8618

Public Works (1896) Department.

G.O., No. 789-W.I.

DATED 29-September 1896

Not wanted for Tomorrow's issue

30/9/96

[Despatch Abstract.]

Floods in the Kistna river: Approving with remarks the Supdg: Engineer's proposal that he should be allowed a free hand in instituting measures for making good the damages caused by the late —, and sanctioning the grant of one month's pay to the members of the petty establishment who were employed on works connected with the protection of the head works.

Ditto: Forwarding Pro: approving with remarks the Supdg. Engineer's proposal that he should be allowed a free hand in instituting measures for making good the damages caused by the late — and sanctioning the grant of one month's pay to members of the petty establishment who were employed on works connected with the protection of the head works.

10/6

P.W.D. 500—15-6-96

164A.

INDEXED

29/9

BACK PAPERS.

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

FURTHER PAPERS.

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

IRRIGATION.

Government (1896) of Madras.

PUBLIC WORKS.

Recd. } 1896. *Enclosures.*

Regd. } 1896. *Spare copies.*

G.O., Nos. 789, 790 I., 29th September 1896.

SEPTEMBER.

Floods in the Kistna River

Forwarding Proceedings approving, with remarks, the Superintending Engineer's proposal that he should be allowed a free hand in instituting measures for making good the damages caused by the late ––, and sanctioning the grant of one month's pay to members of the petty establishment who were employed on works connected with the protection of the head works.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

Read—the following papers:—

From Major W. L. C. BADDELEY, R.E., Superintending Engineer, II Circle, to the Chief Engineer for Irrigation, dated Bezwada, 13th August 1896, No. 1244 K.

I have the honour to submit a report upon the recent flood in the Kistna river.

2. The accompanying list of gauge readings taken between the 29th July and the 12th August shows the manner in which the river rose and fell. The maximum recorded level was 41·30, the previous highest flood being 40·04 in 1882.

3. On the 4th instant, as the river was still rising and the telegrams from Pagatur unfavourable, we prepared sand bags weighing from 170 to 250 lb. each, and with these, the sluices and head works were bunded to keep out the water which rose over the platforms from which the screw gearings are worked.

All low places were raised and where banks were being eaten away by the wash of the water, sand bags were packed in to form a revetment.

The tops of lock gates were raised by temporary arrangements of planks and sand bags, and every thing possible was done; about 15,000 bags were used. The head to be taken by the head sluices was fixed at not more than 14 feet, and the officers at various points down the canals were warned to open all escapes and be prepared to cut the banks when the water that came down the canals was more than they would safely carry. The new head sluice at Seetanagaram, although incomplete, proved invaluable for taking the head off the old sluice; had we not been able to hold up water in the chamber between the two sluices, we must have seriously damaged the canals below or allowed a dangerous head against the old head sluice.

4. During the 4th, 5th, 6th, the situation grew steadily worse, and when the retaining wall of the bank between the river and the canal on the Bezwada side began to settle down, I had doubts whether the river would not form a breach. If the wall had fallen, it would have been impossible to prevent the breach, the earth behind would have slipped forward into 25′ of water, and the bank would have gone, leaving a wide gap through which the river would have poured into the main canal and thence over the delta system. On the western side, the leaks through the bank and left wing of the head sluice combined with the wash in the chamber dragged down the revetment and exposed the earth on the left bank, which we shall have difficulty in protecting for the remainder of the season. Soon after the strain on the works had ceased, more than half of the revetment on the right side of the chamber collapsed, thrusting out the retaining wall. We shall make temporary arrangements with Portland cement concrete in bags, and next year strong retaining walls must be built from sluice to sluice. If this had occurred while the flood was at its height, we could not have saved the Western delta canals. The front returns of the lock on the western side cracked and moved owing to settlement in the foundations. Arrangements are being made to shore up these portions, and it is hoped that this will be successful and enable navigation to be carried on for the remainder of the season.

5. It is not, I think, necessary that I should enter into further details of what was done to protect the head works, and I will, therefore, briefly state the damage done by the flood, as far as can be judged at present, and the measures that are, in my opinion, necessary to be taken if the Kistna district is not to run the risk of being reduced to the condition it was in fifty years ago; for the two deltas can only grow wet crops, and the destruction of the system of canals would deprive hundreds of thousands of people of the means of existence.

6. It must be remembered that the failure of the head works on either side of the river does not merely mean an appalling disaster that, after doing immense damage and causing great loss of life, will, in the course of a few years, be nearly forgotten; for it will be no question of *repairs*, the entire system in the delta affected will have to be *reconstructed*. The present works have taken over forty years to construct and they are rapidly approaching a stage when in any normal year at least 600,000 acres can be cultivated, giving a large revenue to Government and conferring great benefits upon more than a million of people. Considering, therefore, that we have been within a measurable distance of having both deltas wiped out, it is absolutely necessary to take steps to increase the margin of safety of the head works. I am of opinion that the present height of the head works on both sides of the river has been proved to be insufficient.

7. I will now proceed with the outline of the damage done:

River above anicut.—Left flood bank breached for about 450 feet in length, water passing into the valley of the Budameru and thence to the Collair lake. This bank protects the Nizam's Guaranteed State Railway and the East Coast Railway, the Ellore canal, and numerous villages and minor irrigation works; and it must be remade for the whole length of 10 miles of larger section, 12 feet wide at top with slopes of 2 to 1, the front slope being strongly pitched. I have given orders for the breach to be closed by a bank of at least this section; it will probably have to be larger, or a new alignment taken. It will be necessary to spend considerable sums on the proper maintenance of this bank, but this will be a trifle compared to the loss that will occur to the railways and canals from breaches. Had this bank breached lower down, I fear there would have been loss of life.

Right flood bank.—This gave anxiety, but it did not breach and has been patched up. If it breaches several feet of water would pass over the Southern Mahratta Railway near Tadepalli and the loss of life and damage done would be great. This bank also must be placed above suspicion. Work on these banks will be commenced as soon as the river permits.

Head sluice, Bezwada.—This must be raised *without adding more weight than absolutely necessary*, for the foundations are not on record, and though it stood the weight put upon it, the risk was one that was only taken owing to the emergency of the case. The weight distinctly reduced the shake and tremor in the sluice, which at one time was becoming excessive. A second regulator to form a chamber in which water can be raised to take the head off the sluice, is the only sound method of ensuring its stability; the advantage of this plan has also been proved at the Seetanagaram sluice. Moreover, the power of holding up water in rear of the sluices without wrecking the canals is of the greatest importance, and can be obtained in no other way. The parapet walls all round the nose and workshops will, of course, have to be raised to the same height as the parapet of the sluice. There is no difficulty in carrying out these works, but they will take some time to complete. Stoney's shutters should be used for the new regulator at Bezwada. Another great advantage of the double sluices will be that the canals will not be silted to the same extent that they have been on this occasion, as the quantity of water admitted through them will be much less. The flood water of the Kistna is always heavily charged with silt and it is a great advantage to let as little of it as possible into the canals.

Head lock, Bezwada.—The front gates must be raised and the lock converted from a single into a double one. It is not safe to trust to a single lock with such interests at stake.

Bank between the river and the Main canal.—This must be made stronger by facing with stone every part exposed to the action of water. The details of the work to be done cannot at present be settled, but I have ordered some revetment to be commenced at once. The retaining wall of the bank between the river and the main canal, Bezwada, will require extensive repair and, perhaps, reconstruction.

Western delta—Head sluice.—This must be raised and all parapets round the tongues of earth connecting the sluice and lock must be treated in a similar manner. The new head sluice must be pushed on to completion and the chamber between the two sluices strongly floored, and it is certain that nothing but strong retaining walls will stand the action that goes on in this chamber. This chamber must be made absolutely reliable; if it had not been revetted we could not have held up water in it, and the Western delta canals would have had 13 feet of water down them, which would have caused serious damage. It is now impossible to hold up water in the chamber; the revetment did invaluable service and then failed, so if a heavy flood comes in September, we shall be compelled to pass more water down the canals than desirable.

Head lock.—This must be repaired, if possible, or the returns rebuilt; it must be converted into a double lock.

8. I now come to a question which requires much consideration. The effect of the railway bridge is to contract the waterway, as can be seen from the survey, and unless the bridge is lengthened by three spans of 300′ on the eastern side, I fear that the anicut will some day be breached near the Bezwada under-sluices. The fall in the level of the river is revealing signs of damage to the anicut on the Bezwada side; but we cannot find out anything for certain for some months.

9. The survey I attach to this letter shows how very much the river has been contracted by the bridge and north training bank, and when it is considered that the bulk of the water passes through the nine spans commencing from the northern side, the reason for the heavy scouring action that now is going on below the apron, near the Bezwada under-sluices, is not far to seek. The bridge has twelve spans,—the spans 1, 2, 3 commencing from the right bank, do comparatively little work; 4, 5, 6, 7 and 8 pass the bulk of the water; 9, 10, 11 and 12 do more than 1, 2 and 3, but much less than the centre spans.

10. It is an axiom for the proper situation of an anicut that there shall be the freest possible escape for the water in rear; but what is the case at Bezwada? The original spread of the river has been throttled by the bridge and training bank, and during the flood the velocity of the water passing through the centre spans of the bridge was so great that, looking down upon it from the bridge, the effect was not that of water passing rapidly under a bridge, but more like the effect observed when water is discharged through an under-sluice.

The effect of this contraction is to produce back currents and whirlpools, which last year scoured out a hole 50 feet deep in the place referred to, and this scour hole will have increased this year, for, during the flood, the back currents and disturbance near the under-sluices were most marked.

As a proof of the evil effect produced by the bridge and training bank, I may observe that, since the construction of the bridge, a shoal of sand has been steadily increasing in size close to the north protection bund.

11. I must also point out that if the scour I allude to works back and takes down the under-sluices, it may cause a breach into the canal, which disaster would be equivalent to the failure of head works, and the consequences would be most serious as the Eastern delta system would be destroyed.

12. It appears to me from an examination of the survey that the water passing over the anicut, which is 3,700 feet average length during floods, pass into a basin which is contracted at its mouth by the fact that the centre spans of the bridge pass the bulk of the water. How far this tends to raise the level of the water above the anicut I cannot say, but about the back currents and disturbance and consequent danger it causes to the anicut, there is not a shadow of a doubt in my mind. I may remark that this is no new theory of mine. I have considered the protection bund a danger to the anicut ever since I have been in charge of the circle, and the state of the river below the anicut on the Bezwada side during the flood was such as to convince me that the interests of the anicut demand a freer escape of water in rear of it. The matter, in my opinion, is one that must be decided chiefly from the point of view of the responsible Irrigation officers. To allow the bridge to continue in its present state is to court disaster to the Eastern delta system. I must also state my earnest conviction that the danger is one that will increase every year so long as the bridge is allowed to remain as it is.

13. *Flood banks below the anicut.*—On the eastern side serious breaches have occurred which will be attended to when possible; the banks will be made up, new alignments being necessary in places where the lankas or river margins have been washed away, as they must have been, in many places. The banks must be made stronger and be set back as far as possible; for, of course, these banks can only stand spill water. The amount of damage done to our conservancy works must be very great, but nothing is, as yet, definitely known.

On the western side, the flood banks below Kollur at the end of the first reach of the Bank canal have suffered severely, and here again the measures necessary and the extent of damage can only be known when the river subsides.

14. *Canals, Eastern delta—Main canal.*—Uninjured, but badly silted.

Bundar canal.—Uninjured as far as Kankipad except for the breaches purposely made. The other reaches more or less damaged. There will be a great deal of work to do, but nothing special except in the first reach, where a powerful escape is an absolute necessity.

Ellore canal.—Conditions uncertain, as the water from the breach in the left flood bank of the Kistna attacked it, and also the Tammileru came down in flood. The canal is breached.

Ryves' canal.—Breached, but if nothing very serious happens it can soon be put right. Serious scours in rear of the regulator.

Canals, Western delta—Main canal.—Uninjured.

Commamur canal.—Uninjured.

Nizampatam canal.—Said to be breached at lower end.

Bank canal.—Damaged in places below first reach.

15. I cannot say that we are at the end of our troubles with these canals. The silt question alone is a serious one to face with six hundred thousand acres under cultivation, which will wither if the water-supply fails; but the main point has been gained, and that is the safety, for the time, of the head works. I say "for the time" advisedly, because I have doubts whether the head works in their present state would stand a flood of the same violence that they have just withstood.

16. I think I have now given a fairly clear outline of the events of the last few days, and I trust that the Government will allow me a free hand in carrying out such works as are absolutely essential for safety. The collection of materials should be begun at once, for the river will not be dry before March and we have only three months in each year to get in foundations or carry out repairs to the anicut and head works.

Plans and estimates for all necessary works will be prepared as soon as possible, but in some cases it will be advisable that I should issue orders for commencing work in anticipation of sanction, and I beg that my action in such cases may be approved.

17. I have already been informed by wire by the Chief Engineer, Public Works Department, that eight upper subordinates will be posted to the circle for work in connection with flood damages. The permanent staff will have to do all they know to restore irrigation and save crops.

18. In conclusion I have to state that work at Bezwada and Seetanagaram has been carried on night and day from the 1st to the 10th, and I trust that Government will be pleased to sanction a reward of one month's pay to the petty establishment employed at Bezwada and Seetanagaram on work connected with the protection of the head works, for they all worked hard and cheerfully, and their services were of the greatest value during an exceedingly anxious time. I append a list of the establishment so employed with their wages.

19. This report is merely a preliminary to the detailed accounts which I will submit as soon as pressure of work enables the Divisional officers to send in their reports to me.

Enclosure.

Gauge Readings at Bezwada.

Pagatur.	Bezwada.		Date.
36	32·65	6 A.M.,	29th July 1896.
40	35·05	„	30th „ „
43	36·85	„	31st „ „
48	38·25	„	1st Aug. „
49	39·55	„	2nd „ „
47	39·85	„	3rd „ „
50	40·05	„	4th „ „
53	40·70	„	5th „ „
54	41·20	„	6th „ „
	41·30	6 P.M.,	6th „ „
50	41·30	6 A.M.,	7th „ „
42	40·55	„	8th „ „
36	39·25	„	9th „ „
33	37·05	„	10th „ „
32	35·65	„	11th „ „
29	34·15	„	12th „ „

Note.—The Pagatur readings are received by telegrams from Kurnool. The crest of the anicut is 23·00. Previous highest F.L. 40·04 in 1882.

From the Executive Engineer, Kistna Northern Division, to the Superintending Engineer, II Circle, dated 7th September 1896, No. 304 S.E.

With reference to your No. 1404 K.N., dated 27th August 1896, I have the honour to forward a list of men belonging to the petty establishment, Head-quarter sub-division, whom I recommend for a gratuity of one month's pay for services rendered during the recent floods.

Enclosure.

Statement giving names and salaries of the Petty Establishment employed in Bezwada and Seetanagaram recommended for reward of one month's pay for service during the late flood.

Name.	Rank.	Salary. RS.	A.	P.	Remarks.
M.R.Ry. Ch. Venkataramiah Naidu	Anicut Superintendent	120	0	0	
„ M. Buchirazupantulu	Boat Superintendent	50	0	0	
P. Seshayya	Lock Superintendent, Bezwada.	15	0	0	
Syed Murtaza	Anicut lascar	7	0	0	
K. Ramaswamy	Do.	6	0	0	
Khasim Khan	Do.	7	0	0	
Lock and Anicut Establishment charged to Works.					
J. Anjanayulu	Anicut lascar	6	0	0	
M. Gopalaswamy	Do.	7	0	0	
Kajamiah	Do.	6	0	0	
Mahomed Esuff	Do.	7	0	0	
Nurahamud	Do.	6	0	0	
Shaik Hamud China	Lock lascar, Bezwada	6	0	0	
Shaik Mohiddin, Guntûr	Anicut lascar	6	0	0	
Syed Buran	Do.	6	0	0	
Syed Alli	Lock lascar, Bezwada	6	0	0	
M. Varadappa	Anicut lascar	8	0	0	
K. Venkatareddi	Do.	6	0	0	
Ch. Venkataswamy	Do.	6	0	0	
T. Venkataswamy	Lock lascar, Bezwada	8	0	0	
A. Venkayya	Anicut lascar	6	0	0	
M. Veeraswamy	Lock lascar, Seetanagaram	8	0	0	
Shaik Hammad	Do. do.	6	0	0	
Shaik Siliman	Do. do.	6	0	0	
Steamer crew.					
N. Naganna	Sarang	22	8	0	Monthly wages calculated at daily rates given by the Workshop Superintendent for a month of 30 days.
C. Venkataswamy	Driver	22	8	6	
Syed Gouse	Lascar	10	5	0	
Y. Subbayya	Do.	10	5	0	
M. Petha Ramsing	Do.	9	6	0	
K. Seshayya	Do.	9	6	0	
M. China Ramsing	Do.	9	6	0	
B. Atchanna	Do.	9	6	0	
M. Chin Appadu	Do.	8	7	0	
R. Veerappa	Punt tindal	10	0	0	
	Total	436	9	0	

(Signed) H. T. KEELING,
Ex. Engr., Kistna Northern Divn.

No. 1556 K.N.

Forwarded to the Chief Engineer for Irrigation with reference to his telegram, dated 26th August 1896, and in continuation of letter, No. 1244 K., dated 13th August 1896.

(Signed) W. L. C. BADDELEY, Major, R.E.,
Suptg. Engineer, II Circle.

11th September 1896.

No. 172 I.

Submitted to Government with reference to paragraph 2 of G.O., No. 669 I., dated 12th August 1896.

2. The Superintending Engineer gives in sufficient detail, in the above letter, the result of the late heavy floods in the Kistna, and the measures that were taken during their continuance for the preservation of the head works and the irrigation works below them. He asks to be allowed a free hand in instituting measures for making good the damages done, and guarding against their occurrence again. Considering the enormous interests concerned, it appears essential that this request may be granted. The conclusions Major Baddeley has come to, are sound and the proposals made by him may be carried out.

3. As regards the effect the railway bridge has had, and apparently will continue to have, in imperilling the safety of the anicut and head works and the whole of the Kistna delta system, the undersigned is in concord with the Superintending Engineer's views. The Government of India, the undersigned has been informed by the Consulting Engineer for Railways, has ordered Mr. Upcott, who arrived in Bombay yesterday, to proceed direct to Bezwada and consider this question, together with the Superintending Engineer and the Agent of the East Coast Railway. Their conjoint report may be awaited.

(Signed) R. R. E. DRAKE-BROCKMAN, Col., R.E.,
Chief Engineer for Irrigation.

17th September 1896.

Order—No. 789 I., dated 29th September 1896.

The Superintending Engineer's proposals recommended by the Chief Engineer for Irrigation are approved, but the departure from financial rules will be restricted as much as possible.

2. His Excellency the Governor in Council is pleased to accord the grant of one month's pay, amounting to Rs. 436–9–0, to the members of the petty establishment, referred to in paragraph 18 of the Superintending Engineer's letter.

3. The report regarding the Kistna Railway bridge referred to in paragraph 3 of the Chief Engineer's endorsement will be awaited.

4. A copy of these Proceedings will be forwarded to the Government of India.

[Here enter No. 790 I., dated 29th September 1896.]

(True Extract.)

(Signed) R. R. E. DRAKE-BROCKMAN, Col., R.E.,
Secretary to Government,
Irrigation Branch.

To the Superintending Engineer, II Circle.
„ Chief Engineer for Irrigation.
„ Chief Engineer, Public Works Department.
„ Consulting Engineer for Railways.
„ Examiner, Public Works Accounts.

ENDORSEMENT—No. 790 I., dated 29th September 1896.

Forwarded accordingly.

(By order.)

Col., R.E.,
Secretary to Government,
Irrigation Branch.

Issue

19/9
D. I.

This having been drafted from orders it need not be sent again in Circulation

BR
17.9.96

Ext. T. K. Narayana Aiyangar.

No 789 I. dated 29th Sept. 1896

PUBLIC WORKS DEPARTMENT,
IRRIGATION BRANCH.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 9th Sept

READ the following

Letter from the Superg. Engineer Second Circle (H.E. No. 1244-K dated 13 Aug. 1896)
Endorsement from do (H.E. No 1556-K.N. dated 11 Sept. 1896)
Endorsement by the Chief Engr. for Irrgn. (H.E. No. 172 I. dated 17 ~~August~~ Septr. 189

13 [illegible]

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Major Baddeley has come to are sound, and the proposals made by him may be carried out.

3. As regards the effect the Railway bridge has had, and apparently will continue to have, in imperilling the safety of the Anicut, and Head Works, and the whole of the Kistna Delta System, the undersigned is in concord with the Superintending Engineer's views. The Government of India, the undersigned has been informed by the Consulting Engineer for Railways, has ordered Mr. Upcott, who arrived in Bombay yesterday, to proceed direct to Bezwada and consider this question together with the Superg: Engineer and the Agent of the East Coast Railway. Their conjoint report may be awaited.

No. 789. I. d 29th Septr 1896.

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To The Superg. Engineer, Second Circle
" Chief Engineer for Irrigation
" Chief Engineer, Public Works Dept.
" Consulting Engineer for Railways
" Examiner, Public Works Accounts

Dcrkd 10/10/96

26/8

Amedd 31/8/96

No. 790. I. d 29th Septr

Forwarded accor

26/8

Amedd 10/10/96

will
Order requested whether this may issue without circulation. This was drafted from [illegible]

26/8

Sd 26/8/96

To D. P. S.

Sd 26.8.96

Public Works Department,
Irrigation Branch.

~~H. E. the Governor.~~
~~The Hon. Mr. Bliss C.I.E~~
~~The Hon. Mr. Grose C.I.E~~

Read the following :—

Letter from the S. E. II Circle of 13th Aug/96 No 1244 K. reporting on the late heavy floods in the Kistna River.

FOR ORDERS.

The Superintending Engineer gives in sufficient detail in the above letter the result of the late heavy floods in the Kistna, and the measures that were taken during its continuance for the preservation of the Head works, and the irrigation works below them. He asks to be allowed a free hand in instituting measures for making good damages done, and guarding against their occurrence again. Considering ~~[illegible]~~ the enormous interests ~~both~~ concerned, it appears essential that this request may be granted. The conclusions Major Baddeley has come to are sound and ~~they~~ proposals made by him may be carried out

1. I think these recommendations shd. be approved.

2. Col. Brockman does not mention Major Baddeley's proposal to grant a month's pay to the petty establishment, the members of which worked night & day for 10 days. I think this recommendation should be accepted. If my Hon. colleagues agree with me, I would suggest that sanction be given by Telegraph. This kind of recognition has so much more effect, if given quickly. (See para. 19)

A.H. 18. 8. 96

18/8/96.

18/8/96

Write to S. E. to take all necessary steps to put the works in safe condition & restore them to their former state. The Government have been pleased to accord the grant of one month's pay to the subordinate [illegible]

326B

FOR ORDERS.

As regards the effect the Railway Bridge has had and apparently will continue to have in imperilling the safety of the Anicut & Head works, and the whole of the Kistna Delta System, I am in accord with his views. The Govt of India, I have been informed by the Consulting Engineer for Railways have ordered Mr. Upcott who arrived in Bombay yesterday to proceed direct to Bezwada and consider this question together with the Supdg Engr & the Agent of the E. C. Railway. Their conjoint report may be awaited.

17/10/96

Public Works (1896) Department.

CURRENT No. 8678

Order

From The Chief Engineer for Irrigation

16

No. 172.I.

Dated 17th Septr 1896.
Received 29.9.96
Enclosures 5
Spare copies

SUBJECT.

Reports on the damages done by the floods in the Kistna in August 1896.

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS

G.O.	No.	Department.	Date.

Public Works (1896) Department.

Recpt
~~CURRENT~~ No. 263KS.

1A

Order

From The Supdg Engineer
2nd Circle

No. 1244.K.

Dated 13. 8. 96

Received

Enclosures 3

Spare copies

SUBJECT.

Report on the heavy floods in the Kistna in August 1896

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

No. 1244 K.

Supg: Engineer's Office,
2nd circle, Bezwada,
13th August 1896.

1 P

From,

Major W. L. C. Baddeley R.E.
Superintending Engineer,
2nd circle.

To,

The Chief Engineer,
For Irrigation,
Madras.

Enclo: 3
1 List of gauge readings
1 Survey
1 List of Petty &c Estabt.
(will follow)
3

Sir,

I have the honour to submit a report upon the recent flood in the Kistna river.

2. The accompanying list of gauge readings taken between the 29th July and the 12th Augt shows the manner in which the river rose and fell. The maximum recorded level was 41·30, the previous highest flood being 40·04 in 1882.

3. On the 4th Inst: as the river was still rising and the telegrams from Pagatur unfavourable, we prepared sand bags weighing from 170 to 250 lbs each and with these, the sluices and head works were bunded to keep out the water which rose over the platforms from which the screw gearings

of

gearings are worked.

All low places were raised and where banks were being eaten away by the wash of the water, sand bags were packed in to form a revetment.

The tops of lock gates were raised by temporary arrangements of planks and sand bags, and everything possible was done; about 15,000 bags were used. The head to be taken by the head sluices was fixed at not more than 14 feet and the officers at various points down the Canals were warned to open all escapes and be prepared to cut the banks when the water that came ~~to~~ down the Canals was more than they would safely carry. The new head sluice at Seetanagaram, although incomplete, proved invaluable for taking the head off the old sluice; had we not been able to hold up water in the chamber between the two sluices, we must have seriously damaged the Canals below or allowed a dangerous head against the old head sluice.

4. During the 4th, 5th, 6th, the situation grew steadily worse and when the retaining wall of the bank between the river and the Canal on the Bezwada Side began to settle down, I had doubts whether the river

river would not form a breach. If the wall had fallen it would have been impossible to prevent the breach, the earth behind would have slipped forward into 25' of water, and the bank would have gone, leaving a wide gap through which the river would have poured into the Main Canal and thence over the Delta System. On the Western Side, the leaks through the bank and left wing of the head sluice combined with the wash in the chamber dragged down the revetment and exposed the earth on the left bank, which we shall have difficulty in protecting for the remainder of the season. Soon after the strain on the works had ceased, more than half of the revetment on the right side of the Chamber collapsed, thrusting out the retaining wall. We ~~x~~ shall make temporary arrangements with Portland Cement concrete in bags and next year strong retaining walls must be built from sluice to sluice. If this had occurred while the flood was at its height, we could not have saved the W delta Canals. The front returns of the lock on the Western Side cracked and moved owing to settlement in the foundations. Arrangements are being made to shore up these portions, and it ~~t~~is hoped that this will be successful and enable Navigation to be carried

of

on for the remainder of the season.

5. It is not, I think, necessary that I should enter into further details of what was done to protect the head works and I will, therefore, briefly state the damage done by the flood, as far as can be judged at present, and the measures that are, in my opinion, necessary to be taken if the Kistna Dt. is not to run the risk of being reduced to the condition it was in fifty years ago; for the two deltas can only grow wet crops and the destruction of the system of Canals would deprive hundreds of thousands of people of the means of existence.

6. It must be remembered that the failure of the head works on either side of the river does not merely mean an appalling disaster, that after doing immense damage and causing great loss of life, will in the course of a few years be nearly forgotten, for it will be no question of repairs, the entire system in the Delta affected will have to be reconstructed. The present works have taken over forty years to construct and they are rapidly approaching a stage when in any normal year at least 600,000 acres can be cultivated, giving a large revenue to Government and conferring great benefits upon more than a million of people. Considering, therefore, that we

have been within a measurable distance of having both deltas wiped out, it is absolutely necessary to take steps to increase the margin of safety of the headworks. I am of opinion that the present heights of the head works on both sides of the river has been proved to be insufficient.

7. I will now proceed with the outline of the damage done

River above Anicut

Left flood bank breached for about 450 ft: in length, water passing into the valley of the Budameru and thence to the Colair lake. This bank protects the N. G. S. Railway and the E. C. Railway, the Ellore Canal, and numerous villages and minor Irrigation works, and it must be remade for the whole length of 10 miles of larger section, 12 feet wide at top with slopes of 2 to 1, the front slope being strongly pitched. I have given orders for the breach to be closed by a bank of at least this section, it will probably have to be larger, or a new alignment taken. It will be necessary to spend considerable sums on the proper maintenance of this bank, but this will be a trifle compared to the loss that will occur to the Railways and Canals from breaches. Had this ~~bank~~ [illegible] bank breached lower down I fear there would have been loss of life.

Right flood bank

This gave anxiety but it did not breach and has been patched up. If it breaches several feet of water would pass over the S. M. Railway near Tadepalli and the loss of life and damage done would be great. This bank also must be placed above suspicion. Work on these banks will be commenced as soon as the river permits.

Head Sluice - Bezwada

This must be raised without adding more weight than absolutely necessary for, the foundations are not on record, and though it stood the weight put upon it, the risk was one that was only taken owing to the emergency of the case. The weight distinctly reduced the shake and tremor in the sluice, which at one time was becoming excessive. A second regulator to form a chamber in which water can be raised to take the head off the sluice, is the only sound method of ensuring its stability, the advantage of this plan has also ~~between~~ been proved at the Seetanagaram sluice. Moreover the power of holding up water in rear of the sluices without wrecking the Canals is of the greatest importance, and can be obtained in no other way. The parape walls all round the nose and workshp will of course have to be raised to the sam height as the parapet of the sluice. There is no difficulty in carrying out these works but they will take some time to complete. Stoney's shutters should be used for the new regulator at Bezwada. Another great advantage of the double sluices will be that the Canals will not be silted to the same extent that they have been on this occasion; as the quantity of water admitted through them will be much less. The flood water of the Kistna is always heavily charged with silt and it is a great advantage to let as little of it as possible into the Canals.

Head lock - Bezwada

The front gates must be raised and the lock converted from a single into a double one. It is not safe to trust to a single lock with such interests at stake.

Bank between the River & the Main Can

This must be made stronger by facing with stone every part exposed to the action of water. The details of the work to be done cannot at present be settled, but I have ordered some revetment to be comm at once. The retaining wall ~~fr~~ of the bank between the river & the main Canal Bezwada will

will require extensive repair and perhaps reconstruction.

Western Delta

Head Sluice

This must be raised and all parapets round the tongues of earth connecting the sluice and lock must be treated in a similar manner. The new head sluice must be pushed on to completion and the chamber between the two sluices strongly floored, and it is certain that nothing but strong retaining walls will stand the action that goes on in this chamber. This chamber must be made absolutely reliable; if it had not been revetted, we could not have held up water in it and the Western Delta canals would have had 13 ft: of water down them, which would have caused serious damage. It is now impossible to hold up water in the chamber; the revetment did invaluable service and then failed, so if a heavy flood comes in Septr: we shall be compelled to pass more water down the Canals than desirable.

Head lock

This must be repaired if possible, r the returns rebuilt; it must be Con ated into a double lock.

8. I now come to a question which requires much consideration. The effect of the Railway bridge is to contract the water way, as can be seen from the Survey, and unless the bridge is lengthened by 3 spans of 300′ on the Eastern Side, I fear that the Anicut will some day be breached near the Bezwada under sluices. The fall in the level of the river is revealing signs of damage to the anicut on the Bezwada side, but we cannot find out anything for certain for some months.

9. The Survey I attach to this letter shows how very much the river has been contracted by ~~the~~ bridge and North training bank, and when it is considered that the bulk of the water passes through the nine spans commencing from the Northern Side, the reason for the heavy scouring action that now is going on, below the apron, near the Bezwada undersluices, is not far ~~to~~ to seek. The bridge has 12 spans, the spans 1. 2. 3. commencing from the right bank do comparatively little work. 4. 5. 6. 7 and 8. pass the bulk of the water. 9. 10. 11. and 12. do more than 1. 2. & 3 but much less than the centre spans.

10. It is an axiom for the proper situation of an anicut that there shall be the freest possible escape for the water in rear

rear; but what is the case at Bezwada? The original spread of the river has been throttled by the bridge and training bank, and during the flood, the velocity of the water passing through the centre spans of the bridge was so great that, looking down upon it from the bridge, the effect was not that of water passing ~~under~~ rapidly under a bridge but more like the effect observed when water is discharged through an undersluice.

The effect of this contraction is to produce back currents and whirlpools, which last year scoured out a hole 50 ft deep in the place referred to, and this scour hole will have increased this year, for during the flood, the back currents and disturbance near the under sluices were most marked.

As a proof of the evil effect produced by the bridge and training bank, I may observe that, since the construction of the bridge, a shoal of sand has been steadily increasing in size close to the North protection bund.

11. I must also point out that if the scour I allude to works back and takes down the undersluices, it may cause a breach into the Canal, which disaster would be equivalent to the failure of headworks and the consequences would be most serious, as the Eastern delta system would be destroyed.

12. It appears to me from an examination of the Survey that the water passing over the Anicut which is 3700 ft. average length during floods, passes into a basin which is contracted at its mouth by the fact that the centre spans of the bridge pass the bulk of the water. How far this tends to raise the level of the water above the Anicut I cannot say but about the back currents & disturbance and consequent danger it causes to the Anicut there is not a shadow of a doubt in my mind. I may remark that this is no new theory of mine. I have considered the protection bund a danger to the Anicut ever since I have been in charge of the Circle, and the state of the river below the Anicut on the Bezwada side, during the flood, was such as to convince me that the interests of the anicut demand a freer escape of water in rear of it. The matter, in my opinion is one that must be decided chiefly from the point of view of the responsible Irrigation Officers. To allow the bridge to continue in its present state is to court disaster to the Eastern Delta System. I

I must also state my earnest conviction that the danger is one that will increase every year so long as the bridge is allowed to remain as it is.

Flood Banks below the Anicut

13. On the Eastern side serious breaches have occurred which will be attended to when possible; the banks will be made up, new alignments being necessary in places where the banks or river margins have been washed away as they must have been in many places. The banks must be made stronger and be set back as far as possible; for, of course, these banks can only stand spill water. The amount of damage done to our Conservancy works must be very great but nothing is, as yet, definitely known.

On the Western side, the flood banks below Kollur at the end of the 1st reach of the Bank Canal have suffered severely and here again the measures necessary and the extent of damage ~~done~~ can only be known when the river subsides.

Canals

Canals - Eastern Delta

Main Canal - uninjured but badly silted.

Bundar Canal - uninjured as far as Kankipad except for the breaches purposely made. The other reaches more or less damaged. There will be a great deal of work to do, but nothing special except in the 1st reach, where a powerful escape is an absolute necessity.

Ellore Canal - Conditions uncertain, as the water from the breach in the left flood bank of the Kistna attacked it, and also the Tammileru came down in flood. The Canal is breached.

Ryves' Canal - breached, but if nothing very serious happens it can soon be put right. Serious scours in rear of the regulator.

Canals - Western Delta

Main Canal - uninjured.

Commamur Canal - uninjured.

Nizampatam Canal - ~~uninjured~~. Said to be breached at lower end.

Bank Canal - damaged in places below first reach.

I [illegible] conviction

15. I cannot say that we are at the end of our troubles with these canals, the silt question alone is a serious one to face with six hundred thousand acres under cultivation, which will wither if the water supply fails; but the main point has been gained and that is the safety for the time of the head works. I say "for the time" advisedly because I have doubts whether the head works in their present state would stand a flood of the same violence that they have just withstood.

16. I think I have now given a fairly clear outline of the events of the last few days and I trust that the Government will allow me a free hand in carrying out such works as are absolutely essential for safety. The collection of materials should be begun at once for the river will not be dry before March and we have only 3 months in each year to get in foundations, or carry out repairs to the Anicut and head works.

Plans and estimates for all necessary works will be prepared as soon as possible

possible, but in some cases it will be advisable that I should issue orders for commencing work in anticipation of sanction, and I beg that my action in such cases may be approved.

17. I have already been informed by wire by the Chief Engineer, P.W.D. that eight upper subordinates will be posted to the circle for work in connection with flood damages.

The permanent staff will have to do all they know to restore irrigation and save crops.

18. In conclusion I have to state that work at Bezwada and Seetanagaram has been carried on night and day from the 1st to the 10th and I trust that Government will be pleased to sanction a reward of one months pay to the petty establishment employed at Bezwada and Seetanagaram on work connected with the protection of the Head works, for they all worked hard and cheerfully, and their services were of the greatest value during an exceedingly anxious time. I append a x list of the establishment so employed with their wages.

x Will follow — vide R 290 KS/96

19. This report is merely a preliminary to the detailed accounts which I will submit as soon as pressure of work enables the Divisional Officers to send in their reports to me.

I have the honour to be,
Sir,
Your most obd.t servant,

W C Baddeley
Major R.E.
Superintending Engineer,
II Circle.

OW. 3
8628/96

From

The Supg Engineer
II Circle

To

The Chief Engineer
for Irrign:
Madras.

R 2634

No. 1244 K
13.8.96

Encl 3
1 Encl will follow

Floods in the Kistna in Augt 96 - Reports on the heavy —.

Gauge readings at Bezwada.

Pagatore.	Bezwada.		Date.
36	32.65	6 A.M.	29th July 96.
40	35.05	"	30th "
43	36.85	"	31 "
48	38.25	"	1st Augt:
49	39.55	"	2nd "
47	39.85	"	3rd "
50	40.05	"	4th "
53	40.70	"	5th "
54	41.20	"	6th "
	41.30	6 P.M.	6th "
50	41.30	6 A.M.	7th "
42	40.55	"	8th "
36	39.25	"	9th "
33	37.05	"	10th "
32	35.65	"	11th "
29	34.15	"	12th "

Note - The Pagatore ~~g~~ readings are received by telegrams from Kurnool.

The crest of the Anicut is 23.00

Previous highest F.L. 40.04 in 1882

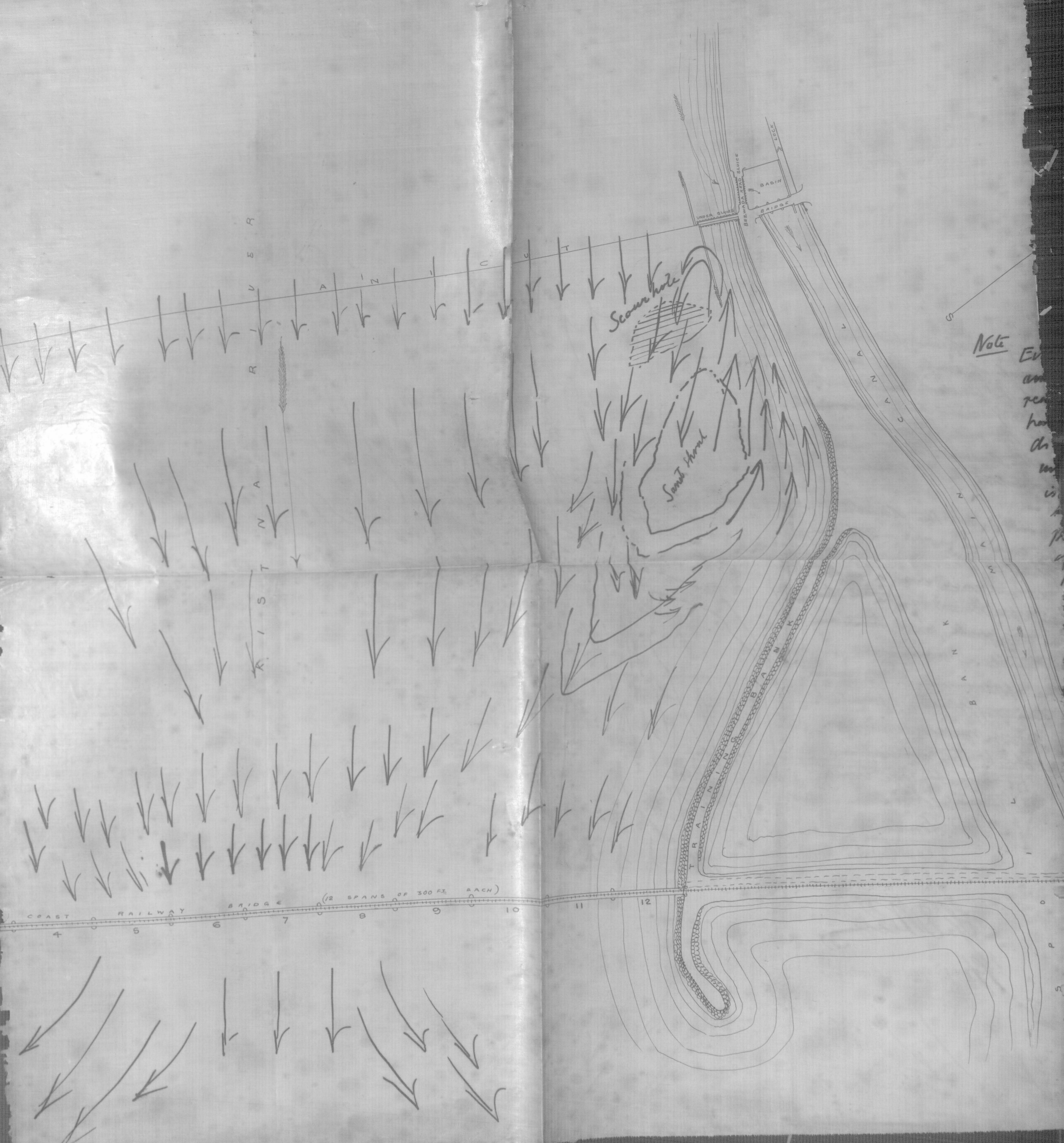
W W Baddeley

Major R.E.
Supg: Engr: II Circle

KISTNA RIVER

SHOWING ANICUT & RAILWAY BRIDGE

SCALE $\frac{1}{3000}$



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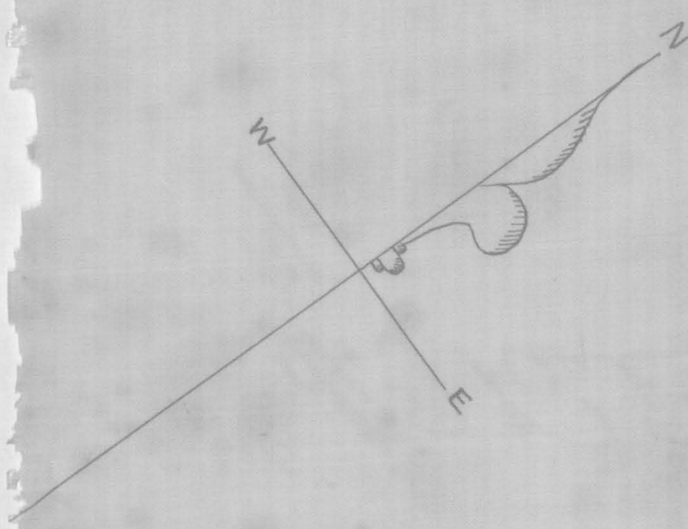
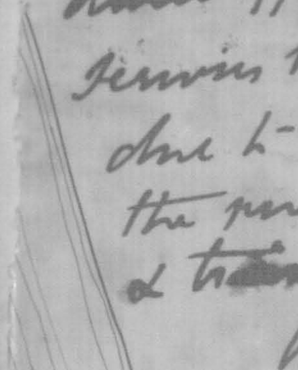


n if all the spans did their full
 of work, the water in
of the Anicut would only
the free discharge desirable.
is the water passing over a
n the Anicut (by the under sluices)
obstructed by the training
k –
arrows denote the direction
the current as observed during
flood –
disturbance over a in the
neighbourhood of the U Sluices
on very peak, and there was
standing wave –
The appearance of the river
during floods, points to
serious mischief going on,
due to the contraction of
the river by the bridge
& ~~training~~ bank –



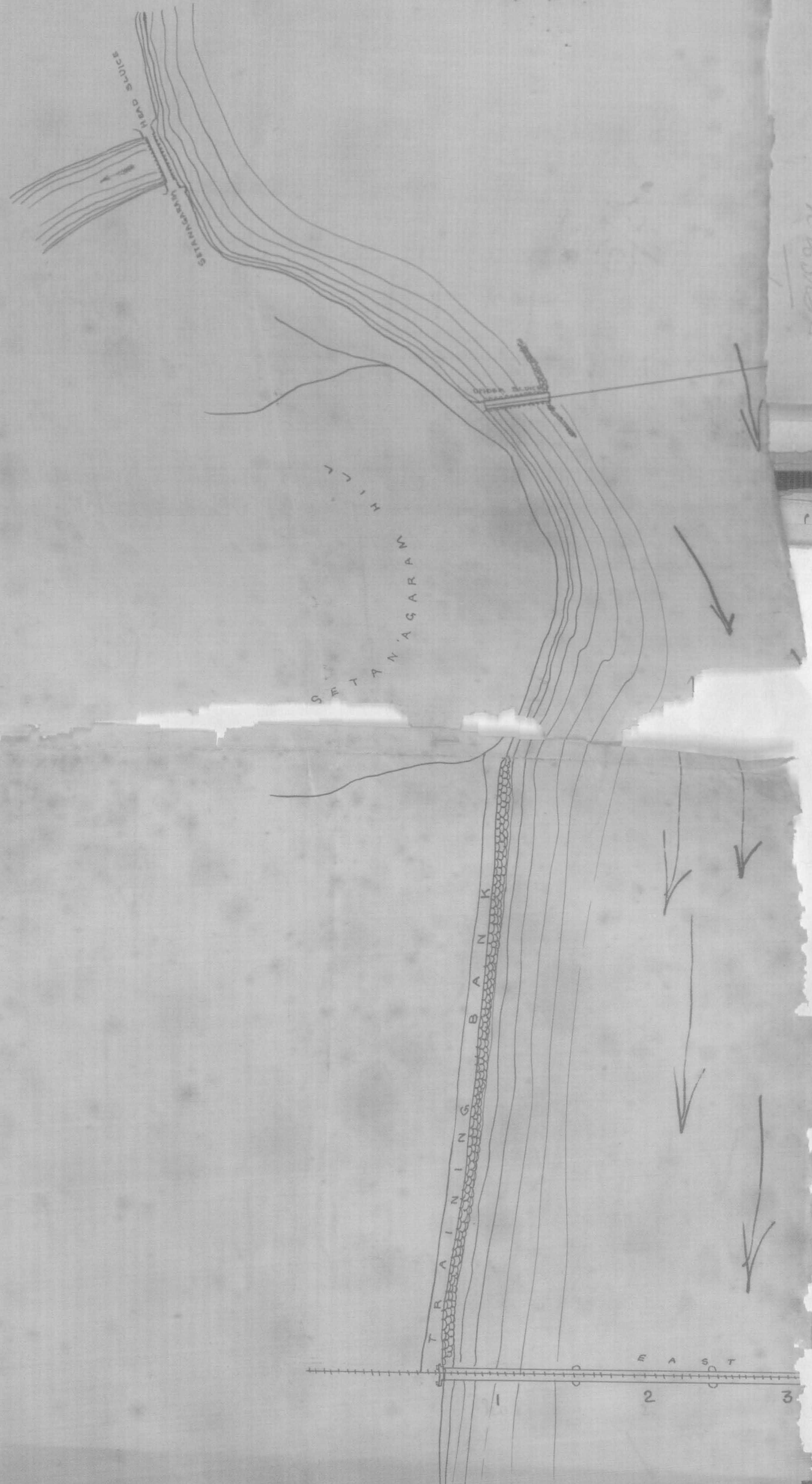
W.W. Bardsley
13-8-96

A. J. Keeling
13/8 EXECUTIVE ENGINEER
NORTHERN Dn. KISTNA.

R263Ksd
1

NOTE.

DURING THE FLOODS IN AUGUST 1896
SPANS NOS. 1.2.3 PASSED VERY LITTLE WATER
SPANS 5.6.7.8 PASSING MOST OF THE WATER
SPANS NOS. 9, 10, 11 & 12
PASSED MORE THAN 1.2 & 3 & LESS THAN
SPANS 5, 6, 7, 8. THE SET OF THE RIVER
ABOVE THE ANICUT WAS AT A RIGHT
ANGLE TO THE ANICUT AND NOT AS
BEFORE TOWARDS SEETANAGARAM.



R 263 Ks
1

Deferred telegram

To

The Supdg. Engineer
Second Circle.

No. 49. x List with wages referre
in para 18 of your Numb
1244-K of thirteenth inst
urgently wanted x

26/8.

896

Recd 31/8

H.P.
Despatch this
at once
26/8

Later Cases.
R 290 KS d/ 4.9.96
D. 172-W d/ 17.9.96

Desptd 26/8/96

Public Works (189) Department.

CURRENT No.

10

B 290 K

Order

From

The Supdg Engr
II circle

No. 1556 K.N

Dated 11 September 1896

Received 14-9-96

Enclosures 1

Spare copies

SUBJECT.

List of men of Petty Establishment recommended for reward for service rendered during the late Kistna Flood — Forwarded —

W.d.l.

Draft disposal approved by D.E. + S.E. [illegible] with the [illegible] para 2 [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

BR 14-9-96

papers

J.H.

[illegible] the of

P. W. 19
[illegible]-5-8-96.

BACK PAPERS.

Receipt ~~O.O.~~ Issue	No.	Department.	Date.
R	263-	KS	15-9-96
R	273	O/n	10.8.96

FURTHER PAPERS.

Receipt ~~O.O.~~ Issue	No.	~~Department.~~	Date.
I	172-	I	17-9-96
I	669		12th aug. 96

4/42

Statement giving names & salaries of the Petty Estt. em-ployed in Bezwada and Sitanagaram recommended for reward of one month's pay for service during the late flo

Name	Rank	Salary	Remarks
M.R.Ry. Ch. Venkataramiah Garu	Anicut Subdr.	120	
" M. Bachiraju Pantulu	Boat Subdr.	50	
P. Seshayya	Lock Subdr., Bezwada	15	
Syed Murtaza	Anicut lascar	7	
K. Ramaswamy	-do-	6	
Khasim Khan	-do-	7	
Lock and anicut Estt. charged to works.			
J. Anjanayalu	Anicut lascar	6	
M. Gopalaswamy	-do-	7	
Kajamiah	-do-	6	
Mahomed Esuff	-do-	7	
Nurahamud	-do-	6	
Sheik Hamud China	Lock lascar Bezwada	6	
Sheik Mohiddin Gunturi	Anicut lascar	6	
Syed Buran	-do-	6	
Syed Alli	Lock Lascar Bezwada	6	
M. Varadappa	Anicut lascar	8	
K. Venkatareddy	-do-	6	
K. Venkataswamy	-do-	6	
Venkataswamy	Lock Lascar Bezwada	8	
I. Venkayya	Anicut lascar	6	
Veeraswamy	Lock lascar Sitanagaram	8	
eik Hammad	-do-	6	
eik Siliman	-do-	6	

Steamer crew

Name	Rank	Salary	Remarks
Naganna	Sarang	22-8-0	Monthly wages calculated at daily rates given by the workshop Superintendent for a month of
enkataswamy	Driver	22-8-0	
d Gouse	lascar	10-5-0	
Subbayya	-do-	10-5-0	
Pitha Ramsing	-do-	9-6-0	
Seshayya	-do-	9-6-0	
China Ra[illegible]	-do-	3	

B. Athanna	Luscar	9-6-..
M. Chinnappan	do	8-7-..
R. Veerappa	Punt Tindal	10-..-..
	Total Rs 43-6-9	

Sd/ H. T. Keeling
Executive Engineer,
Kistna Northern Dn.

True copy,
Jno. Upston
Manager,
Supdg Engrs office,
II Circle

Compd
[illegible]

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11 P ~~11 P~~

Letter from the Executive Engineer, Kistna Northern Divis to the Superintending Engineer, II Circle, No. 304 S.E, dated 7th Sept 96

With reference to your No. 1404 K.N, dated 27th August, 1896, I have the honor to forward a list of men belonging to the petty establishment, Head Quarter Sub-Division whom I recommend for a gratuity of one month's pay for Services rendered during the recent floods.

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12 P

Enclosure: 1

No. 1556 K.N / 11·9·96

Forwarded to the Chief Engr, for Irrigation with reference to his telegram dated 26th August, 1896, and in continuation of letter No. 1244 K.N/10-8-96.

M.C. Baddeley
Major R.E.
Supdg Engineer,
II Circle

R29 Ks

O.W.C.S.
86/8/96

Deferred telegram

To

The Supdg Engineer Sec
Circle

Your letter 1244 K. thirteenth instant. All necessary steps sho
be taken to put the works in
safe condition and restore them
to their former status. M
have been pleased to accord
the grant of one months pay
to the subordinates referred
in para 18.

19/8/96

Despd 19.8.96

Later Cases.
I No 49 Tele d 26-8-96
R 290 K d 11-9-96
I 172 I d 7-9-96