(1) Number of pages 74

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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 2300 - 2301. Press / Misc.

413 - 414.

Dated 2 - 3 - 9 - 1820.

Not to be folded or roughly handled

Read the following papers :—

No. 413. From the Acting Superintending Engineer, 1st Division, to the Secretary to Government, Public Works Department, dated Dowlaisteweram, 13th August 1870, No. 1,637.

I HAVE the honour to return the papers connected with the restoration of the Weyairoo navigation, received back with G. O. of the 29th June last, No. 1,564, and at the same time I beg to transmit a design and estimate, amounting to Rupees 64,000, for placing the lock in the old Nundamoor Channel with the surplus weir discharging into an adjacent drainage channel.

One List, sent by banghy.

2. The Government will now have before them both designs, with comparative cost of either, namely, the Aurollah diversion, to cost Rupees 84,650, and avoid all navigation in old drainages, and the old line of navigation by the Weyairoo, to cost Rupees 64,000, retaining all the many disadvantages of this route; and I now beg to add a few remarks in explanation of the schemes.

3. In saying that the Weyairoo was of immense width and depth, I certainly had no idea that such a construction could be put upon these words as that it constituted an advantage in navigating an old delta drainage channel which, in addition to receiving the silt from its own drainage area, has for years been having passed into it the monsoon waters of the Godavery. I have therefore had prepared, at very great inconvenience, transverse sections of this drain, and I trust these will explain more clearly what I mean; the depth I referred to was that below the natural surface of the country, and the width I do not think requires further illustration than that given. It will also be seen from these sections that the depth of water is no where so profound as to make poling difficult, and I can find nothing on record to show that this profundity was ever a source of inconvenience in this navigation, nor do we usually expect in a delta to meet with a physical phenomenon of this kind.

4. My objections to retaining the line of the Weyairoo remain in principle, therefore, just as I had originally stated them, and which I explained at length in your office that the line is even now very difficult to navigate on account of its great width and depth below the surface of the adjacent land; that the side slopes are covered with tall grass, bushes, and jungle, which cannot be exterminated in the presence of such large bodies of water, and must be cleared several times a year at great expense; and, finally, this line of navigation is *fast silting up*, as it receives not only its own drainage area waters, but those of the Godavery and the Ralla Madugoo; and if it was considered advisable to go to the expense of some Rupees 75,000 for diverting the waters of this latter alone on account of the silt they carried into the navigation above the Chettipett Calingalah, for one or two miles, for no where else is the basin of the Ralla Madugoo navigable, it is far more advisable to make the diversion complete at an additional cost of some Rupees 9,650, and so avoid the silt both of the Weyairoo and the Ralla Madugoo, even had the scheme for the latter been practicable, which I do not believe it is, as I have already stated on account of the proximity of the Godavery river embankment, and the very little difference of level to be obtained in that valley. Further,

it will be seen from the transverse sections of the Weyairoo, that whenever it becomes necessary to clear out the silt from its bed, the expenditure required for this purpose will be very heavy, both on account of the lift and lead through the dense grass and jungle growing on its banks; the material so excavated must, each year this operation has to be performed, be carried to considerable distances, as the Weyairoo is liable to heavy freshes of its own which would wash all this stuff in again if not out of its influence, and whatever silt is deposited on the banks near the water will only increase the area for grass and jungle to accumulate upon.

5. I must confess myself at a loss to understand why so much stress should be laid on the necessity for diverting the waters of the Ralla Madugoo from the navigation for one or two miles above the Chettipett Calingulah, and then discharging it again into the Weyairoo *above* the aqueduct, and allowing these very same waters and their silt to flow into the old line of navigation proposed to be retained by the Weyairoo; no object is gained by this purpose except the one I credited Captain Ryves' project with, namely, the reduction of the head on the Chettipett Calingulah; but this can be as well effected by the weir I have proposed, and the whole of these silt traps avoided by the project as I have now arranged it from the Aurollah head.

6. Again, the Ralla Madugoo drains an area of only some 120 square miles of country, and to partially block out its drainage waters on account of the silt alone it is considered very advisable to go to some very considerable expense; whereas to avoid the Weyairoo, on the same account, draining an area of over 800 square miles of country, and receiving the waters not only of the Ralla Madugoo but the Godavery also, it is considered inexpedient to incur less than half that expenditure. I have not had regular surveys made for the Ralla Madugoo diversion, but the levels had been taken for Captain Ryves, and also for the Trunk Road surveys, and it was quite evident from these the scheme, if not impracticable on account of the reasons before given, could under any circumstances be only a very partial good, and that too to only a small portion of the navigation, whilst it failed altogether to relieve the Weyairoo Aqueduct from the flood waters of this drainage area, and still deposited the silt, kept out of one part of the same line of navigation, in another.

7. I now beg to add a few remarks on the observations of the Acting Chief Engineer's Note, paragraph 6. In this I am made to say that the result desired by me was a large supply to the Uttilli Canal, and at the same time the reduction of the depth entering the Ellore Canal. I beg to observe I never made such a proposition at all. Paragraph 10 of my letter, No. 553, printed with G. O. now under reply, contains all that I ever proposed on this point, namely, that as the Ellore and Uttilli Canals had a common head, at any time when the latter was closed the whole of the waters must pass down the Ellore Canal if an intermediate surplus weir was not built; otherwise to prevent this flow the head at the Chettipett Calingulah must be reduced, and this would then diminish the supply to the Nursapur Canal—as this is one of the largest lines of navigation and irrigation in the whole district, such a result is not at all desirable to attain.

8. *Paragraph* 8.—A weir is always, as far as I am aware, necessary in connection with a lock, if only to unwater the canal above, or by its shutters to let off any surplus waters entering it; but in this instance it is so arranged as to regulate the surface fall at any time the irrigating sluices are not acting.

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Having carefully examined the plan as sent up, I regret to say I am unable to observe the defects in it referred to by him; the drop is 13 feet, of this 10 feet is provided for on the water cushion 2 feet beyond the wall of this, as shown in red ink, and only 1 foot in the bed of the surplus canal; this is a maximum difference of level, the ordinary one would be only 12 feet. With regard to the pencil notes on this plan, I am not aware that it is ever necessary to cut the calingalah channel down to the level of the lower sill of the lock; it is quite sufficient to take it down to ordinary low water level on this sill. As far as my own judgment will enable me to see, I consider it very necessary to have the crest wall of a weir and its apron cushion wall of the same length, so that as the head on the one increases it may rise on the other also, and thus protect the apron more and more, but this is a matter of mere detail.

9. *Paragraph* 9.—As ordered I have placed side culverts to the centre lock gates at an additional cost of Rupees 3,500 I beg to add I consider the outlay quite unnecessary; the valves in these lock gates do not render several feet of the chamber useless, for no boats should ever be allowed to come near enough to the lift wall so as to strike it, for in the event of their so doing some of the joints are sure to be started, as the blow has to be received where the wall is weakest. As it was absolutely necessary to observe the strictest economy in designing this project, I arranged to avoid this expense, otherwise I should hardly have gone against the principles I had advocated for the locks on the Cocanada and Nursapur Canals. As the maximum level of the water in the Ellore Canal is 32·75, this paragraph requires no further remarks; perhaps, however, it may save some further reference if I add now that according as the lock is placed in the old Nundamoor Channel, or in the new Aurollah Canal, the side walls will vary in height, and the estimate has been prepared to provide for this arrangement in either case.

10. *Paragraph* 10.—I have marked on the design for this work how the ordinary difference of level, 12 feet, is provided for; as regards the slopes, revetments, etc., these are matters of detail, which can be attended to in executing the work; I would only add, good delta soil will stand at a less slope than one to one, whereas if there be any sand in it three to one would hardly suffice; but such a matter hardly necessitates anything more than careful observation when executing the work. I am not aware in what part of the world, except in the North West Provinces, it is usual to provide more than 3 feet of water on the cushions—certainly, our experience on these works would not justify the required outlay for this purpose. The Chettipett and Paranelli Calingulahs both discharge far larger quantities of water constantly than the proposed work will ever do occasionally, and the depth provided on their cushions is from 2 feet to 2 feet 3 inches, and these have answered admirably for several years, of course if we used inverts and brick floors a greater depth of water would be required, but no Hydraulic Engineer of any knowledge and experience would use brick when the most ordinary kind of stone was procurable, and I have already shown* how very unadvisable it is to use inverts in such cases; any revetment required to the masonry side walls will be provided as required.

* G. O., No. 687, dated 3rd March 1870.

11. It is proposed to take off 35,500 cubic yards per hour from the Ellore Canal by the Aurollah head, of this 22,500 cubic yards per hour are for the mid

level canal, and 10,000 cubic yards per hour for the low level canal, and 3,000 cubic yards per hour for the lockage; it is impossible to have the canal of regular section throughout, according to the discharge for irrigation alone, as it was ordered to be made of the dimensions of a first class navigable canal, and the weir near the lock will regulate the surface fall and the draw off practically, more than any of the other works.

12. I have now, I trust, given explanations sufficient to allow the project to pass; it is difficult to conceive the inconvenience experienced by the people of the district and ourselves on account of this work not being in working order, and at the same time a great deal of damage is being done to the Ellore Canal banks in transhipping the produce which it is impossible to prevent under the circumstances of the case.

13. Until I receive orders on the subject of this project I am unable to include it in the Western Delta completion project, now all but ready to be sent in; but I shall not allow this matter to delay the despatch of the delta scheme, as whichever design is adopted it can easily be included in the general statement to be prepared in Madras. My only hope is we may be allowed to get on with this most important work, as this line of navigation has already been closed for many months, and several more months must elapse before so large a lock and its subsidiary works are completed, and, as all the delta projects are now nearly ready, it is very necessary to have this line open to assist in the execution of other works in connection with it. I may add the cost of the Aurollah scheme has been considerably increased by including some items in it which might have been charged to the extension of Irrigation and to Agricultural Repairs.

No. 413-A. *Note by the Acting Chief Engineer for Irrigation.*

THE Acting Superintending Engineer has, with reference to G. O. of the 29th June last, No. 1,564, submitted, with explanations and additional information, alternative projects for restoring the navigation which has been closed by the ruined state of the old Nundamoor Lock.

2. The provision of an additional surplus work in aid of the Chettipett waste weir has been included in the navgation estimates, but it will be better to consider them apart because, as before pointed out, the two objects to be attained have no necessary connection.

3. The restoration of the navigation on the old line is estimated to cost as under—

		Rs.	Rs.
Earthworks	...	9,879	
Contingencies	...	521	
			10,400
Double lock, 12 feet drop ...	...	...	42,160
Removing old lock	...	...	3,000
	Total	...	55,560

The survey sketch illustrating the arrangements and the longitudinal and cross sections of the lock channel show that it is proposed to place the lock near the lower end of the channel: the old lock was at the lower end, and the result of this alteration would be that the channel would require to be deepened for about

500 yards to the extent of the drop of the lock. It has not been mentioned why this arrangement has been estimated for in preference to selecting a site for the new lock immediately above the old one, and, in the absence of any explanations, I do not see any necessity for incurring the extra expense which amounts to about Rupees 8,000.

It may be noticed also that the lock has been made to appear more expensive than is correct. Rupees 41,000 are entered for the lock near Madapuram, on the line from the Ellore Canal, and Rupees 1,100 are added to that estimate to provide for an additional height of 1½ feet for the chamber walls, if the lock be built on the old line; but the drop of the lock in the latter case is only 12 feet (25·31—13·31) against 13 feet (25·75—12·75) in the former, and a corresponding reduction should have been allowed. The cost of the locks may therefore be taken as about equal whichever site be selected, and the total of the expenditure necessary for restoring the navigation by the old line may be estimated at Rupees 46,400.

4. The alternative line by the Ellore Canal and Madapuram is estimated to cost for—

	Rs.
Earthworks	25,220
Double lock	41,000
Weir near do.	3,140
Head sluice and bridge, mid level channel	1,810
Do. low level channel	1,080
	72,250
To which must be added for closing the old Nundamoor Channel, say	250
Total...	72,500

Paragraph 8 of my note, printed in the G. O. above referred to, contained some remarks on the weir proposed to be built in connection with the lock near Madapuram, and paragraph 8 of Major Fischer's letter is in reply thereto. I said that if the lock walls were built a foot or 18 inches above the maximum water level in the Ellore Canal, a weir would not be necessary, there being no water required to be passed into the canal below the lock for irrigation; also that if a weir were required the design needed modification, as out of a total fall of 13 feet, which the circumstances demanded, only 4½ feet had been artificially provided for. Major Fischer replies that a weir is always, so far as he is aware, necessary in connection with a lock, if only to unwater the canal above or to let off surplus water. In this case there would be no surplus water, for the canal above the lock would be still-water except so far as the draught of the sluices occasioned a current and consequent surface fall. Only the water required for irrigation and taken off by the mid, and low, level channels, with a small quantity additional for lockage, would enter the canal, and any discharge at a weir would under ordinary circumstances be a waste of water. Again, the canal would be unwatered, except for a depth of a few inches, by the low level canal, and the remainder could be passed through the lock without difficulty. A weir would not unwater the canal so long as any supply was being carried by the Ellore Canal. The Superintending Engineer, moreover, is unable to observe any defects in the design for this weir. From the survey and

sections of the proposed junction canal it will be seen that he intends to place the weir near the lower end of the weir channel. The floor of the water cushion, which corresponds with the bed of the weir channel immediately below the fall, is at 9 feet below the crest, or at 20·75, the cushion wall is at 23·25; with 3 feet going over the weir there would be a nearly similar depth on the cushion wall, and consequently the water level here would be at 26·25, or thereabouts: at a distance of a few yards the water in the lower reach of the navigation canal would be at 17·75, therefore the water issuing from the weir channel would have a surface fall of 8·50 feet in a few yards, and this arrangement appears to me to be eminently defective. Major Fischer says, "the drop is 13 feet, of this "10 feet is provided for on the water cushion 2 feet beyond the wall of this, as "shown in red ink, and only 1 foot in the bed of the surplus canal; this is a maxi-"mum difference of level, the ordinary one would be only 12 feet." There is a remarkable confusion of ideas in this sentence. The drop of 13 feet is from bed to bed (25·75—12·75), the surface fall is 15 feet (32·75—17·75), the difference of level between water above and bed below is 20 feet (32·75—12·75), and Major Fischer's sentence disposes of 13 out of 20, instead of 13 out of 13, and the plan of the work gets rid of 12 out of 20, leaving 8 feet unaccounted for. What is necessary is that the weir water should enter the canal below without undue velocity—the arrangements designed necessitate a velocity which would be excessively injurious to the canal banks, and would make it impracticable for boats to get to and from the lock whenever any considerable quantity of water happened to be passing over the weir. I have already said that a weir is not required, and the item may be struck out from the estimate. On the other hand, it would be advisable to make the top of the walls of the upper chamber of the lock 2½ feet above the estimated high water level in the Ellore Canal, so as to guard against any accidental increase of that level, and this alteration would add 1½ feet to the walls as designed, and 1,100 Rupees to the cost of this lock. The estimate for making this the connecting line of navigation would then be Rupees 70,460.

5. From the above remarks then it appears that the restoration of the old line of navigation will cost 46,400 Rupees, and that the adoption of the proposed new line would require Rupees 24,060 additional. The cross sections of the Weyairoo furnished by the Superintending Engineer, show that while on the one hand there is an ample depth of water for navigation throughout, on the other hand the position of the deep channel varies much, and that in some parts, owing to towing being impracticable, the navigation of this stream cannot be comparable as regards convenience with that which a regular canal would afford. I think that the Weyairoo is susceptible of improvement, and that gradually it might, by judicious clearance and regulation, be brought to a tolerably uniform cross section with a width of from two hundred to three hundred feet, and a depth varying from 8 to 6 feet, but it is probable that were improvements in this direction commenced for navigation purposes the cost over a length of some 5 miles would considerably exceed the difference between the estimates for the new and old lines. Moreover, the Weyairoo navigation will, if the new line be adopted, still remain available for local traffic, and will be of some use. Taking then into consideration the greater convenience of the new line, the probability that in the long run it

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will be the cheapest, as also the fact that by it additional villages will be accommodated, I think it will be advisable to adopt Major Fischer's suggestion to restore the navigation by the Ellore Canal and Madapuram, rather than by the old Nundamoor Channel. I would recommend, therefore, that the Superintending Engineer be authorized to include Rupees 70,460 in his estimates for the western section of the Godavery Delta, for opening a line of navigable canal, viâ Madapuram.

6. The inconvenience resulting from the unavoidable closure of the Nundamoor lock has been very great, and unfortunately a great deal of delay has occurred in obtaining in a complete form the information necessary for deciding upon the best way of restoring the navigation. It is therefore of no little importance that, as soon as the Government have decided upon the line to be adopted, the Superintending Engineer should be enabled to take immediate steps for re-opening the navigation by preparing materials and going on with subsidiary works. The estimates for the completion of all necessary improvements in this part of the delta are reported to be nearly ready, but after their receipt by me some time will be required for their examination in this office, their consideration by Government, and their submission to the Government of India for sanction. This being the case, I would recommend that the Government of India be asked to allow this comparatively small but important work to be gone on with in anticipation of the sanction of the general estimates, and to permit Rupees 15,000, out of the Budget provision of Rupees 80,000 from Loan Funds, for the Western Delta, to be appropriated thereto at once.

Item No. 78.

7. I have now to offer a few observations on the proposed additional waste weir to be built near the head of the Ellore Canal. It has already been admitted that it will probably be advantageous to increase the means, now afforded by the Chettipett Calingulah, of disposing of surplus water, and the Superintending Engineer's additional remarks on this subject tend to confirm his previously expressed opinion that the flood waters of the Ralla Madagu cannot, without much expense and difficulty, be diverted and prevented from entering the main canal. It remains therefore to consider where the additional waste weir should be placed, and the details of the work. In paragraph 10 of the note already referred to, it was noticed that the design for the waste weir did not appear to be adapted to the circumstances of the site, and the additional information now afforded supports this view. The bed of the Ellore Canal is at 25·31, and that of the Weyairoo at 11·58, the difference or fall being 13·73. The difference between the water surfaces, 33·50 and 20·66 respectively, is 12·84 feet. The cushion wall of the weir is proposed to have its top at 23·50, and the level of the water passing over this wall, with a full discharge over the weir, would be about 27·00. Consequently there would be a surface fall of 6·34 feet to the Weyairoo, which is not an admissible arrangement. According to the plan estimated for by the Superintending Engineer, the cheapest site for the waste weir, would be at the ruined tank bund, just above the head of the old Nundamoor lock channel, but as the cushion floor of the waste weir requires to be placed not higher than + 12·00, instead of as in the design at 20·50, and the top of the cushion wall at 17·00 instead of 23·50, while the bed of the surplus channel should be at

G. O., 29th June 1870, No. 1,564.

about 16·00 at its upper, and 14 at its lower end, instead of 21·50 and 17·00 respectively, and as these alterations would add perhaps 4,000 Rupees to the cost of the weir and 3,000 Rupees to that of the channel below it, it is probable that a more economical arrangement may be made in connection with the old lock channel, should the Government approve of the adoption of the new line for navigation. The Superintending Engineer should, therefore, see whether a weir having its cushion and walls on the levels above indicated could not be built for less money at the lower part of the old lock channel. It must be noticed, with reference to paragraph 10 of Major Fischer's letter, that a work of this kind should be designed and estimated for completely: revetments and the length of wing walls are not details to be settled after, but before, the estimate is submitted for sanction, or the estimate will be but an indifferent index of the probable cost of the work.

	Rs.
Weir estimate	8,000
Channel	500
	8,500
Additional	7,000
Probable total	15,500

OOTACAMUND,
1st *September* 1870.

(Signed) J. MULLINS, Major, R.E.,
Acting Chief Engineer for Irrigation.

No. 414.

ORDER THEREON, 23rd September 1870, No. 2,300.

IRRIGATION, No. 19.

AFTER considering the additional information, which has been submitted in these papers, His Excellency the Governor in Council is of opinion that it will be advisable to re-connect the navigation between the canals of the western section of the Godavery Delta and the Weyairoo, by improving the mid and low level canals from the Ellore high level canal, and cutting a channel from the low level canal to the Weyairoo by Madapuram, rather than to build a new lock on the old Nundamoor lock channel. The outlay in the latter case would be Rupees 46,400, and in the former Rupees 70,460, but the difference, His Excellency in Council thinks, will be fully compensated for by the greater convenience of the new line, and probably by a saving of expense in the maintenance of the navigation in a state of efficiency.

2. The inconvenience which the closing of a line of navigation, which had been long in use, has occasioned, renders it advisable that as little further delay as possible should be allowed to occur in completing the works required for connecting the navigable canals of the delta with the Weyairoo, and the Government of India will accordingly be requested to permit the immediate preparation of materials and the commencement of the subsidiary works by sanctioning an appropriation of Rupees 15,000, out of Budget Item No. 78 of the current year against which an allotment of Rupees 80,000 from Loan Funds has been entered for the western section of the Godavery Delta. The small sum mentioned will probably suffice until the estimates for this section of the delta generally, which are reported to be nearly ready, can be laid before the Government of India for sanction.

3. The attention of the Superintending Engineer of the 1st Division will be called to the remarks contained in paragraph 7 of the Note by the Acting Chief Engineer for Irrigation, and he will be requested to reconsider the details of the proposed

additional waste weir, which the Government consider it will be well to place a little below the Chettipett Calingulah, and probably in the lower part of the old Nundamoor lock channel, to secure a more complete regulation of the water-supply when the main canal is receiving land drainage.

Ordered that the following letter be sent:—

(Here enter No. 2,301, dated 23rd September 1870.)

(True Extract.)

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

To the Acting Superintending Engineer, 1st Division.
,, Acting Chief Engineer for Irrigation.
,, Controller of Public Works Accounts.
,, Revenue Department.

Exd. S. T. Augustin

Sec.ls Engineer's Office 1st Div.
Vizagapatam 13th August 1870

No 1637

From

Major A. J. Fischer M.E
Actg. Secls Engineer
1st Division

To,

Colonel C. A. Orr M.E
Secretary to Government
P.W.D.
Madras

Sir,

I have the honor to return the papers connected with the Restoration of the Bezwada Navigation received back with G.O. of the 29th June last No 1564 and at the same time I beg to transmit a design and Estimate amounting to Rs: 64,000 for placing the Lock in the old Kistnamair Channel with the surplus water discharging into an adjacent drainage Channel.

2/ The Government will from have before them both designs with comparative cost of either viz. the Anicut & channel and cost Rs: 84,650, and avoid the Navigation in the drainages and the additional Navigation by the Bezwada to cost Rs: 64,000 retaining all the existing advantages of this route and I now beg to add a few remarks in explanation of the schemes.

3/ In saying that the Bezwada was of immense

immense width and depth. I certainly have no idea that such a Construction could be put upon these words as that it constituted an advantage in Irrigating an old dead Rivers Channel which in addition to receiving the silt from its own drainage area has for years been receiving deposits into it by the diversion action of the Godavery. Some Engineers have foreseen very great inconveniences likely to arise from this drain and I think there will appear to be more than the natural expense attending the work. I do not think it worth while illustrating these statements further as it will be seen from these sections that the silt has to be removed to a greater depth to make perfect, difficult and I can find nothing on record to show that this presumably does not exist of inconveniences in this Irrigation such as we usually speak of in a Delta to meet with as physical phenomenon of this kind.

4th. My Objections to retaining the line of the Negapiroo Annicut in principle Engineers such as Had originally stated them which I explained at length in your Office, that the line is even now very difficult to Irrigate, on account of its great width and depth over the surface of the adjacent land, that the side slopes are covered with tall Grass, bushes and jungle which cannot be exterminated in the presence of such large bodies of water, and must be cleared several times a year at great expence and finally this line of Irrigation is faulty as it receives not only its own drainage falling on it as it crosses but those of the Godavery and the area valley but those of the Godavery and the Valla Irrigation, and if it was considered advisable to go to the expence of some Rs. 75,000 for diverting the waters of this latter above an account of the silt they carried into the Irrigation above the Chettypet Anicut for 1 or 2 miles, for nowhere else is the basin of the Valla Irrigation navigable, it is far more advisable to make the diversion complete at an additional cost of some Rs. 9,650 and so receive the silt both of the Negapiroo and the Valla Irrigation and had the scheme for the latter been practicable, which I do not believe it is as I have already stated on account of the proximity of the Godavery River Embankment and the very little difference of level to be obtained in that valley. Further it will be seen from the transverse sections of the Negapiroo that when it becomes necessary to clear out the silt from it the expenditure required for this purpose will be very heavy both on account of the silt and Sand and the dense grass and jungle growing

growing on its banks. the Material to be removed
must each year this operation has to be
performed be carried to considerable distance
as the Region is liable to heavy freshes
of its own which would undo all this stuff
in regard if not at its influence over
that water which is deposited on the banks from
the water will only increase the area for grass
and jungle to accumulate upon.

5/ I must confess myself at a loss
to understand why so much stress should be
laid on the necessity for diverting the waters
of the Malla Maragoo from the Navigation
for 1 — or 2 miles above the Chellyar
Calingalah, and then discharging it again
into the Region below the Aqueduct and
allowing these very same waters and their
silt to flow into the old line of Navigation
proposed to be retained by the Region; for
is gained by this purpose, for all the evil
I credited Captain Agnew's project viz. the
the re-entrance of the head of the Chellyar Calin-
-galah but this can be as easily effected by
the new Shaw proposed and the objections
silt traps avoided by the projected Shaw
now arranged it from the Canal
by again the Malla Maragoo

an area of only some 120 square miles of
country and to partially block up its drainage
waters on account of the silt alone this con-
sidered very advisable to go to some very con-
siderable expence, whereas to avoid the Region
on the same account draining an area of over
800 square miles of country and receiving the
waters not only of the Malla Maragoo but the
Godavery also it is considered inexpedient to
incur less than half that expenditure as I have
not had regular surveys made for the Malla
Maragoo diversion but the tanks had been
laid for Captain Agnews and also for the
Trunk Road Surveys and it was quite evident
from these the scheme if not impracticable on
account of the reasons before given could under
any circumstances be only a very partial
good and that too be only a small portion of
the Navigation whilst it failed altogether to
relieve the Region Aqueduct from the flood
waters of this drainage area and silt deposited
the silt kept out of one part of the same line
of Navigation to another.

7/ I now beg to add a few remarks
on the observations of the Acting Chief Engineer
note para 4 in this. I am made to say that
the result desired by me was a large supply

to

to the Attleb Canal and at the same time the reduction of the Sill entering the Canal, I beg to observe I never intended such a proposition at all. First of my plan shewn on the 353 printed with 3.0 ten miles scale, contains all the Locks proposed on this point viz. that at the Canal and Attleb Canal are but a common head at any time when the Sluices were closed the whole of the waters must pass down the Canal from entering the Attleb Canal which would be very detrimental to the Navigation. This flow the head at the Shallyghat Chittagong must be reduced and this would then diminish the supply to the Canal, as this is one of the largest lines of Navigation and Irrigation in the whole Chittagong a result is to be obtainable desirable to attain.

2/ Para 6. I beg to always respectfully as I am more necessary in connection with a Lock is only to regulate the Canal Culverts or by its Shutters to stop any superfluous entering it, but in this instance it is necessary as to regulate the surface fall at any time the irrigating Sluices are shutting, having carefully examined the plan as before stated to say I am unable to observe the objects referred to by him. The draft in the pocket of this report

Chamber of Locks is provided for on the water cushion 2 feet beyond the wall of this as shewn in red ink and only 1 ft in the bed of the Attleb Canal this is a maximum difference of level the ordinary one would be only 12 feet. With regard to the pencil notes on this plan I am not aware that it is ever necessary to cut the Chittagong Channel down to the level of the lower sill of the Lock, it is quite sufficient to take it down to ordinary low water level on this sill. As per as my own judgement will enable me to speak upon it seems there necessary to have the crest wall of a weir and its apron cushion wall of the same length so that as the head on the one increases it may rise on the other also and thus protect the apron from and more but this is a matter of more detail.

3/ Para. As ordered I have placed side culverts to the centre Lock gates at an additional cost of Rs 3,500. I beg to say I consider the cutting quite unnecessary, the values in these Lock gates do not render several feet of the Chamber useless for no boats should ever be allowed to come near enough to the lock wall so as to strike it, for in the event of their doing some of the joints are sure to be started as the blow has to be received where the wall is weakest, as it was absolutely necessary

necessary to observe the strictest economy in designing this project. I arranged the work for expence whereever I could, having some regard to the principle. That recommended for the excellent of the Commissioners of Irish Canals. As the maximum limit of Depth in the Ulster Canal is 3'-7½" this plan requires no further remarks, perhaps however it may have some further reference to Locks and accordingly the Lock is placed in the old Newtownards Channel or in the new Charlotte Canal the sidewalls will be 4 in height and the Estimate has been prepared to suit either arrangement.

10th Canal Plans made in the Office for this work how the Bearings, Offsets & Levels of Section is provided for, see Report & the Tender Regulations you have the Section of Cubic Contents which can be allowed to in excavating the Locks Canals Channels &c. only good Belfast Soil will cost more than 1/6 to excavate & puddle any where in it, but would hardly suffice, but such a matter hardly necessitates any thing more than careful observation when opening the ground. I am not aware of what part of the country the Soil in the Sixth Reach Division consists of to provide more than 3 feet of water on the Cushions certainly our experience in those localities

Ref. No 687
Dated 3rd March 1870.

Such justify the required outlay for this purpose the Chellyph and Parapelle Calingalahs Lake. discharge for larger quantities of water than hitherto. Should the proposed work double each do accordingly and the depth provided on the cushions is from 2'-6" to 3'-3" and these have answered admirably for several years, of course increased supplies and breast flows a greater depth of water would be required but the Hydraulic Engineer of any knowledge and experience would use brick when the most ordinary kind of stone was procurable and shall already shewn how very invisable it is to use inverts in such cases, any excellence required to the masonry the walls will be provided as required.

11th It is proposed to take 33,300 Cubic Yards per hour from the Lone Canal by the Lough head of this 22,500 Cubic Yards per hour are for the Mid level canal and 10,800 Cubic Yards per hour for the low level canal and 3,000 Cubic Yards per hour for the Locks. It is impossible to have the Canal of regular section throughout according to the discharge above for irrigation as it was ordered to be done in case of the dimensions of a first class navigable canal and the weir near the Lock will regulate the surface fall and the draw off practically more than any of the other works.

I

12/ Have now stated generally the reasons sufficient to allow the project to pass it is difficult to conceive the inconveniences experienced by the people of the District and themselves on account of this work not being in working order and at the same time a great deal of damage is being done to the Colusa Canal banks in transshipping the produce which it is impossible to prevent under the circumstances of the case.

13/ Until Reports more on the subject of this project I am unable to include it in the Western Delta Completion Project now all but ready to be sent in, but I shall not allow this matter to delay the despatch of the Delta scheme as to which even design is adopted it can easily be included in the General Statement to be prepared in January next. My only hope is we may be allowed to get on with this most indispensable work as the time of Navigation has already been closed for many months And several more must elapse before so large a work and its subsidiary works are completed and all the Delta projects can be nearly ready it is very necessary to have this line open to assist in the execution of other works in connection with it. I may add the cost of the Sacramento scheme has been considerably increased by including some items in it which might have been charged to the extension of Irrigation and to Agricultural Repairs.

I have the honor to be
Sir,
Your most obt Servt

Alex. Fraser Major RE

To The Secretary
Govt of India
Public Works Dept

8 Original Plans were sent to the Supy Engr
per Orders in the Chief Engineers letter No 73
~~dated~~ of the 3rd March /71 and received to
afsd plans of them on the 23 - 3 - 71

Orgl Plans - 4 }
Copies ——— 6 } Given to Mr Hanton
Estimates ——— 26 } on the 7 Nov/71

Note by the Acting Chief Engineer

The Acting Superintending Engineer has, with reference to G.O. of the 29th June last, No 1564, submitted, with explanations and additional information, alternative projects for restoring the navigation which has been closed by the ruined state of the old Nandanoor Locks.

2. The provision of an additional surplus weir works in aid of the Chettipetta waste weir has been included in the Navigation estimates, but it will be better to consider them apart because, as before pointed out, the two objects to be attained have no necessary connection.

3. The restoration of the navigation on the old line is estimated to cost for

Earthworks	Rupees 4,879		
	Contingencies	521	10,400
Double locks 12 feet drop			42,100
Removing old locks			3000
		Total Rupees	55500

The survey sketch illustrating the arrangements and the longitudinal and cross sections of the locks

locks close together that it is proposed to place the lock near the upper end of the channel: the old lock was at the lower end and the result of the alteration would be that the channel would require to be deepened for about 500 yards to the extent of the drop of the locks. It has not been mentioned why this arrangement has been estimated for in preference to selecting a site for the new locks immediately above the old one and, in the absence of any explanations, I do not see any necessity for incurring the extra expense which amounts to about Rupees 8,000

It may be noticed also that the lock has been made to appear more expensive than is correct. Rupees 11,000 are entered for the lock near Madapuram on the line from the Coleroon Canal and Rupees 1100 are added to that estimate to provide for an additional height of 1½ feet for the chamber walls, if the locks be built on the old line: but the drop of the locks in the latter case is only 12 feet (25.31 – 13.31) against 13 feet (25.75 – 12.75) in the former, and a corresponding reduction should have been allowed. The cost of the locks may

Therefore

therefore be taken as about equal whichever site be selected, and the total of the expenditure necessary for restoring the navigation by the old line may be estimated at Rupees 72,500.

4. The alternative line by the Coleroon Canal and Madapuram is estimated to cost for

Earthworks	Rupees	25,220
Double locks	"	11,000
Weir near do	"	3140
Head sluice & bridge mid level channel	"	1810
do Low level channel	"	1080
		72,250

to which must be added for closing the old Mundamoor channel say 250

Total Rupees 72,500

Para 8 of my note printed in the G.O. above referred to contained some remarks on the weir proposed to be built in connection with the locks near Madapuram, and para 8 of Major Fischer's letter is in reply thereto. I said that if the lock walls were built a foot or 18 inches above the maximum water level in the Coleroon Canal, a weir would not be necessary, there being no water required

required to be fed to the canal below the locks in irrigation; also that if a wier across the escape for the navigation, at a level of a total fall of 10 feet, above the circumstances would only be met but would be entirely provided for. Major Fischer replied that a wier is always, so far as he is aware, necessary in connection with a locks, if only to measure the canal allowance to let off surplus water. In this case there would be no surplus water, for the canal above the locks would be still water except so far as the draught of the vessels occasioned a current and consequent surface fall. Only the water required for irrigation and letting off the surplus, and lock, lock channels, with a small quantity additional for leakage, would enter the canal, and any discharge at a wier would under ordinary circumstances be a waste of water. Again the canal would be unwatered, except for a depth of a few inches, by the low level canal, and the remainder could be fed through the locks without difficulty. A wier would not unwater the canal so far as any supply was being carried by the below canal. The

depending

depending foreigner however is unable to observe any defects in the design for the weir from the survey and sections of the proposed junction canal it will serve that to intends to place the weir near the lower end of the weir channel. The floor of the water cushion, which corresponds with the top of the weir channel immediately below the fall, is at 4 feet below the crest or at 20.75. The cushion wall is at 23.25; with 3 feet going over the weir there would be a nearly similar depth on the cushion wall, and consequently the water level here would be at 26.25 or Thereabouts: at a distance of a few yards the water in the lower reach of the navigation canal would be at 17.75, Therefore the water flowing from the weir channel would have a surface fall of 8.50 feet in a few yards, and this arrangement appears to me to be eminently defective. Major Fischer says "The drop is 13 feet "of this 10 feet is provided for on the water "cushion 2 feet beyond the wall of this no shown "in red in No and only 1 foot in the bed of the "navigation canal this is a maximum difference of"

of locks. The ordinary flow would be only 12 feet
[illegible] a considerable saving of labour in
the cost of 1/2 foot of 15 feet is given as
75 lacs (32.75 - 17.75), the cost of 15 feet
(32.75 - 17.75). The difference of 1/2 feet between
water above and the sill below is 20 feet (32.75 - 12.75),
and hence Lieut Baker's estimate disposes of 13 feet
of 20 instead of 13 feet of 13, and the flow of
the same gets rid of 7.12 feet of 20 leaving a
foot unaccounted for. What is necessary is that
the pair water places under the canal below
without undue velocity. The arrangements
designed necessitate a velocity which would
be excessively injurious to the canal banks,
and would make it impracticable for
boats to get to and from the locks. Whenever
any considerable quantity of water happens
to be passing over the weir it has already
been said that no weir is not required and the
item may be struck out from the estimate
On the other hand it would be advisable to
make the top of the walls of the upper chamber
of the locks 2½ feet above the intended high
water level in the below canal, so as to guard

against

against any accidental increase of 1½ feet
over this alteration would add 1½ feet to the
walls as designed, and 1100 Rupees to the cost
of this locks. The estimate for making this
the connecting line of navigation stands then
at Rupees 74,160.

5 From the above remarks it appears that the restoration of the old line of navigation will cost 46,400 Rupees, and that the adoption of the proposed new line would require Rupees 27,760 additional. The cross sections of the Mayaroo furnished by the superintending Engineer show that, while on the one hand there is an ample depth of water for navigation throughout, on the other hand the position of the deep channel varies much, and that in some parts, owing to towing feet of impracticable, the navigation of this stream cannot be comparable as regards convenience with that which a regular canal would afford. It thus that the Mayaroo is susceptible of improvement, and that gradually it might, by judicious clearance and regulation, be brought to a tolerably uniform

navigation over section 1 the width of from 200 to 300 feet and a depth varying from 6 to 6 feet, but it is probable that considerable improvements in the direction commenced for navigation purposes will cost over a lakh of rupees & while would considerably exceed the difference between the estimates for the proposed & old lines. Moreover the projected navigation will, if the new line be adopted, still remain available for local traffic, and will be of some use. Taking into consideration the greater convenience of the new line, the probability that in the long run it will be the cheapest, as also the fact that, by it additional villages will be accommodated, I think it will be advisable to adopt Major Fischer's suggestion to restore the navigation by the Kollero Canal and Kadapuram, rather than by the old Nungdamoor channels. I would recommend therefore that the superintending Engineer be authorized to include Rupees 7 lakhs, in his estimates for the Western section of the Godavery Delta, for opening a line of navigable canal

via Kadapuram.

6 The inconvenience resulting from the unavoidable closure of the Nundamoor locks has been very great, and unfortunately a great deal of delay has occurred in obtaining the complete information necessary for deciding upon the best way of restoring the navigation. It is therefore of the little importance that, as soon as the Government have decided upon the line to be adopted, the superintending Engineer should be enabled to take immediate steps for re-opening the navigation by preparing materials and going on with particular works. The estimates for the completion of all necessary improvements in this part of the Delta are reported to be nearly ready, but after their receipt by me some time will be required for their examination in this office, their consideration by Government and their submission to the Government of India

for

for sanction. This being the case I would recommend that the Government of India be asked, to allow this comparatively small but important work to be done at once in anticipation of the sanction of the General Estimates, and to permit Rupees 13,000 out of the Budget provision of Rupees 40,000 from Loan Funds, for the Western Delta, to be appropriated thereto at once.

I should now like to offer a few observations on the proposed additional waste weir to be built near the head of the Cotton Canal. It has already been admitted that it will probably be advantageous to increase the means, now afforded by the Sethitpett Cutting, of disposing of surplus water, and the Superintending Engineer's additional remarks on this subject tend to confirm his previously expressed opinion that the flood waters of the Kolar Hudagu cannot, without much expense and difficulty, be diverted & prevented from entering the Main Canal. It remains therefore

G.O. 29th June 1870 No 1564.

No 12

for to consider where the additional waste weir should be placed, and the details of the work. In para 10 of the note already referred to it was noticed that the design for the waste weir did not appear to be adapted to the circumstances of the site and the additional information now afforded supports this view. The bed of the Cotton Canal is at 25.31, and that of the Veyanoor at 11.58, the difference or fall being 13.73. The difference between the water surfaces, 33.50 and 20.66 respectively, is 12.84 feet. The cushion wall of the weir is proposed to have its top at 23.50 and the level of the water passing over this wall, with a full discharge over the weir, would be about 27.00. Consequently, there would be a surface fall of 6.34 feet to the Veyanoor, which is not an admissible arrangement. According to the plan estimated for by the Superintending Engineer the cheapest site for the waste weir would be at the ruined tank bund just above the head of the old Nundanoor Lock channel

channel, but as the cushion floor of the waste weir requires to be placed not higher than +12.00, instead of as in the design at 20.50, and the top of the cushion wall at 17.00 instead of 22.50, while the bed of the surplus channel should be at about 16.00 at its upper, and 14 at its lower end, instead of 21.50 and 17.00 respectively, and as these alterations would add probably 4,000 Rupees to the cost of the weir and 2,000 Rupees to that of the channel below it, it is probable that a more economical arrangement may be made in connection with the old Loeto channel, should the Government approve of the adoption of the weir line for navigation. The Superintending Engineer should therefore see whether a weir having its cushion and walls on the levels above indicated could not be built for less money at the lower part of the old Loeto channel. It must be noticed with reference to para 10 of Lieut Fischer's letter that if works of this kind should be designed & estimated for completely: revetments and the lengths of wing walls

Original estimate Rs 8000
Channel — " 500
8,500
additional — " 7000
Probable total Rs 15,500

are not details to be settled after, but before the estimate is submitted for sanction, or the estimate will be but an indifferent index of the probable cost of the works

Cotacamund
1st September 1870

I have &c
Colin Lumsden Major R.E.
(Acting) Chief Engr for Irrigation

c/o
The Secretary to Govt P.W.D.

Public Works 1870 Sept.
Proc. of Govt. for September
No. 3667

From

The Sy. Chief Engr. for
Irrigation.

To

The Secretary to Govt
P.W. Dept.

Madras, 1st
Dated: 17th } Sept. 1870.
Recd: 17th }

Enclosed 25
Plans 1st

+ 8 Original Plans referred to the
Supg. Engr. 1st Sn. and Chief Engr.
Letter No. 70 - dated 4th Sept. 1871 and Annexed
Copy of Letter
to Superintending Engineer dated 6-9-1871

Note on the
alternative projects for
restoring the navigation
which has been closed
by the ruined state
of the old Nundanoor
Lock in the Godavery
District.

No 2300, 23rd Sept. 70.

No 1413 A

Public Works Department.

No. 2300.

Proceedings of the Madras Government

Under date the 23rd Sept. 1870.

Read the following

From The Sy. Supg. Engr. 1st Sn. No. H.E. No. 1637 D/ 13th August 1870

From The Sy. Chief Engr. for Irrigation. No. H.E. No. D/ 1st Sept. 1870

After considering the additional information which has been submitted in these papers, His Excellency the Governor in Council is of opinion that it will be advisable to reconnect the navigation between the Canals of the western section of the Godavery Delta and the Veyaroo, by improving the mid, and low level Canals from the Ellore High level Canal, & cutting a Channel from the low level Canal to the Veyaroo by Madapurum,

rather than to build a new
lock on the old Kundanoor
lock Channel. The outlay
on the latter case would be
Rs 46.400, and on the former
Rs 70.460. But the differena,
His Excellency in Council
thinks, will be fully
compensated for by the greater
convinience of the new line,
and probably by a saving
of expense on the maintenance
of the Navigation on a
state of efficiency.

2. The inconvenience,
which the closing of a line
of navigation, which had been
long in use, has occasioned,
renders it advisable that as
little further delay as possible
should be allowed to occur in
Completing the works required
for Connecting the navigable
Canals of the Delta with the
Kegairoo, and the Government
of India will accordingly
be requested to permit the
immediate preparation of
materials and the Commence-
ment of the subsidiary works
by sanctioning an appro-
priation of Rs 15.000, out
of Budget item 40 of
the Current year, against
which an allotment of Rs 80,000
from Loan funds has been
entered for the Western Section
of the Godavery Delta. The
small sum mentioned will
probably suffice until the
estimates for this Section of
the Delta generally, which
are reported to be nearly
ready, can be laid before
the Government of India
for sanction.

The

3. The attention of the Superintending Engineer 1st Division will be called to the remarks contained in Para 7 of the note by the Off Chief Engineer for Irrigation, and he will be requested to reconsider the details of the proposed additional waste weir, which the Government consider it will be well to place a little below the Chettipett Calingulah, and probably in the lower part of the old Nundanoor lock Channel, to secure a more complete regulation of the water supply when the drain Canal is receiving land drainage.

Ordered that the following letter be sent:-

No. dd

To

The Secretary to the Government of India P.W.D.

Sir,

I am directed to transmit for the Consideration of the Government of India a Copy of the Proceedings of this Government as per margin, together with the plans, estimates, &c, therein referred to, and to request the sanction of His Excellency the Governor General in Council to the immediate Commencement of the works required to restore the Communication for navigation between the Canals of the western section of the Godavery Delta and the Veyaroo

2. For many years the navigation has been carried

No. dated

A. D.

No. 2301.

To

The Secretary to the Government of India P.W.D.

Sir,

I am directed to transmit for the Consideration of the Government of India a Copy of the Proceedings of this Government as per margin, together with the plans, estimates, &c, therein referred to, and to request the sanction of His Excellency the Governor General in Council to the immediate Commencement of the works required to restore the Communication for navigation between the Canals of the western section of the Godavery Delta and the Veyaroo

2. For many years the navigation has been carried

No. dated

A. D.

To
The Supdg Engr 1st Div
" Chief Engr for Irrigation
" Controller
" Asst Secy

W. 2/9/70

on by means of the Nundamoor lock, by which the traffic passed from the head of the Ellore High level Canal to the Kayairoo, and thence by the Venkiah Channel down to tide water. The Nundamoor lock was found last year to be in so dangerous a state as to require its immediate closure and, since that time, all produce hitherto carried by the line of navigation referred to, has had to be transhipped, thereby causing much inconvenience, as well as great additional expense.

3. The best way of restoring the navigation has received careful Consideration, and it will be observed from the papers submitted that His Excellency the Governor in Council is of opinion that, taking all the circumstances into Consideration, it will be better to adopt a new line, though, by so doing, the first outlay will be increased from Rs 46,400 to Rs 70,460. Greater Convenience, the accommodation of a larger number of villages, and less expense in maintaining the navigation in an efficient state are the chief reasons which have appeared to this Government to make the more expensive line preferable.

4. The estimates for the western section of the Godavery (Delta generally are nearly ready, but as some time will necessarily be occupied in their examination and submission to the Govt of India, I am to request that, under the circumstances now brought to notice, the small sum of Rs 15,000 out

of the allotment of Rs 80,000 entered in the Budget of this year, items to 9s may be appropriated to allow of materials for the masonry works being prepared and collected, as also of such minor subsidiary works, as it may be desirable to carry out at once, in order to prevent interference with irrigation, being commenced without delay.

5. I am directed to mention that, should the Govt of India consider it necessary that the difference only, between the original cost of the old Jumna Canal and that of the new arrangements now proposed, should be allowed to be met from Loan Funds, Rs 20,000 may be deducted from the amount, Rs 70,460, of the estimate now submitted, but

I am to state that as in any case the expenditure whether provided for from Ordinary or Extraordinary funds, would, as a radical improvement, be classed as a new work and exhibited as Capital outlay, it will be simpler to deal with the expenditure as a whole, seeing that the principle on which the improvements to the Delhi generally are being provided for from borrowed Capital is that the irrigation works have as a whole been highly remunerative, and it has been considered that the further outlay required to make them thoroughly efficient will more than cover the interest on the money needed for their improvement, while the

total returns on the total outlay cannot fail to be highly satisfactory.

W. 29/9/70

G.O. 2300 of 23.9.70

Desp^d 28/9/70 with 26 copies of G.O. 2800 of 1870.

25 enclosures as per list.

Attached forwarded to the Govt of Burma 29/9/70 by Book-post. Rec^d initially Oct 4 93 18 Feb 7/71