M.R.O. 1—77,006—8-6-37.

(1) Number of pages_____

(2) Date of repair_____

(3) Initials of the Reference_____

MADRAS RECORD OFFICE.

Government of Madras.

Public works **DEPARTMENT.**

G.O. No. 189	Press / Mis.
387-88	
Dated 23 . 1	1871 .

Not to be folded or roughly handled

No. 387. Read the following letter from the Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Public Works Department, dated Madras, 15th December 1870, No. 102:—

I HAVE the honour to submit plans, estimates, and all other usual documents, relating to the distribution works under the 10th Section of the Madras Irrigation and Canal Company's main canal, as particularized in the margin, together with the Agent's letter, No. 506, 2nd December 1870, and its accompaniments.

From Agent, No. 506, dated 2nd December 1870.
Chief Engineer of 25th November 1870, with Report and Tabular Statement from Mr. Higginson.
4 Detail Plans of works, Nos. 498 to 501.
1 General Plan, No. 502.
1 Do. Abstract Estimate.
1 Do. do.
1 Detail. do.
1 Tabular Statement.

2. The area proposed to be irrigated is 4,222 acres, all on the left side of the main canal, lying between it and the rivers Pennair and Booga, and extending from the 183rd mile on the main canal to its terminal point near Cuddapah, at the 188th mile; and the scheme consists of six main channels, the first four supplied by irrigation sluices in the main canal, and the other two from the channel of the scouring sluice at the Cuddapah terminus.

3. The particulars of the main channels are as follow, and their course, as well as the area to be irrigated under each length, is clearly shown on the general drawing:—

	Length. M. Chs.	
No. 1.—Chennoor ...	... 3 57	does not require any special remark.
„ 2.—Dooganapully ...	... 0 24½	is of trifling length. To water a small tongue of land that the neighbouring tank does not reach.
„ 3.—Chinnamapully ...	... 0 57½	is also of small length. It crosses the waste channel of a tank, the surplus from which is intended to pass over No. 3 channel, where a bank will be annually thrown across the opening.
„ 4.—Mundlampully ...	... 2 40	do not require special remark.
„ 5.—Batchampully ...	... 1 8	
„ 6.—Cuddapah Cantonment ...	1 30½	

The discharge of the channels has been regulated on the principle approved of in Government Order, No. 31, dated 12th October 1868, and varies from 3½ to 8 cubic yards per hour per acre.

The masonry works are—

4 Irrigation sluices in main canal.
6 Village road crossings.
2 Culverts under main roads.
8 Drainage culverts.

1 Overfall to lower the water from the bed of one reach in a channel to another.

1 Retaining wall for annual bank.

1 Weir on scouring sluice channel.

4. The particulars of the estimate are—

	RS.	A.	P.
4 Irrigation sluices in main canal	1,575	4	8
Minor masonry works for six channels, including			
Sluices for Nos. 5 and 6	2,817	8	9
Earthwork for six channels	3,274	7	6
Contingencies	749	7	1
Subsidiary channels, at 6 Annas per acre ...	1,583	4	0
	10,000	0	0

for the irrigation of 4,222 acres, being an average of Rupees 2-5-11 per acre; this is a higher average than was expected, and arises from its having been necessary to take the channels on contour lines instead of on the ridges, and that even then the area capable of being watered proved only half of what it was supposed the main canal commanded. The average, however, is reasonable enough, but it is not unlikely it may have to be exceeded eventually, as no minor channels are estimated for, and six Annas an acre may not be sufficient for the immediate delivery of the water to the fields, as whatever minor works may, in addition, be hereafter necessary, they should be of masonry, and not dry rubble, as is proposed in the Executive Engineer's report.

5. The rates are—

	RS.	A.	P.	
Rubble masonry	3	12	0	to 5 Rupees a cubic yard.
Dry rubble apron	1	0	0	,, ,,
Arch work	0	5	0	,, a cubic foot.

Cuttings and banks, 8 and 9 cubic yards per rupee, which the Executive Engineer admits are somewhat high; but for small quantities in detached situations they can't be called excessive.

6. This irrigation project is of small extent compared with some others, and the works are simple in their nature; all are very fully described in Mr. Higginson's report, in which, as well as in his drawings, nothing deserving of notice has been omitted, and yet all is brought within a moderate compass, and the scheme is very complete. I would beg that the Executive Engineer's report and his tabular statement of channels may be printed with this letter.

7. The only discrepancy which I find in the papers is that the drawings and estimates do not include surplus weirs, which the Executive Engineer mentions he had provided at each change in a channel's capacity for the purpose of regulating the discharge, and which I conclude the Chief Engineer decided on dispening with.

I recommend the estimate, amounting to Rupees 10,000, for sanction, noting that an advance of Rupees 850, in part thereof, was authorized by Government Order No. 2,916, 2nd December 1870.

From the Agent and Manager of the Madras Irrigation and Canal Company, to the Consulting Engineer for the Madras Irrigation and Canal Company, dated Madras, 2nd December 1870, No. 506.

I HAVE the honour to forward copy of the Chief Engineer's letter No. —, dated 25th November* 1870, with plans and estimates for distribution works in the 10th Section as therein particularized, and request you will be good enough to obtain the early sanction of Government for the execution of these works.

* Also the Chief Engineer's copy of Mr. Higginson's report.

From the Chief Engineer, to the Agent and Manager of the Madras Irrigation and Canal Company, dated Cuddapah, 25th November 1870.

10th Section Distribution.

I HAVE the honour to apply for sanction for Rupees 10,000 expenditure on the distributing channels of the 10th Section, including the cost of sluices, and the advance asked for for them.

2. The copy of Mr. Higginson's report explains the nature of the works. The area irrigated is 4,222 acres, at a cost *per acre* for earthwork of Rupees 0-13-7, for masonry of Rupees 1-2-4, total Rupees 1-.5-11. To this an allowance of Annas 6 an acre is added as a margin for any work required for conveying water to the actual fields.

3. The following documents accompany this application :—

4 Detail plans of works, Nos. 498 to 501.
1 General Plan, No. 502.
3 Estimates.
1 Tabular Statement.
1 Report of the Divisional Engineer.

REPORT TO ACCOMPANY 10TH SECTION DISTRIBUTION.

PLANS AND ESTIMATES.

Chennoor Channel.—This was the first channel surveyed, and being the most important I was anxious to complete it also, as it determined the extent of land that was actually under command of the canal. The natural drainage runs nearly parallel with the Pennair, and the actual ridge of this compartment is close to the banks of the river, consequently the channel has been run as near as possible to the river, so as to avoid the village of Chennoor, which covers a large area.

The soil of this tract is alluvial, but of a much firmer quality than black cotton, and is, I consider, of the best description for wet cultivation.

The velocities of this channel range from 3,100 to 2,600 yards per hour, which the soil is well able to stand. The fall of the ground is about 3 feet per mile, which is the fall given to the channel needing only one overfall of 2 feet 6 inches to be introduced. It has been laid out for 3¼ miles, rather further than was actually required for a main channel, but for some distance from the present terminus no suitable nullah could be found into which to discharge the water. Only one drainage is crossed, and that is of small area.

The main road to Kurnool is crossed at a suitable place by a culvert, and provision has been made to carry over the channel the side drainage of the road which extends, however, but a short distance.

The latter part of the land under this channel is under garden cultivation by well irrigation, and the ryots stated they should much prefer the use of canal water as being less expensive, and better in every way; they appeared anxious to have the canal made at once. I have no doubt about the water being taken up rapidly here, as the ground is already laid out for wet cultivation over a

large extent, greatly obviating the difficulty attending the introduction of canals in what has been hitherto comparatively dry cultivation, as the crops raised were chiefly vegetables for Cuddapah market, only requiring occasional irrigation.

Provision has been made for the only three village roads in general use to cross the channel.

2. *Dooganapully channel.*—This compartment, bounded by streams passing under the main canal, is of small extent, and partly under tank irrigation. All existing wet cultivation has been excluded from the areas calculated upon. I have no doubt that, in course of time, several tanks in this neighbourhood will be abandoned, and their beds put under cultivation, as they are not to be depended upon for a supply; and this year (an unusually wet one) Ooperpully tank has breached twice, and, within the last few days, every tank I believe in this part of Cuddapah has followed its example.

This channel has only been taken round the village to a point commanding the tongue of land, and discharged into a drainage channel. There are no masonry works on this whatever.

3. *Chinnamapully channel.*—Contours round a hill forming one bund of the tank, and crossing on the way the discharge channel of the calingulah. The passage of this water across the channel is provided for by an annual bank. It is seldom this calingulah discharges at all, but provision has been made to pass the amount of water discharged the last few days which have been exceptionally wet. The supply into this tank is always cut off when full, and the drainage into it is very small, so that the chances are the water will seldom cross the channel and break the annual bank. There are no other masonry works on this, the channel being stopped short of the main road and discharged into a nullah passing through a culvert under the road.

4. *Mundlampully channel.*—I was much disappointed to find that a large portion of the land below the canal at this point lies a foot or two only above the bed of main canal; a ridge extends for a long distance nearly level on the top, and in no place more than 3 or 4 feet above the canal. There are just 1,000 acres lost to irrigation by this and certainly the best soil. The channel contours round this high land to its further extremity, commanding all the land below it on that side of the ridge and down to the Booga river. The soil is of a reddish description, with kunkur sub-soil, and would have stood a higher velocity than 3 feet per mile, had it been required. Immediately below this channel a new tank has been commenced, though not yet half finished, which will monopolise a large piece of useful land, and when finished can be of little use for the purpose of collecting water, as the drainage into it is very small indeed.

As this is a contour channel, there are several drainages to cross, and which have been provided for by simple culverts covered by flags, which are easily procured.

5. *Batchampully channel.*—This and the next start from the scouring sluice channel which is in a convenient position for both to take off. As they are both contours, to avoid loss of level, and consequently land, I have started both channels with their beds at the level of scouring sluice sill, and on the crest of the weir made provision for the insertion of either boards or flags to raise the water to the level required for the two channels.

The scouring sluices will be able to discharge the surplus water of the main canal over this weir unless it is required to empty it, when the boards can be easily removed by the sluice keeper. As this channel contours round the opposite side of the hill to the previous one with the same fall of 3 feet per mile, it has not been continued so far, as it is intended to irrigate the distant land with the previous one; only one drainage is crossed, the rest being intercepted by a stop bank which leads it into the tank just beyond the terminus; one village road has been provided for by a bridge.

Cuddapah Cantonment channel.—It was expected that this channel would command the ridge of land on which the cantonment lies, but it proved a few feet too high, consequently it

was carried round with a one-foot contour, which was extended to the river and which bounded the land available for irrigation.

A few drainages are crossed, the only one of any extent being a few chains from the sluice. The old road into Cuddapah, used almost entirely by pack-bullocks and foot-passengers, has been provided with a bridge.

6. The sections of the channels have been kept as uniform as possible, a bottom width of 3 feet suiting the discharges required. The slopes have been made throughout two to one, though I think some of the soil might stand them steeper, yet with such narrow channels it is not worth while to run the risk of the beds being filled up by the soil from the slopes in wet weather.

7. With the exception of the cantonment channel, which has a fall of one foot per mile, all have a fall of 3 feet, which appears to be the best suited to the velocities required and the natural fall of the ground.

8. The formula used for calculating the velocities is $1{,}500\sqrt{\sqrt{}}$ f, which is one I believe in general use, and giving the same results as Beardmore's.

9. The quantity of water allowed per acre has been calculated according to the table in Circular No. 31, of the 12th October 1868, or as near that as practicable, and which certainly gives an abundant supply.

10. It is intended to place the spoil banks, as well as banks at such a distance apart, as to allow of the channel being eventually enlarged if found necessary. A berm of 3 feet on either side being left for the purpose.

11. Surplus weirs have been introduced at each change in the channels capacity, the discharge vent being constructed so that a few sods or stones can be introduced with a view to regulate the discharge when necessary.

12. On the general plan the capacities of channels, length of sections, masonry works, etc, have all been denoted. The drainages and nullahs are also shown, the latter, separating the land under each channel into compartments, being colored.

13. The masonry works on the above main channels have been all estimated for as built in chunam; dry masonry culverts and bridges are intended to be introduced on the minor channels, when built, wherever possible.

14. The cost per acre of the main channels is Rupees 1-15-11, and, with the addition of 6 Annas for minor channels, will make it Rupees 2-5-11 per acre of land intended to be irrigated.

15. I have been obliged to rate both masonry and earthwork a little higher than what has been paid on the main canal works, because the work being of such a small description, and so scattered, it would not pay a contractor to undertake at the same rates that we have paid hitherto for work with large cubic measurement and in one locality.

The following will show the description of land under the canal :—

		Acres.
Total area		... 8,368
Land above bed level of main canal ...	1,542	
Tanks and wet cultivation	493	
		... 2,005
Total land under command		... 6,333
Land available for irrigation		... 4,222

16. Thus it appears that only half the total area is available, whereas hitherto two-thirds had been calculated upon.

17. The cost has proved more than I expected, but it is owing to most of the channels being contours, instead of on the ridges, intercepting in consequence much drainage.

Tabular Statement of Channels, 10th Section Distribution works.

Names of channels.	Fall per mile.	Square section of water.	Depth.	Bottom width.	Acreage.	Cubic yards per hour per acre.	Discharge cubic yards per hour.	Velocity yards per hour.	Village in which channel lies.	Source of supply.
Chennoor channel.	Feet.	S. Feet.	Feet.	Feet.						
Chennoor.—1st Section...	3	18	2	4½	* 1,920	3¼	6,240	3,120	Moodamedapully and Chennoor.	Main canal.
2nd do. ...	3	14	2	3	1,398	.....	4,544	2,932		
3rd do. ...	3	11½	1½	3	1,070	.....	3,478	2,761		
4th do. ...	3	9	1½	3	548	4½	2,605	2,605		
Dooganapully channel.										
Dooganapully	3	6½	1½	3	* 231	8	1,848	2,418	Dooganapully ...	Do. do.
Chinnamapully channel.										
Chinnamapully	3	9	1½	3	* 521	5	2,605	2,605	Chinnamapully ...	Do. do.
Mundlampully channel.										
Mundlampully.—1st Section.	3	11½	1½	3	* 928	3¼	3,478	2,761	Chinnamapully, Chennoor and Mundlampully.	Do. do.
2nd do.	3	9	1½	3	651	4	2,605	2,605		
Batchampully channel.										
Batchampully	3	9	1½	3	* 434	6	2,605	2,605	Batchampully ...	Main canal scouring sluice channel.
Cantonment channel.										
Cantonment	1	9	1½	3	* 188	8	1,504	1,504	Alangapully and Batchampully.	Do.

Note.—The acreages marked * are the acreages governed by each channel, viz., No. 1 ... 1,920
" 2 ... 231
" 3 ... 521
" 4 ... 928
" 5 ... 434
" 6 ... 188
Total... 4,223

(Signed) H. P. HIGGINSON,
Executive Engineer, Pennair Division.

No. 388. ORDER THEREON, 23rd January 1871, No. 189.

IRRIGATION, No. 21.

WITH this letter the Consulting Engineer for the Madras Irrigation and Canal Company submits plans and estimates of Rupees 10,000 for the distribution works connected with the 10th Section of the main canal, for which an advance of Rupees 850, was authorized in G. O., No. 2,916, of the 2nd December 1870, in anticipation of formal sanction to the estimates.

2. The amount of land available for irrigation and intended to be supplied is set down at 4,222 acres, and the cost of distribution is estimated at Rupees 2-5-11 per acre, which, though higher than the rate anticipated, is considered moderate.

3. The scheme appears to have been prepared with care and is submitted in a complete form, and Colonel Carpendale explains that the discharge of all channels is calculated in accordance with the principles approved by Government for adoption.* The arrangements generally commend themselves to the Consulting Engineer, but he suggests that all minor works which may hereafter be found to be necessary for the immediate delivery of water to the fields should be constructed of masonry instead of dry rubble as proposed by the Executive Engineer of the Company.

* G. O., No. 2,882, dated 10th September 1868.

4. His Excellency the Governor in Council considers this an essential modification, and, while sanctioning the estimates agreeably to the recommendation of the Consulting Engineer, desires it to be understood that the change shall be carried out when the works are put in hand.

(True Extract.)

Colonel, R.E.,

Secretary to Government.

To the Consulting Engineer for the Madras Irrigation and Canal Company.
" Agent and Manager for do. do.

Exd. S. T. Augustin.

Consulting Engineer's office
Irrigation & Canal Company.
Madras, 15th Dec 1870.

No. 102.

From,
Colonel A. Cotton R.E.
Consulting Engineer & C.
To,
The Secretary to Government
Public Works Department.
Sir,

I have the honor to submit plans, estimates, and all other usual documents, relating to the distribution works round the 10th Section of the Madras Irrigation and Canal Company's Main Canal as particularized in the margin, together with the Agent's letter No. 506-2nd December 1870 and its accompaniments.—

No. 506-2 Dec/70
25 Nov/70
& Tabular
Mr Higginson
ans Works
498 & 501.
No. 502.
Estimate
Statement

2. The area proposed to be irrigated is 4222 acres all on the left side of the Main Canal, lying between it and the Rivers Pennar and Boogy, and extending from the 183rd mile on the Main Canal to its terminal point near Cuddapah at the 188th mile — and the scheme consists of six main channels; the first four supplied by irrigation sluices in the Main Canal, and the other two from the channel of the scouring sluice at the Cuddapah terminus

terminus.

3. The particulars of the Main channels — are as follows, and their courses, as well as the area to be irrigated under each length, is clearly shewn on the General Drawing:

		Length in M-chs:	
No. 1	Chennoor	3-57	does not require any special remark.
" 2	Doocanapully	24½	is of trifling length & water a small tongue of land that the neighbouring bank does not reach. —
" 3	Chinnamapully	57½	is also of small length — It crosses the waste chan.l of a tank the surplus from which is intended to pass over No. 3 channel where a bank will be annually thrown across the opening. —
" 4	Mundampully	2-40	do not require special remark. —
" 5	Bakkampully	1-8	
" 6	Cuddapah Cantonment	1-30½	

The discharge of the channels has been regulated on the principle approved of in Government Order No. 31-12 October 1868 and varies from 3¼ Do. Cubic yards per hour per acre. —

The masonry works are: —

4 Irrigation sluices in Main Canal
6 Village road crossings
2 Culverts under main roads
8 Drainage culverts
1 Overfall to lower the water from the bed of one reach in a channel to another. —
1 Retaining wall for annual bank.
1 Weir on Downing sluice channel.

4. The particulars of the estimate are: —

	Rupees		
4 Irrigation sluices in Main Canal	1575	4	8
Minor masonry works for dist channels including sluices for Nos 5 & 6.	2817	8	9
Earthwork for dist channels	3274	7	6
Contingencies	749	7	1
Subsidiary channels at 6 as: per acre	1583	4	"
Total Rupees	10000	"	"

for the irrigation of 4,222 acres being an average of Rupees 2-5-11 per acre — This is a higher average than was expected, and arises from its having been necessary to take the channels on contour lines instead of on the ridges, and that even then the area capable of being watered proves only half of what it was supposed the Main Canal commanded — The average however is reasonable enough, but it is not unlikely it may have to be exceeded eventually, as no minor channels are estimated for, and dist annas an acre may not be sufficient for the immediate delivery of the water to the fields as whatever minor works may in addition be hereafter necessary, they should be of masonry, and not dry rubble as is proposed in the Executive Engineer's report. —

5. The rates are: —

Rupees

Rubble masonry Rs. 3-12-as 8-5 Rs. a cubic yard
Dry rubble apron — 1 — — — a — do —
Brickwork — — — 5 — à cubic foot.
Cuttings and banks Rs. 8 à 9 cubic yards per rupee

which the Executive Engineer admits are some-
=what high, but for small quantities in detached
situations they can't be called excessive.
This irrigation project is of small extent com-
=pared with some others, and the works are sim-
=ple in their nature: all are very fully described
in Mr Higginson's report, in which, as well as
in his drawings, nothing deserving of notice has
been omitted, and yet all is brought within a
moderate compass, and the scheme is very com-
=plete. I would beg that the Executive Engineer's
report and his tabular statement of channels
may be printed with this letter.

7. The only discrepancy which I find in the
papers is that the drawings and estimates do
not include surplus weirs which the Executive
Engineer mentions he had provided at each change
in a channel's capacity, for the purpose of re-
=gulating the discharge, and which I conclude the
Chief Engineer directed on dispensing with

with. —

I recommend the estimate amounting to
Rupees 10,000 for sanction, noting that an ad-
=vance of Rupees 850 in part thereof was au-
=thorized by Government Order No. 2916-2nd —
December 1870. —

I have the honor to be,
Sir,
Your most obedient servant,
G. Higginson Colonel
Chief Engineer & Secretary Company

No. 1879. P. W. D.

Proceedings of the Superintending Engineer

Rec'd the following

from the Consg Engineer
for Irrign &c.

Dated 13th Dec'r 1870

Submitting for the sanction
of Government the Estimate
for the distribution works
connected with the 10th
Section of the Main Canal
of the Ganges Canal

Forwarding an advance of
Rs 850 was authorized in
P. W. D. No. 2916 of the 2nd Sept'r
in anticipation of Formal
sanction to the Estimate.

2. She amount of Land
available for irrigation
and

No. 5112

From
The Consg Engr for Irrign &c.
To
The Secretary to Govt N.W.P.

Dated 15th } Dec'r 1870.
Rec'd 16th }

Encls: 8.
Plans: 5.

Submits for sanction
plans & estimates amounting
to Rs: 10,000 for distribution
works Rs under 10th Section Main
Canal received with Agents No.
506 - 2nd Dec'r 1870.

No 189 - 26th Jany 1871.

No 387
dated Dec'r 1870 Rec'd 31st

and interested to be supplied is set down at Rs 22-2 Acre, and the cost of distribution is estimated at Rs 2-8-11 per acre, which, though higher than the rate anti-cipated is considered moderate.

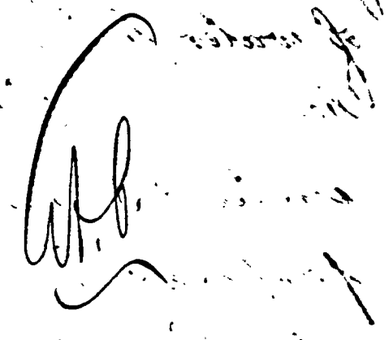
3 The scheme appears to have been prepared with care and is sub-mitted in a complete form and Col Carpendale explains that the discharge of all channels is calcu-lated in accordance with the principles ap-proved by Government for adoption*. The arrange-ments generally commend themselves to the Consulting Engineer

*G.O. No. 2882 of 10th Sept 1870.

Engineer, but he suggests that all minor works which may hereafter be found to be necessary for the immediate delivery of water to the fields should be constructed of masonry instead of dry rubble as proposed by the Execu-tive Engineer of the Company.

4 His Excellency the Governor in Council considers this an essen-tial modification, and while sanctioning the estimates agreeably to the recommendation of the Consulting Engineer, desires it to be under-stood that the change shall

shall be carried out when the works are put in hand.



21/3

Sd.

The Long Engr for the Dn. I. & Co. Septa thirteen hebdomd Agent & Manager do do

Decr 24/1/71.

Cfs 5712

Govt. of ~~1870~~ 1871 Madras.

PUBLIC WORKS.

To The Consulting Engr for the Madras Irrigation and Canal Company

Dated

Recd. Encl.

G. O. 23 Jany. No. 189.

Nos. 387 & 388

Distribution Works - Rec

Estimates of Rs: 10,000 for the distribution works connected with the 11th Section of the Madras Irrigation Canal, sanctioned with remarks.