a furlong. Were the vegetation on each side removed, this narrow portion would no doubt in course of time attain the required section. It would, however be far more satisfactory to drop the straight cut into the creek about $\frac{3}{4}$ mile lower down. This could easily be done, without additional cost or materially altering the alignment, by giving

No 7 H.2913

This can be done JCL

giving the cut a slight "S" curve in the last 2 miles. The shallow portion of the creek is just below the bund and about a mile below the infall of the new cut. It extends for a little over a furlong, the average depths of water being about 2 feet below M.S.L. and the widths about 200ft, but with a flood level at +3 there is a section of 1000 Sqft which is very nearly the required area. It might of course be dredged out, but this seems unnecessary as the flow of drainage water into soon scour out the bed, besides of the cut is joined in at the head of the creek as suggested, the tidal flow will probably have more scouring effect owing to improved alignment.

4. The next question raised by the Chief Engineer is one of flood levels and discharges. The Yanamadurru Drain receives drainage the

drainage from two distinct sources, namely, from the Yerra Calva an upland stream and from a large area of wet cultivation in the Delta. The whole of the flood water of the Yerra-Calva is discharged under the Nandamur aqueduct on Ellore Canal. The water-way under the aqueduct is designed to discharge 14,580 Cft per second (vide $\frac{60.401}{21.6.80}$), but the maximum discharge from the basin of the stream has been gauged at site of proposed Ammamallanka Reservoir at 22,500 cft per second, so, theoretically the waterway is not nearly sufficient. On the other hand, the highest flood on record (1872) was observed by Mr. Walch to discharge only 9600 cft per second under the aqueduct with a head of 10". Apparently the rate of run off is greatly moderated by the flatness

flatness of the country, after the stream reaches the plains & the discharge from the catchment basin has been over estimated. However this may be, the fact remains that the aqueduct has stood for nearly 50 years and in that time the greatest flood passed under it was 9600 cft per second, so, the maximum discharge, as far as the Yerra Calva is concerned, may safely be taken at 10000 cft per second. Next we have the drainage from about 100 Sq Miles of the Delta. The discharge from this area has been put down at 6150* cft per second being the total of the discharges from inlets and subsidiary drains taken from the old Project Estimates etc. The figure certainly seems very high for the run off from a flat area. It will also be observed looking at the statement

* 2.28" off the entire Catchment of 100 Sq miles.

the

that there is a good deal of variety in the Coefficients which have been chosen for the Calculations and that some of the water is received from Canal surplus weirs. The total Cannot, however, be far out Considering the duration of the flood in September 1895 which was Chiefly from Delta drainage. Hence, the total drainage to be carried by the Yennamadurru during heavy rain in Nellore Taluqs and in the Delta may be taken at 16000 cfs per second. It is needless to point out that this Volume of water is far in excess of what the section of the Drain is Capable of Carrying, and Consequently, the lands bordering on the drain are Submerged for long periods especially those at the end about Bhimavaram.

5. In estimating the actual discharge at the end

of the Drain, calculations have been based on the flood levels recorded during the Cyclone of September 1895, during which a maximum reading was recorded on Bhimavaram lock lower pile. Below this no gauges have been maintained. I have therefore had to accept flood marks pointed out by villagers or make approximate assumptions for some calculations.

6. A list of gauge readings and rainfall at various stations for September 1895 is herewith enclosed. The gauge readings have been reduced to M.S.L. for ready reference. The first Column of the Statement shows the depths of water on Duvvu weir, but the figures cannot be trusted, as I am doubtful if all the boards could have been taken out although it is shown by the register

7. C

* I have since seen a report in which it is stated that the boards could not be taken out owing to the sudden rise of water.

No 7 H.E. 9/3

they were. The high readings are therefore possibly due to the obstruction on the Crest of the weir and not to an exceptionally high flood on the Yerracalva. It will be noticed in the Statement that there was only moderate rain registered at Bandaru in the Yerracalva catchment basin, on the 4th and 5th, This, however, only indirectly affects the question under reference, and it is with the gauges lower down the drain we have to deal. The first of these gauges is at Pippera bridge 4 miles above Bhimavaram lock, the second is at Gollalakoderu at the confalls of the Gostanadi drain 5 miles above the lock and the third is at the lock. A glance at this statement of gauge readings shows pretty clearly the necessity of the straight cut. It will be observed that

that the cyclone burst in the Delta on the 6th and water at once rose on all the gauges. On the 7th the maximum was reached on the Pippera and Gollalakoderu gauges and from the 8th both gauges showed a steady fall. On the Bhimavaram gauge water stood steady for three days, did not reach the maximum till the 10th and then began to fall slowly. Even during high floods the Bhimavaram gauge is slightly affected by the tide which may partly account for the slight fall on the 9th and the sudden rise on the 10th, otherwise the figures appear reliable and indicate the flooding of the country at the end of the drain for a long period owing to the insufficient outlet to sea.

7. To calculate the

actual

actual discharge at the end of the drain three Cross sections just above Bhimavaram lock have been selected which give an average area of 1944 Sq feet. Taking the fall between Kolalakoderu and Bhimavaram on the 7th at 1.25 per mile, the discharge arrived at is 4700 cft per second again with the same sections taking the fall between the same two gauges on the 10th and making the necessary allowance for the increase in sections etc we get a discharge of 5008 Cft per second. Therefore 5000 cft per second may be taken as the maximum discharge past Bhimavaram lock, or the maximum which has to be disposed of down the new cut and the old course into the Upputeru. The Coefficients chosen in the Calculations

Maximum discharge brought down by the Drain above the new Cut.

Present flood Level at the head of the new cut.

*i.e. above the termination of the Banks.

Limiting flood level at the head of the new cut after the cut has been made.

Calculations assume the Drain to be in good order, which it is not at present.

8. The maximum flood level at the head of the new cut (3 miles below the lock) is said to be +6.7. This was probably reached on the same day as Bhimavaram gauge stood at 10.3. Now calculating the discharge through a section taken just above the head of the new cut where the drain banking stops* and allowing a fall between 10.3 at Bhimavaram and 6.7 at the head of the cut we get a discharge of 4928 Cft per seconds or very nearly the same as at Bhimavaram Lock on the same day. The level +6.7 may therefore be accepted as correct.

9. The level +5 at the head of the new cut, shown on the plans submitted, seems to have been assumed in that

without calculation as that of a moderate flood. It is now proposed to assume this level limited to +5·75 after the Cut is made and the following Calculations show that it Cannot be reduced more. Taking gauge readings of 7th and assuming a uniform fall from Golealakoderu +15·74 to the head of the new Cut +5·75 we get a fall of 1·25 per mile and a dis- -charge of 3,305 cft per second through the section of the drain just above the head of the new cut. This is much less than the dis- -charge fixed on (name 5000) as the maximum but it will be observed that one of the branches is silted up for about a mile, so all that has to be done is to clear out this portion of the drain to the required section as shown on the tracing, which

Calculations

Discharges down the new cut & Old Course into the Lepputeru.

which will enable it to discharge 5000 cft per second. It may be objected that this section, in its present condition, Could not carry the flood of the 7th without a much higher reading than 9.5 being recorded at Bheemavaram lock, this may, however be explained by the fact that banking stops at the section, so, a high velocity through it was possible as the flood practically discharged into open Country without any water in front of it.

10. There is Considerable difficulty in calculating the discharges down the proposed cut and old Course owing to the fact that the Lepputeru is tidal & and has not a fixed flood level. however +2 has been fixed as the Mean Flood Level on as the following Considerations By examining readings on the

the lower gauge at Mogaltur
lock it has been roughly made
out that the Godawari datum
to which all levels are referred
and M.S.L, are nearly the
same. From the infall of
the Naidupalem Creek to the
sea, a distance of about
6 miles, the estuary is
a wide open estuary and
can only be slightly affected
by floods. The mean range
of tide for September 1896
shown at Mogaltur lock
is about 2½ feet. It may
therefore be safely guessed
that the mean flood level
at the infall of the Naidu-
palem Creek cannot be
not more than +2. On this
assumption we have a
surface fall down the
proposed cut of .5 per mile
which, without altering the
proposed section, gives dis-
charge of 2766 cft per second.

The

about from head to new cut

This gives a fall of
2½ ft through new cut
and 1½ ft through Creek.
5.75
2
3.75 ft. head
allowance 0.4
this point 7½ miles
below the head of

the level at the Bondada infall
may be taken at +5 which
will give a fall of .31 per
mile, and we have then
a discharge down the old
course of 1396 cft per second
Then there is a total dis-
charge of 4162 cft per second
down the new cut and
old course into the
estuary against a
maximum brought down
by the drain of 6000 cft per
second. The balance must
be treated as spill and
as it is proposed to throw
the spoil along the left
of the new straight cut
in the form of a bank,
no great harm can be done
by it. There is bound to be
spill unless the section
is banked on both sides,
which is not desirable or
necessary, in fact, the
section must be regarded
as a tentative one. Judging

by

judging by the scour, which must go on even in blind creeks to maintain their wide and deep sections, it may be safely prophesied that proposed section of the cut will enlarge so much so, that I am almost inclined to recommend that the bottom width be reduced from 100 to 50 feet.

As it has been shown that 100 feet bed width is none too great and cannot agree to this proposal to be really effective a full section is required. I do not think there would be much increase of width due to scour. JCR

11. As regards the cost of lands to be taken up, the Deputy Director of Mahaweli has informed me in his letter No: 522/14.6.97 that the approximate value of the land is Rs 25 per acre. There will be no difficulty in disposing of the soil as the land through which the cut runs is all good waste except for about a mile at the beginning and 1/4 of a mile at the end. As these portions it has been proposed to take up a strip one furlong in width

Cost of Lands.

12. Extension of Irrigation. At present the drainage water, in high floods now reaching the point where it is proposed to take off the new cut, flows across country in a South-Easterly direction through the Dipasumaara Village and finds its way into the Gunnapadi Sen as drain flooding the country as far as the Muthani Oodu Channel. The lands proposed to be irrigated lies in Dipa-Sumaara to the South of the Yenamadurra Irrigation Channel, therefore, by throwing up a bank for at least some distance along the left of the new cut this village will be well protected. There is no question about the possibility of Commanding the lands, but I doubt if more than 1000 acres can be irrigated until the distribution between Canals in the upper

1D P

former Estimate 2000. Nothing then said about this being dependent on improvement of distribution in upper part of delta.

part of the Delta is improved.
I refer to the Construction of
the proposed lock on the
Kakkarapparu Canal just
below the Costanadi Lock.
13. In Conclusion, I may
add that the Vyaamadurru
Drain from Costanadi upfall
to the head of the new cut
is in great need of attention
and a Considerable sum will
have to be spent on it. This
Reach of the drain runs in two
parallel branches with a
broad piece of land between
them. The flow down the
branches is obstructed by
thick growth of naanal grass
and the land is cultivated
and overgrown with trumma
trees. The branches will have
to be cleared and repaired.
The lands might be taken
over by this Department
with advantage. It would of
course be very costly to
take up such a large area,
but

but it might in a measure
be made to pay by leasing
it out for cultivation under
certain restrictions. The
Estimate which is now
being prepared for this
will come under "Main-
tenance and Repairs"
and will be submitted
for your sanction in due
Course.

I have the honour to be etc
(Sd) D Marshall
Asst Engr G.W. Dn

No: 1222 Gd Dated 29.9.1897
1-10-1897
desp 8th

Copy submitted to the
Chief Engineer for Irrigation
in reply to his memo no:
I/2866 of 16/9/97. The questions
do not admit of
accurate demonstration
but quite irrespective
of any calculations which
could be made, it can
hardly

Encls. 6.
1 Sketch Map showing the position of short cut Mogalatur drain
1 Sections of Nandipalem Creek
1 do of drain above proposed straight cut
1 Statement showing drainage & Boundaries of affluents
1 Register of gauge readings
1 Hydraulic Calculations.

T6

handley be doubted, that the Cut would prove most beneficial, as pointed out in this office No. C/141 of 4 augt 1896.

CHIEF ENGINEER FOR IRRIGATION. 12 OCT 1897 No. 2169D

J Cumming
Supdg Engineer 1st Circle
1/10/97

Cod
30-9

Public Works (1898) Department.

CURRENT No. 1625

From The Govt of India

Order

No. 261

Dated 16th February 1898.

Received } 22.2.98
Registered }

Enclosures 15 (16 plans)

Spare copies 4 6 Encls 15

SUBJECT.

Short cut on the Jenamadurru drain to Naidupalem Jerr in the Godavari Western Division.

Forwarding a note, for consideration, by the Offg: Inspector General of Irrigation on the project of excavating a proposed ——.

Dl 1
1/3/98

BACK PAPERS.

No.	Date.

FURTHER PAPERS.

No.	Date.

Note by the Offg. Inspector General of Irrigation on the estimate for excavating a short cut on the Yenamadurru drain to Naidupalem Yeru, Godavari Western Division.

This estimate is forwarded to the Government of India for sanction in accordance with Chap. V, para. 35V(*a*), Public Works Code, Volume II, because the work is classed as unremunerative and the cost is over Rs. 10,000 for "Works." The reports and plans are forwarded to show that the construction of the work is justified from an engineering point of view. The estimate as submitted amounts to Rs. 86,300, or Rs. 1,05,500, including establishment and tools and plant charges. Before recommending the project to the Government of India for sanction there appear to be some discrepancies in the calculation and a few points connected with the scheme which require explanation.

2. The project is for a straight cut over 100 feet wide and about 4½ miles long, that it is said will reduce the length of the present drain by 10 miles, and relieve the flooding of a large area of irrigable land now caused by the old tortuous channel. According to the longitudinal section of the cut the surface fall in flood would be only 1 foot (+5·0 — +4·0) in a length of 4½ miles or under 3 inches a mile, but assuming that the water level would rise to +6·0 at the head of the cut, that at the tail remaining as before (+4·0), the fall would be less than 6 inches a mile. According to the discharge calculations forwarded with the project the surface slope of the present drain at the head of the new cut, with a flood level of +6·7 and discharge of 4,928 cubic feet per second, is given as 1·2 per mile. Again, with a gauge of 5·75 at the same point, calculated discharge 3,305 cubic feet per second, the slope is shown as 1·25 per mile. Similarly in the discharge calculations for the drain in flood just above the Bhimavaram lock, which is about 3 miles in a straight line upstream of the head of the proposed new cut, the surface slope on 7th September 1895, with gauge 9·50, flood discharge 4,700 cubic feet per second, is given as 1·25 per mile; and at the same place on 10th September 1895, gauge 10·30, flood discharge 5,008 cubic feet per second, the slope is given as 0·9 per mile. The zero of the Bhimavaram lock gauge is −3·0 so that the reduced water surface level in the above two cases were +6·5 and +7·3, respectively. It is not understood how these comparatively high slopes can have obtained in the present tortuous channel for the gauges quoted above, seeing that the flood level during high tides stands at +4·0 in the Naidupalem Creek at a place 13 or 14 miles below the point where the proposed cut is to take out, and if the surface slopes given are correct, it is further not clear how a new cut with a surface of, at most, 6 inches a mile will effect any marked improvement in the existing conditions of flood levels. Even making full allowance for the tide range which at Musalapalam is, I believe, only about 4·0, it is not understood how the slopes given in the discharge calculations can obtain, unless it is that the whole country side near the head of the new cut becomes submerged once the floods rise to +6·0 or +6·7, which appears to be the case, and that then the direction of general flow is southwards across country, also that the water during high tides backs up the Wupputer river to a level of +4·0 and maintains practically this level for several miles west of the point where the new cut tails into the old channel. If this is actually the case, the proposed cut would be effective only during periods of low tide, and it seems doubtful whether the improvement in drainage anticipated would be worth the expenditure involved by the proposal.

3. In para. 4 of the Chief Engineer's report it is stated that according to the Tehsildar's rough estimate, over 14,000 acres of land would be protected from partial loss of crop and over 4,000 acres of new land brought under cultivation if the cut is made; but it is not mentioned on what data this estimate is framed. There is nothing in the papers to show the probable reduction in flood level the cut would effect in the locality where the land referred to is situated.

It is possible that the conditions of the case are more favourable in reality than represented by the figures given in the report and on the plans; but before according formal sanction to the project it appears desirable that the probable beneficial effect of the proposed cut should be further elucidated.

CALCUTTA; *The 2nd February 1898.*

J. S. BERESFORD,
Offg. Inspr. Genl. of Irrigation.

No. 1 I. G.

Submitted to the Government of India.

CALCUTTA; *The 10th February 1898.*

J. S. BERESFORD,
Offg. Inspr. Genl. of Irrigation.

G. I. C. P. O.—No. 1282 P. W. D.—11-2-98—77—E. H.

P.W.E. 15
1625/98

All communications should be addressed to the Secretary.

No. 26 I.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

CIVIL WORKS.

Irrigation.

To

The Secretary to the Government of Madras,

Public Works Department.

Calcutta, the 16 February 1898.

Sir,

I am directed to acknowledge the receipt of the Proceedings of the Government of Madras, No.41 I., dated the 18th January 1898, requesting the sanction of the Government of India to the estimate, forwarded therewith, amounting to Rs.1,05,500 (including Establishment and Tools and Plant Charges) of the cost of excavating a proposed short cut on the Yenamadurru drain to Naidupalem Yeru in the Godavari Western Division, chargeable against the open Capital Account of the Godavari Delta System.

2. In reply, I am to forward herewith, for consideration, copy of a note by the Officiating Inspector General of Irrigation on the project, and to request that an explanation of the points noticed therein may be submitted to the Government of India at an early date.

3. The plans and estimates forwarded with the Proceedings of the Government of Madras are returned herewith, and I am to request that they may be re-submitted with the further information now asked for.

I have the honour to be,

Sir,

Your most obedient servant,

O. C. Lees

Under Secy. to the Govt. of India.

Documents accompanying :-

(P.T.O.)

16/2