M.R.O. 14—18,000—57-9-24

MADRAS RECORD OFFICE.

Government of Madras.

Revenue **DEPARTMENT.**

G.O. No. 2271	Press ~~Mis.~~
469-470	
Dated 27—9—1867.	

Not to be folded or roughly handled

Proceedings of the Madras Government, Revenue Department, 27th September 1867.

No. 469. Read the following Proceedings of the Madras Government in the Public Works Department:—

Passing orders on letter from Officiating Superintending Engineer, 8th Division, relative to Streeviguntum Anicut project in Tinnevelly District. } (Here enter 25th September 1867, No. 2,987.)

No. 470. ORDER THEREON, 27th September 1867, No. 2,271.

Irrigation, No. 19.

Ordered to be recorded.

(True Extract.)

(Signed) F. H. WILKINSON,
Acting Under Secretary to Government.

Ed. S. T. Augustin.

From the Officiating Superintending Engineer, 8th Division, to the Secretary to Government, Department Public Works, dated Courtallum, 15th August 1867, No. 976 :—

1 Copy of report of Colonel Horsley.
1 Remarks on the above.
1 Abstract Estimate.
1 Specification.
1 Sketch Map.
1 Plan of Anicut and head works.
2 Plans of masonry works.
Sections of channels.

1. I have the honor to submit documents as per margin, connected with the Streeviguntum anicut project* in the Tinnevelly District.

2. In taking up this project, two courses were open to me, the one to write a complete report of my own, gathered from the records, the other to submit Colonel Horsley's report as originally drawn up, and to add a paper of remarks on such points as appeared to require notice. I have followed the latter course, for the reason that in drawing up a new report, I must have borrowed nearly the whole substance of it from the original report : the first estimate was revised for the then prevalent rates of work, by Captain Payne as District Engineer of Tinnevelly in 1862; and sanction was accorded on the original report. Again, in the present year, the same Officer, Captain Payne, was deputed to revise the estimate a second time, and this has been done on the same original scheme. It would, therefore, have been hardly necessary for me to do more than submit the original papers, had not the area of land to be brought newly under cultivation, and the financial return been different, as given by the present Collector, from those given by the Revenue Department in 1855. The project is thus essentially that of Colonel Horsley's, and I have confined myself to a few general remarks and observations on the expected return of revenue, and available supply of water in the river.

3. The plans have been copied on thin tracing cloth, in accordance with the orders of the Government of India, and the provisions for making the channels navigable have been taken out.

4. Under the item of Superintendence I have set down an Officer's pay at 200 Rupees per mensem; this is not intended to represent the pay of the Executive Officer in charge of the works, but to be approximately the difference of pay between an Officer of some standing who might be deputed to Tinnevelly, and that of a Departmental Officer of lower position, who would take the place of the former for ordinary duty. The other alterations in the estimate, generally, are in the rates, not in quantities, and therefore call for no remarks. The Collector of Tinnevelly has had the opportunity of perusing these papers before their despatch.

* G. O. No. 1,630 of 11th July 1862.
Do. ,, 1,880 of 8th Aug. ,,
Do. ,, 3,695 of 6th Dec. 1865.
Do. ,, 210 of 18th Jan. 1866.
Do. ,, 1,763 of 6th June ,,
Do. ,, 58 of 18th March 1867.

From the Civil Engineer, 8th Division, to the Chief Engineer in the Department Public Works, Fort Saint George, dated Madura, 22nd October 1855.

1. I have the honor to transmit, for sanction, an estimate of Rupees 3,85,000, for constructing an anicut, &c., across the Tumbrapoorny river at Streevigun-

tum, in the District of Tinnevelly, with channels proceeding from it to the Port of Tuticorin on the north, and to that of Coolasagaraputnum on the south; as also branch channels for the supply of Coorookay and other tanks in the Punjamahl* talook, of the same district.

5 Plans sent separately.

* Now called Tenkarai.

2. A sketch of the country to the eastward of the Murdoor anicut, showing the extent of land irrigated by the two channels proceeding from this work, as also the probable extent of land (colored yellow) which will be brought under cultivation, by means of the channels from the proposed anicut at Streeviguntum, together with sections of the ground, &c., through which the latter will pass, and plans of the anicut and other subsidiary works required on each line, accompany the estimate.

3. It is proposed to construct the anicut near the site of the present Coorumboo, or temporary dam, supplying the Keelpadagay channel on the left bank of the river, and to make use of this channel for a short distance, after widening it to the required section, and then (to avoid interfering with existing rights) to open a new one round the southern border of the cultivation belonging to the above village, and to join the Aroomoogamungalum supplying channel opposite the village of Yerul, at A in the sketch, where the surplus of Paroongolam tank falls in. At this point a division will be made, one share of the water being allotted to Aroomoogamungalum, Coorookay, &c., tanks, and the other to Iroovapapoorum Paycolam, and other tanks situated between it and Tuticorin. The total distance from the anicut to Tuticorin by this line is twenty-six and a half miles.

4. The yellow line in the sketch shows the course of the proposed channel, and the parts to the eastward of it, similarly colored, represent the extent of land which will be more or less under its influence. A portion of this land, bounded by a dotted line bordered with red, estimated at 1,000 seed Cotays, lies within the boundary of the Maniachy Zemindary.

5. From the Aroomoogamungalum channel at B in the sketch, a branch will be taken along the line colored yellow to join the Coorookay channel at C, for the better supply of that tank, its present channel being on so low a level that the water flows back to the river before the tank is more than half filled. The Pullayacoil tank, which is dependent upon the surplus of Aroomoogamungalum tank, will likewise be benefited, as it will receive a more regular, as well as increased, supply from this source than is now the case.

6. On the right or southern bank of the river, the proposed channel will follow the line of the present Keelyvoical, (a drainage channel for the cultivation under Velloor and Thenkurray tanks,) and entering the Cadumba tank at its western extremity will flow through this extensive reservoir, and thence by a new cut to Ammenpooram and Cannum tanks. From this point the channel will be continued in the direction shown in the sketch to an old ruined tank, a short distance south of Trichendore, branches being thrown off by the way to supply a breached tank termed "Shonauncautvalycolum," situated a few hundred yards to the eastward of the village of Cannum, and another termed "Arooduyarcolum" close to Trichendore. The surplus of Ellapansiken tank will fall into the swamp which extends along the coast for five or six miles, and during the rains discharges into the Caramany river, a little to the south of the Port of Coolasagaraputnum. The total distance from the anicut to Coolasagaraputnum by this line is twenty-seven miles.

7. In framing the estimate for the above works I have had in view not simply channels of irrigation, for which a much less sum (about one lac of Rupees less) would have sufficed; but deeming it probable that the eastern coast canal will eventually be extended to Tinnevelly, I have thought it advisable to make them of such a section as would fit them for navigation as well as irrigation, and to allow for the necessary locks, bridges, &c., that would be required in that case on each line. I have also taken advantage of the anicut to throw a bridge over the river at Streeviguntum, a work that is very much wanted to keep open the communication between the populous towns on its banks, and which can in this way be accomplished for a comparatively trifling sum.

8. As the great object at present, however, is to improve and increase the cultivation to the eastward of Streeviguntum, I would suggest that sanction should be solicited for so much only as will be sufficient to accomplish this end, leaving the remainder for future consideration in connection with the Eastern Coast Canal project. The amount that will be required for irrigation purposes, inclusive of the bridge over the anicut at Streeviguntum, is shown in the accompanying Abstract Estimate, viz., Rupees 2,85,000.

9. The Collector of Tinnevelly, at my request, has furnished me with a statement showing the probable annual return to Government from the above outlay, amounting in the aggregate to Rupees 46,346-4-4, of which the following is an abstract, viz:—

	Ayacut Nunjah waste. C.	M.	P.	Arable Nunjah waste. C.	M.	P.	Assessment. Rs.	A.	P.
Northern or Vadacal...	903	13	6	598	15	1	4,884	1	6
Southern or Thencal...	918	5	7	48	12	1	233	13	10
Totals...	1,822	0	5	647	11	2	5,117	15	4

One crop land to be converted into two crops.

	Land. C.	M.	P.	Assessment. Rs.	A.	P.
Northern or Vadacal...	370	18	3	2,207	14	11
Southern or Thencal...	640	3	5	4,764	7	11
Totals...	1,011	1	0	6,972	6	10

Dry land to be converted into wet.

	Land. C.	M.	P.	Assessment. Rs.	A.	P.
Northern or Vadacal...	643	12	2	4,563	11	1
Southern or Thencal...	1,007	15	1	5,738	12	5
Totals...	1,651	6	3	10,302	7	6
Total from new cultivation...			Rupees...	22,392	13	8
Do. from saving on remissions for drought and short produce...			,,	23,953	6	8
Grand Total, Annual Return, Rupees...				46,346	4	4

10. This statement is, I believe, much below the mark as respects the probable extent of new cultivation and the annual return from the same. It will be observed that while out of C. 903, M. 15, P. 6 of ayacut nunjah waste under the Vadacal, it is estimated that C. 598, M. 15, P. 1, yielding a revenue of Rupee 4,884-1-6, will be reclaimed, only C. 48, M. 12, P. 1 out of C. 918, M. 5, P. 7 under the Thencal are supposed to be reclaimable. As far as my own observation extends, there is every reason to suppose that the ayacut nunjah waste lands to the south of the river will be reclaimed in equal proportion with those north of it, and if so, the annual return to Government under this head may be expected to be nearly double the amount entered in the statement.

11. Again, as respects the conversion of dry land into wet, the statement shows only C. 643, M. 12, P. 2 under the Vadacal, and C. 1,007, M. 15, P. 1, under the Thencal, whereas I estimate that about seed cotays 2,662 on the north (exclusive of 1,000 cotays in the Maniachy Zemindary) and seed cotays 2,234 on the south of the river might gradually be brought under wet cultivation; and supposing it assessed at the same rate as in the statement, it would yield an annual revenue to Government of about Rupees 31,607, instead of Rupees 10,302-7-0.

12. With regard to the Maniachy Zemindary lands, the Collector informs me that the Zemindar has been required to state whether he is willing to pay for the water which will be available for their irrigation, but that no reply has yet been received from him on the subject; supposing him to cultivate to the extent of 1,000 cotays, and to pay at the same rate per cotay as the Government ryots, there would be a further return from the northern channel of about Rupees 7,000.

13. But supposing the return to be only Rupees 46,346 per annum, the original outlay will be repaid in little more than six years.

14. To give some idea of the value of the Tambrapoorny as an irrigating river, and of the probable quantity of water available for the above extent of cultivation, I may mention that the area drained by it above the Murdoor anicut is about 1,870 square miles, of which 937 square miles form the basin of its principal tributary, the Chittaur and its several feeders. Including the Murdoor, it is crossed by seven anicuts, and irrigates about 30,000 seed cotays, or 48,000 acres of land, yielding an annual revenue to Government of seven lacs of Rupees; of this, about 9,000 seed cotays, (or 14,400 acres,) assessed about 1,77,000 Rupees, are watered by the two channels proceeding from the Murdoor anicut, and the tanks dependent thereon, the principal of which on the north of the river are the Streeviguntum Cuslah, Periacolam, Paroorcolam, Shevalaymail and Keelcolam, and Paroongolam; and on the south of the river the Velloor, Thenkurray, and Cadumbah tanks. The Tambrapoorny river rises in the Western Ghauts and is fed by both monsoons. The total fall of rain during the year at Uthu Mullay, near the source of the Tambrapoorny, is often as much as 300 inches; while at Pulamcottah in the plains the average fall per annum for the nine years ending 1851 was only 22¼ inches. After a course of twenty-three miles through hills and forest, receiving on its way a considerable tributary, termed the Paumbaur, the Tambrapoorny breaks through the rocky barrier above Paupanassum, and reaches the first anicut about one-and-a-half mile below the famous falls of that place. From this to the Murdoor anicut the distance is forty-one miles, and the fall about 141 feet. From the Murdoor anicut to the sea the distance is twenty-nine miles, and the fall 77½ feet. The proposed site for the new anicut is twelve miles below the Murdoor, and the fall from thence to the sea is thirty-two feet.

15. The quantity of water flowing down the Tambrapoorny was ascertained, by observation at Palamcottah during an ordinary high fresh on the 6th December 1847, to be about 1,760 cubic yards per second, the mean velocity being six feet per second, and the average depth twelve feet. To this must be added about 350 cubic yards per second for the Chittaur, which falls into the Tambrapoorny, two miles above the Murdoor anicut, making in all 2,110 cubic yards per second at the latter work. Of this large body of water about 70 cubic yards per second are drawn off by the Mailacal and Keelacal, the two channels proceeding from the above work, and the remainder, together with what is returned by surplus culingulahs and the drainage from the lands, passes on to Streeviguntum and thence to the sea, with the exception of about 50 cubic yards drawn off by the Tendripairy and Auttoor channels on the right, and the Keelpadagay and Koorookay channels on the left bank. This is during ordinary high freshes, but even when the river is comparatively low, there is still sufficient water flowing past Streeviguntum for the lands proposed to be irrigated by the channels from the new anicut.

16. From the statements furnished monthly by the Collector to the Board of Revenue, in the Department Public Works, of the quantity of water in the Tambrapoorny river, it appears that, taking the average of five years, viz., from 1850 to 1854, inclusive, there was never less than four feet of water at Streeviguntum during the cultivating season, or from July to March, and even in the month of April the average is very little short of this. The breadth of the stream when the river is at its lowest if about twenty-five yards, or equal to the bottom breadth of the two channels taken together. It may fairly be assumed, therefore, that there will be never less than 1½ foot depth of water in each channel during the cultivating season, and with this as a minimum depth, the discharge would be 3¼ cubic yards per second. This may be shown as follows:—The northern channel has a bottom breadth of 36 feet with side slopes of 2 to 1, and a full of 10½ feet in the first 7 miles, or 1½ foot per mile, the area of section, therefore, would be $13 \times 1\frac{1}{2} = 6\frac{1}{2}$ square yards, and the hydraulic mean depth $\frac{6\frac{1}{2}}{14\frac{1}{2}} = \frac{13}{28\frac{1}{2}}$ of a yard, or about 16 inches. Table 1 of Captain Stoddard's Hydraulic Rules, &c., shows that with a fall of 1½ foot per mile and hydraulic mean depth of 16 inches, the velocity will be about 20 inches per second. This velocity multiplied by the area as above, or $6\frac{1}{2} \times \frac{13}{18} = \frac{169}{54} = 3\frac{1}{18}$ cubic yards per second nearly, or sufficient to cover 4,361 cotays of land with a third of an inch per diem, and to preserve the crop from failure. With 3 feet of water in the channel it may be shown by the above table that the discharge would be 11 cubic yards per second, or three times the former, and sufficient to cover the above extent of land with one inch per diem. This latter may be considered as the normal state of the channel for at least six months of the cultivating season. During the north-east monsoon freshes, the depth of water in the channel will not be less than 4½ feet, at which time the delivery by each channel will be about 21 cubic yards per second, or 18,14,400 cubic yards per diem.

17. The southern channel will have the same sectional area as the northern, and the same slope for the first 5¾ miles, consequently the delivery will be the same. It is thus seen that there is every probability of there being ample water in the river, and that the proposed channels are of sufficient capacity to conduct the requisite quantity to the lands available for wet cultivation north and south of it.

18. It only remains now for me to give a short description of the anicut and its subsidiary works. The anicut is to be 1,382 feet in length between the wing walls, the foundations, both of the body of the work and of the apron in rear to be of brick-in-chunam laid on wells, sunk 10½ feet in sand, and raised above the wells 4½ feet, including the thickness of the cut-stone covering to the latter. The height of the anicut above the average level of the river's bed is to be 6 feet, and the width at the crown 7½ feet. It is to be faced throughout with cut-stone and furnished with five sets of under-sluices to let off sand and surplus water when necessary. The breadth of the cut-stone apron in rear is to be 24 feet and the depth 4½ feet, and beyond it there is to be a rough stone apron 4½ feet in depth and 36 feet in breadth, including the retaining wall of stone-in-chunam, which latter will rest on a line of wells sunk to the same depth as above-mentioned. Thirty-two piers, each 6 feet thick and 15 feet in height above the apron, are to be constructed at intervals of 42 feet from centre to centre, and on these and the two abutments at the extremities of the anicut are to be turned thirty-three arches of 36 feet span and 9 feet rise, to carry a roadway 15 feet in width between the parapets. At the northern end of the anicut a river lock is to be constructed, to admit of boats passing to and fro, in the event of water communication being established between the interior of the district and the Sea Coast at Pinnacoil, as suggested in my Diary (General Observations) of the 16th September 1854. The estimate provides for 75 feet length and 15 feet breadth of lock, with a fall of 3 feet to allow of the water acting on the sandy bed of the river, and keeping open a channel to that depth for the passage of boats. The estimate was framed some months previous to the receipt of the Circular from the Chief Engineer's Office, No. 753, dated 7th September 1855, directing that all plans for locks on navigable canals should allow for 20 feet broad in the clear between the side walls, and 150 feet long between the mitres. If necessary, the latter dimensions can be substituted for the former when the work is under construction, but for all ordinary traffic a length of 75 feet and breadth of 15 feet would probably be found sufficient. A small semi-circular arch of 15 feet span is to be turned over the lock chamber to complete the communication with the north bank of the river.

19. At the head of each of the two channels proceeding from the anicut, a lock of similar dimensions to the above will be required in the event of it being determined to make use of them for navigation as well as irrigation. For the present, however, I would recommend that the project should be considered as one of irrigation only, and in that case the present head sluice of Keelpadagay will suffice for the northern channel, a similar one being constructed on the right bank immediately above the anicut for the supply of the southern channel.

20. The subsidiary works required on the northern channel, supposing it to be for irrigation only, are as follow :—

(1.) A dam across a sandy stream falling into the channel 270 yards below the head sluice.

(2.) A bridge of 36 feet span across the channel, in lieu of the present imperfect stone platform bridge, to keep open the communication between the villages to the north of the channel and the river.

(3.) A division sluice for the irrigation of the Keelpadagay lands at the point where the new channel leaves the old one at D in the sketch.

(4.) A small supply sluice at the head of the branch channel to the same land at E.

(5.) A bridge of 30 feet span on the cross road leading from Paroongolam to Mangalacoorchy on the river bank at E.

(6.) Ten irrigating sluices for new land to be brought under cultivation between E and D in the sketch.

(7.) Two bridges of 30 feet span with causeway between them and a calingulah across the Aroomoogumungalum channel at Yerul.

(8.) A dam with surplus sluices across a jungle stream falling into Aroomoogamungalum tank at G in the sketch.

(9.) A bridge of 30 feet span across the Pullayacoil salt pan road at H.

(10.) A dam 600 feet in length with under-sluices across the Oop-oday a large jungle stream which crosses the line at I. in the sketch.

(11.) A sluice of supply to Korumpullum tank.

(12.) A head sluice for the branch channel to Coorookay tank at B in the sketch.

21. Supposing the channel to be used for navigation, locks will be required at the places marked L L L. The channel to Tuticorin may be considered in the light of a branch only for the main channel, which latter may be extended eventually to the northward for some miles, and thereby bring more land under cultivation. There is no reason indeed why the main channel should not be carried on northward through the Ettiapooram Zemindary till it meets the Vypaur river, a distance of twenty miles from the point where the branch to Tuticorin separates from it.

22. The subsidiary works required on the southern channel, supposing it to be for irrigation only, are as follow :—

(1.) A head sluice in the right bank of the river in connection with the anicut.

(2.) Two syphon sluices at Tricalore in lieu of the present aqueducts which check the flow of water.

(3.) A bridge of 30 feet span across the channel west of Tricalore, at A in the sketch in lieu of the present stone platform bridge.

(4.) A calingulah and bridge at the west end of Cadumba tank.

(5.) A sluice at east end of the same tank for the supply of Ammenpoorum and Cannum tanks.

(6.) Ten sluices for the irrigation of new land between Cannum and Trichendore.

(7.) Two sluices in Ellapanaiken tank and a surplus calingulah in the same.

(8.) Alterations to the eastern calingulah in Cadamba tank to prevent waste of water.

(9.) Head sluices for the branch channels to Avoodayoor and Shonancautvalay ruined tanks.

(10.) One sluice of irrigation and a calingulah of discharge in Avoodayoor tank.

(11.) Two sluices of irrigation and a calingulah of discharge in Shonancautvalay tank.

23. To render the southern channel navigable locks will be required at the points marked I. I. I. in the sketch, and the channel instead of being allowed to flow through the Ammenpooram and Cannum tanks should be taken round them, and a sluice of supply for these tanks constructed at B in the sketch. To complete the communication with the Port of Coolasagaraputnum, eight miles south of Trichendore, a canal must be excavated from the south end of Ellapanniken tank for about a mile, to connect it with the swamp, which, as before mentioned, extends southward as far as that place.

24. In addition to the several documents mentioned in the 1st and 2nd and 8th paragraphs of this letter, I beg to forward, herewith, the statement of cultivation and beriz, referred to in the 9th paragraph, together with an abstract estimate drawn out in the long form in the Collector's Office.

Remarks on Colonel Horsley's report on the Streeviguntum Anicut project.

1. In 1855, a project was submitted by Captain, now Colonel, Horsley, for the extension of irrigation to the sea-coast by means of an anicut to be built over the Tambrapoorny river at Streeviguntum, with main channels, on the left bank to Tuticorin and on the right bank to Coolasagaraputnum near Trichendore, these channels being intended to serve for navigation, as well as for irrigation. The project was sanctioned by the Government in 1857, but under the financial restrictions consequent on the mutiny, this scheme shared the fate of other works of importance, and was necessarily laid aside. A grant of funds was made in 1862, but before work was put in hand, the money was withdrawn; the prices of labor and materials have risen very considerably during the past twelve years; the amount of the estimate now submitted, Rupees 7,50,000, is nearly three times the amount of the original estimate, Rupees 2,85,000, and there is every reason to fear that the cost of work will go on increasing, so that should any obstacles retard the execution of the project, the sum now required for its completion will hereafter prove inadequate. If the works had been put in hand when the scheme was first matured, the outlay would have been repaid some time since, and there would have been only the maintenance charges to set off against the annual increase, which at a very low computation would have been half a lac of Rupees, and in all probability double that sum.

The project has been retained in its integrity, as designed by Colonel Horsley, with the exception only of the provisions for making the main channels navigable. Colonel Horsley became, during a lengthened residence in the Madura and Tinnevelly Districts, thoroughly acquainted with the country, and after having considered the subject for no less a period than twelve years, presented his report and designs in November 1855. It was at that time considered probable that the Eastern Coast Canal might be extended to Tinnevelly, and with this in view Colonel Horsley had intended to make the channels navigable; for some time past, however, the idea has been given up, and it is now proposed to divert the water of the Tambrapoorny solely for irrigation.

2. The District of Tinnevelly, so far as concerns the rain-fall, is subject only to the north-east monsoon, during a period of about two months from October to December; but as it is bounded all along by the western ghauts, the greater part of the cultivated land receives its water-supply from the rain which falls on the hills during the south-west monsoon. The first fresh in the Tambrapoorny usually comes down in the month of June, and the supply of water is constantly renewed, insomuch that even during the hot months the river is never dry. Thus, though the rain-fall on the plains is but small, the Tambrapoorny and the small streams which flow into it are under the influence of both monsoons, and while a great deal has been done to utilize the water, there is still a vast volume which year after year runs waste into the sea.

A description of the proposed lines of channels being given in Colonel Horsley's report, it is unnecessary to repeat it. The financial prospects of the scheme in the year 1855 were as follows. The probable annual return to Government from an outlay of Rupees 2,85,000 was estimated by the Collector of Tinnevelly at Rupees 46,346, or about 16¼ per cent., the return being made up of two principal items, viz:—

From new cultivation	Rupees	22,393
Do. saving on remissions for drought and short produce	,,	23,953
Total Rupees		46,346

At the same time, Colonel Horsley considered the figures of return to be set down as much too low; for while 598 cotays were shown as likely to be cultivated out of 913 cotays of Nunjah waste on the northern channel, only 48 cotays out of 918 were entered for the southern channel; and if a like proportion were admitted for the latter, there would be 550 cotays more of new cultivation, assessed at present rates at Rupees 4,455. Again, in the conversion of dry land to wet, Colonel Horsley is of opinion that an additional area of 2,018 cotays should be reckoned upon on the north, and 1,226 cotays on the south bank of the river, which would yield an annual revenue of Rupees 21,304; there being likewise 1,000 cotays in the Maniachy Zemindary not taken into account, in case the Zemindar might refuse to pay the same as the Government ryots.

Hence, if these two sums, Rupees 4,455 and Rupees 21,304, are added to the Collector's figure of return Rupees 46,346, there is obtained a total return of Rupees 72,105, or about 25¼ per cent. on an outlay of Rupees 2,85,000. There has, however, been much change in the past twelve years, in the manner of assessing the land, and more land has been brought into cultivation; likewise the assessment being more settled, the amount of remissions has much decreased.

Mr. Puckle, the present Collector of Tinnevelly, gives the remissions at "upwards of a lac of Rupees in the past ten years;" hence, the annual amount of remission is assumed at only Rupees 10,000.

Vide his letter No. 95 of 24th April 1867.

Again, with regard to the expected increase of cultivation, Mr. Puckle sets down the area to be brought under new cultivation at 4,500 acres assessed at 5 Rupees ... ... Rupees 22,500
and 3,000 acres to be converted from 1 to 2 crop land at Rs. 2-8-0 „ 7,500

Total Rupees 30,000
to which adding for remissions ... ... „ 10,000

there is a grand total of ... ... „ 40,000
or 5½ per cent. on the estimated outlay of Rupees 7,50,000. At the same time the Collector considers that there are 25,000 acres of land lying along the coast that may be brought into cultivation, and give a return of Rupees 75,000 per annum; while Colonel Horsley says there is no reason why the main northern channel should not be carried through the Ettiapoorâm Zemindary till it meets the Vypaur river, or about twenty miles beyond Tuticorin, and thereby bring more land under cultivation.

3. Much importance attaches to the question whether when large irrigation projects are taken up by the Government, a water rate shall be paid by the ryots on the consideration of their obtaining an unfailing supply for cultivation. In a recent report on the extension of irrigation in Candush, Guzerat, and the Deccan, Colonel Strachey mentions the opinion of the Settlement Officers of Bombay, that the land can well bear a rate of Rupees 4 per acre, in addition to the fixed settlement rates. The Collector of Tinnevelly considers that the settlement in Southern India must be permanent, and that its principles do not admit of an additional rate for water. It appears, however, to be the duty of the Engineer to bring the subject prominently forward for the consideration of Government, inasmuch as the imposition of a water rate will at once double the figures of return given above.

In his letter No. 119 of 18th May 1867.

A water rate of Rupees 4 per acre on 7,500 acres will produce Rs. 30,000 per annum, and bring up the general annual return to Rupees 70,000 or 9⅓ per cent. on the capital to be expended, 7½ lacs.

4. The Collector observes that the expense of a bridge over the anicut would be repaid by tolls, and certainly a toll on carts passing over the anicut is a most legitimate source of revenue. There is at present no bridge over the river between that near Palamcottah and the sea, and an ordinary fresh prevents bandies crossing the river. If the moderate toll of 1 Anna suggested by the Collector be levied from all bandies that go over the bridge and their number be taken at 220 per diem, the toll tax will amount to Rupees 5,000 per annum. A charge of 2 Annas might well be made, considering the great convenience of a bridge at Streeviguntum, that sum being often paid on ordinary roads; but the receipts be taken at only 1 Anna, the aggregate amount in a year represents the interest, at 5 per cent. on 1 lac of Rupees outlay, out of the estimate of 7½ lacs.

5. The Collector, Mr. Puckle, takes a very lively interest in the anicut project and is most sanguine as to its results; while the residents in Tuticorin and the inhabitants of the different villages are expressing their appreciation of the expected benefits, by tending in contributions towards the work. The voluntary subscriptions up to this time amount to Rupees 25,000. The Collector has further volunteered to aid the Engineer Department in supplying materials. He has set apart a large quantity of cut-stone from the demolished Fort at Palamcottah, and promises by means of money contributed, to deliver the stone at the building site; he will give every facility towards palmyras and jungle wood being obtained, and in the provision of firewood for burning bricks and lime. The Collector is anxious to render his assistance as early as possible in the preparation of the large quantity of bricks required, and to relieve the Engineer Department both of the time and trouble of having the bricks made, as also to deliver them on the works free of carriage charge. This will much facilitate the execution of the masonry work, and neglecting minor items, the cost of the works will be much reduced, if besides receiving stone gratis, the Engineer can have bricks supplied to him at 4 Rupees per thousand, according to the Collector's estimate, instead of at Rupees 7, as per the Public Works estimate, including carriage.

The cubical content of cut-stone in chunam entered in the estimate is 3,684 yards, which at Rupees 12 comes to ... ... Rupees 44,208
But the stone being supplied on the spot, the cost of building will be at the rate of Rupees 3-12-9 or ... ... „ 13,990

Difference saved, Rupees 30,218

Again, the cubical content of brick-work in chunam, provided in the estimate, is in round numbers 26,190 yards, which at different rates is charged in the aggregate ... ... Rupees 1,35,900
But by making a proportionate reduction in the rates on account of bricks being supplied cheap, the cost will be only ... ... „ 96,620

Difference saved, Rupees 39,280

or in the two items of cut-stone and brick-in-chunam, there will be a saving of Rupees 69,498.

6. Returning to the cultivable area, Colonel Horsley presumes there are 1,000 cotays of land in the Maniachy Zemindary, which may be brought under cultivation, and at 5 Rupees per acre will give a return of Rupees 8,100. Mr. Puckle considers that the present scheme neglects 25,000 acres of land, that will bring in 75,000 Rupees at 3 Rupees per acre; but the irrigation of this large tract of land will form an extension of the scheme, and is not a component part of the surveyed project. Still if such an extension were to be hereafter made, the rate of return per acre, Rupees 3, is so low, that it may be considered as representing the revenue, after allowing say 1 lac for the extension of the channels, and this forms of itself a contingent return of upwards of 8½ per cent. on the supposed capital expenditure of 8½ lacs.

The table appended shows the return that may be expected from the Collector's statement of increased cultivation, including value of remissions, and from the consecutive additions of a water-rate, of return from the Zemindary, and from a toll on the bridge. The least per-centage shown is the value of A 5½, while the value of A3, or 6·62 may safely be taken as the minimum return; while again considering the water-rate as an admitted item, and taking credit for the Collector's assistance in providing materials, the value of B3 or 11·03 per. cent. may be fairly expected. If the project had been carried out when first sanctioned, or rather if the cost of building had remained the same as at that period, the value of A. would have been 13, and that of B3, 26½ per cent.; hence though in a financial view, the prospect of remuneration is far less favorable than formerly, the benefit to be derived by the people is by no means diminished, and at the lowest computation the return from the outlay offers a fair investment of capital.

7. The supply of fresh water to the town of Tuticorin will prove a great boon to the inhabitants: the water in most of the wells is brackish, and but a limited quantity is obtained from wells, and holes scooped out in the sand, a mile from the sea-shore. The residents cannot obtain wholesome water for the house, stable or garden, from wells near their houses, but have to send to a distance for all the water required for domestic purposes; in fact, scarcity of water, such as is experienced in other stations only in the hot season, or in years of unusual drought, is felt throughout the year at Tuticorin, and is a perpetual source of discomfort.

8. The annual rain-fall at Palamcottah is set down by Colonel Horsley at 22½ inches for the nine years ending 1851; during the ten years from 1857 to 1866, the average rain-fall registered at Palamcottah has been 28½ inches. The greatest quantity that fell in one year was 42·88 inches in 1862, and the minimum was 18·81 inches in 1865. During this period of ten years, by far the greatest quantity of rain fell in the month of November, the average for that month being 9·5 inches, or just one-third of the annual fall; the greatest fall in one week was, in November 1866, 18·10 inches, and the maximum in one day 9 inches in the same month. But while the rain-fall on the plains is thus shown to be very moderate, the hills in which the Tambrapoorny rises are under the influence of the heavy south-west monsoon; the quantity of water arriving at the Murdoor anicut in an ordinary high fresh was calculated by Colonel Horsley at 2,110 cubic yards per second. The drainage area above the Murdoor anicut is 1,870 square miles, and supposing the rain to extend over one-half of this area, and also that one-half of the water runs off the hills, there must be a fall of 4½ inches in the 24 hours to produce a flood of 2,110 cubic yards per second. This volume is not taken as excessive, but as the usual discharge in high freshes, of which many come down the river during the year.

9. Now as regards the area of land that may be cultivated by the channels taken off from the anicut, Colonel Horsley puts down 5,360 acres under new cultivation, and conversion of 1 crop to 2, as producing the return of Rupees 46,346: but also estimates a further revenue of Rupees 21,304 (*vide* paragraph 2 above) from 6,227 acres more, or a total irrigable area of 11,587 acres. It is assumed that there will never be less than 1½ foot depth of water in each channel during the cultivating season; the bottom breadth of the channel is 36 feet, with side slopes of 2 to 1, and fall of 1½ feet per mile, and the discharge is 7.' or3 ½ cubic yards nearly per second, which is sufficient to cover 4,361 cottays, equivalent to 7,064 acres of land with a third of an inch per day.

1 Cottay —1·62 acres.

But with 3 feet of water in the channel, which is its normal state for at least six months of the cultivating season, the discharge is about 11 cubic yards per second, or sufficient to cover the same extent of land with 1 inch per day, or the north and south channels together will supply that volume of water which will cover 14,128 acres with 1 inch daily. The area now given by the Collector, that will yield a return of Rupees 30,000, is only 7,500 acres, so that the water available is nearly double that required, allowing a depth of 1 inch.

The actual quantity of water required for raising a crop of paddy cannot be taken at any fixed rate; approximate calculations have been made in different parts of the country, and owing to various causes, such as the nature of the soil, evaporation, &c., the results are not very similar.

Major Sankey in reporting on the Mauri project, assumes 7,500 cubic yards to be required for the cultivation of an acre with two crops; this allows little more than one-fifth of an inch daily; throughout the whole period of nine months, and taking the discharge of each of the Stroeviguntum channels at 10·83 cubic yards per second, there is sufficient water at the above rate to irrigate 33,085 acres of land on both the north and south banks of the river.

In the table annexed, the areas of land are calculated, which can be cultivated by the volume of water of 10·83 cubic yards per second, allowing a distribution of from 1½ to 3 cubic yards per hour per acre, or a depth of water varying from 26 to 53 inch per day. The least area, or that with the largest allowance of water, viz., 3 cubic yards per acre per hour, is nearly 26,000 acres, dependent on both of the channels; and it is thus very evident that the water supply in the channels of the estimated section is sufficient to irrigate very much more land than that contemplated in the project, or in other words, that the irrigable area may be considerably extended without enlarging the capacity of the main channels.

	Outlay.	Return. Annual Return by the Collector's statement.	By reduction of remissions.	By water rate at Rupees 4 on 7,500 acres.	From Munaichy Zemindary.	Return from additional 25,000 acres.	Total.	Per-centage on outlay. 1	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
Amount of estimate	7,50,000	30,000	10,000	.....	.....	.....	40,000	5·33	A.
	.....	.....	.....	.....	.....	.....	70,000	9·33	B.
	.....	.....	.....	.....	.....	.....	78,100	10·41	C.
Add to estimate 1 lac for extending channels	8,50,000	.....	.....	.....	.....	73,000	1,53,100	18	
Deduct from estimate for stone and brick provided by Collector	6,80,000	30,000	10,000	.....	.....	.....	40,000	5·88	A.
	.....	.....	.....	.....	.....	.....	70,000	10·29	B.
	.....	.....	.....	.....	8,100	.....	78,100	11·48	C.
						Return from toll on Bridge. 5,000			
Amount of estimate	7,50,000	30,000	10,000	30,000	.....	.....	45,000	6·6	A2
	.....	.....	.....	.....	.....	.....	75,000	10·	B2
	.....	.....	.....	.....	8,100	.....	83,100	11·08	C2
Deduct for materials provided by the Collector	6,80,000	30,000	10,000	30,000	.....	.....	45,000	6·62	A3
	.....	.....	.....	.....	.....	.....	75,000	11·03	B3
	.....	.....	.....	.....	8,100	.....	83,100	12·22	C3

D

Table showing the number of acres of land that can be irrigated from a volume of water of 10·83 cubic yards per second.

At cubic yards per acre per hour	No. of acres irrigated from each channel.	Depth of water per day in inches.	No. of acres irrigated from both channels together.
1½	25,992	·26	51,984
2	19,494	·35	38,988
2½	15,595	·44	31,190
3	12,996	·53	25,992

From the Collector of Tinnevelly, to the Officiating Superintending Engineer, 8th Division, Madura, dated Tinnevelly, 24th April 1867, No. 95.

1. In reply to your letter No. 113, dated 16th instant, I have the honor to inform you that I have been over most of the villages likely to be affected by the Streeviguntum anicut, and have seen the enormous benefits likely to be conferred by the work between Streeviguntum and the sea, a distance of twenty miles. The crops are now on the ground (at the end of April) and are not reaped till May, instead of in February, as is the case higher up the stream. The tanks from which these lands are irrigated receive their supply from the overflow of other tanks supplied from the Murdoor anicut, some ten miles above Streeviguntum, and many good freshes come and go before the lower tanks receive a drop of water; in fact the cultivating season far down the river is three months later than it need be, and the remissions made for failure of crops below the proposed anicut during the last ten years amount to upwards of a lac of rupees. The proposed anicut will bring under cultivation 1,500 acres of Nunjah waste, assessed at 7,500 Rupees, will convert 3,000 acres of single crop land into double crop, which at Rupees 2-8-0 an acre represents 7,500 Rupees, and will irrigate 3,000 acres of dry land, which at 5 Rupees an acre represents 15,000 Rupees, total 30,000 Rupees.

2. There is, moreover, a tract of marsh extending from Coolasagaraputnum to Vypar almost entirely uncultivated, but capable of growing rice crops if supplied with fresh water to wash out the salt.

3. I have lately ridden over the whole length of this with the Inspector General of Police, and we both agreed that this barren tract, some forty miles in length, by an average of one in breadth, might be irrigated apparently with the greatest ease. The level is low, almost the sea level, and if the flood water that collects there during the monsoon had but an exit through the said hills, this alone would wash out the salt. An exit is easily provided, and here are 25,000 acres that the people would readily take up at 3 Rupees an acre lying waste from want of the water that fills the river day after day and week after week during several months of the year.

4. I calculate that the increase of revenue to be derived from an anicut at Streeviguntum would be at least a lac of rupees per annum, and the people are so impressed with the advantages of the scheme that they are now subscribing, and will in a few days more pay into the treasury, a very considerable sum as a donation towards the work, and as an earnest of their anxiety that the Government should commence it at once. On receipt of this sum I will address the Board, and beg that

the present favorable opportunity may be taken advantage of, and that the money paid by the ryots may be spent at once in carting to the work the enormous mass of stone that now encumbers the Fort at Palamcottah; these stones, as you are doubtless aware, are excellently well suited for building, being many of them dressed on one side at least, and most of them averaging 4 feet in length. If the people subscribe, as they probably will, from 30,000 to 40,000 Rupees, I can move some 8,000 cubic yards of this stone down to the spot at once free of all charge to Government, and thus considerably diminish the cost of the work. Excellent bricks for wells, &c., are procurable on either side of the river, and firewood for brick and chunam burning can be got in any quantity close by.

5. The first proposals for this anicut went in nearly ten years ago, and though circumstances have rendered a restriction of outlay necessary ever since the estimate was framed, I trust that it may now be possible to commence a work that will add so greatly to the prosperity of this district.

From the Collector of Tinnevelly, to the Officiating Superintending Engineer, 8th Division, Madura, dated Tinnevelly, 18th May 1867, No. 119.

1. The assessment of 5 Rupees an acre alluded to in your letter, No. 282, dated 9th instant, is about the average I propose for wet lands in the Settlement. Our Settlement in Southern India must be permanent, as it is practically impossible to revise the rental of millions of tenants every few years, and the fluctuating charge of the Olungoo system has only lately been abolished.

2. In your calculation of the revenue to be derived from the anicut, you omit the future assessment of the enormous tract of waste land along the coast from Coolasagaraputnum to Tuticorin, which may be brought under cultivation. You mention 8 lacs as the probable cost of the work, but the expense of a bridge over the anicut would be re-paid by tolls, and I conclude the idea of a navigable canal has been abandoned.

3. A water cess was declared inapplicable to Trichinopoly, a district similarly situated to this, and the water-cess scheme has hitherto been confined to the Kistna and Godavery anicuts.

4. The ryots have paid Rupees 6,000 towards the expenses of the work, and much more will be collected shortly.

Abstract Estimate or Statement showing the probable amount required in excess of the sanctioned estimate for the Streeviguntum Anicut, &c., in the District of Tinnevelly.

Particulars.	As per sanctioned Estimate.				As per revised Estimate.				Excess.
	Quantity.	Price.	Rate per	Amount.	Price.	Rate per	Amount.		
Anicut Bridge and River Lock.		Rs. A. P.		Rs. A. P.	Rs. A. P.		Rs. A. P.		Rs. A. P.
Brick-in-chunam... ... Cubic yards.	13,662¾	2 0 0	Cubic yards.	27,325 4 0	5 0 0	Cubic yards.	68,313 2 0		
Rough stone in do. ... ,,	1,840¾	2 0 0	Do.	3,680 8 0	3 8 0	Do.	6,440 14 0		
Archwork, brick in do. ... ,,	3,142¾	2 8 0	Do.	7,855 2 0	6 0 0	Do.	18,852 6 0		
Cut-stone in do. ... ,,	2,767¼	7 0 0	Do.	19,371 10 0	12 0 0	Do.	33,208 8 0		
Rough stone and boulders. ,,	7,592¾	1 8 0	Do.	11,389 2 0	2 8 0	Do.	18,981 14 0		
Constructing wells, brick-in-chunam ... ... ,,	3,048¾	2 4 0	Do.	6,850 2 0	5 8 0	Do.	16,766 12 0		
Brick-in-clay ... ... ,,	3,612¼	1 8 0	Do.	4,518 12 0	3 0 0	Do.	9,037 8 0		
Plastering ... ... Square feet.	88,982½	2 0 0	100 Square feet.	1,779 10 0	2 0 0	100 Square feet.	2,669 7 0		
Jungle wood ... ... Cubic feet.	3,635¾	1 4 0	Cubic foot.	4,544 11 0	3 8 0	Cubic foot.	12,725 2 0		
Pointing ... ... Square feet	48,807	0 7 0	100 Square feet.	213 8 0	1 4 0	100 Square feet.	610 1 0		
Pairirahs, 25 feet long...	223½	2 0 0	Each.	446 11 0	4 0 0	Each.	893 6 0		
Do. half 10 do.	115	0 6 0	Do.	43 2 0	0 12 0	Do.	86 4 0		
Removing sand ... ... Cubic yards.	50,847½	0 0 6	Cubic yard.	1,589 0 0	0 1 0	Cubic yard.	3,178 0 0		
Do. earth ... ... ,,	17,821	0 0 9	Do.	831 0 0	0 2 0	Do.	2,227 10 0		
Do. gravel ... ... ,,	1,957½	0 6 0	Do.	734 2 0	1 0 0	Do.	1,957 4 0		
Putting up and removing 33 large centerings	...	30 0 0	Each.	990 0 0	60 0 0	Each.	1,980 0 0		
Do. do. 33 small do	...	5 0 0	Do.	165 0 0	10 0 0	Do.	330 0 0		
Sinking and filling 871 wells	...	3 1 0	Do.	2,667 7 0	6 0 0	Do.	5,226 0 0		
Removing old masonry ... Cubic yards.	584½	0 4 0	Cubic yard.	146 2 0	0 8 0	Cubic yard.	292 4 0		
1 Lock gate 17'×23'	...	650 0 0	...	650 0 0	...	...	1,300 0 0		
1 Do. 17'×20'	...	575 0 0	...	575 0 0	...	,,	1,150 0 0		
Embankment	...	...	...	3,000 0 0	...	...	6,000 0 0		
Baling	...	...	...	2,000 0 0	...	...	4,000 0 0		
Scaffolding and sundries	...	...	...	4,692 14 0	...	...	13,773 10 0		
Total for anicut bridge and river lock.	...	...	...	1,01,067 11 0	...	...	2,30,000 0 0	1,28,932 5 0	
North Channel from Streeviguntum to Tuticorin.									
Earth ... ... Cubic yards.	7,41,202¾	0 0 8	Cubic yard.	30,883 7 0	0 2 0	Cubic yard.	92,650 5 0		
Repairs to Paykulam tank ,,	48,747¾	0 0 8	Do.	2,031 3 0	0 2 0	Do.	6,093 9 0		
Excavating a channel 10 yards broad at bottom for a length of 10¼ miles, side slopes 2 to 1, average depth 2 yards...	...	2,000 0 0	Mile.	21,000 0 0	6,160 0 0	Mile.	64,680 0 0		
Sundries, tamping Paykulam tank ...	...	...	...	243 12 0	...	...	376 2 0		
Masonry Works.									
Brick-in-chunam... ... Cubic yards.	3,540¾	2 0 0	Cubic yard.	7,080 4 0	5 0 0	Cubic yard.	17,700 10 0		
Rough stone in chunam ... ,,	1,855¼	2 0 0	Do.	3,711 11 0	3 8 0	Do.	6,495 7 0		
Brick-in-chunam, archwork ,,	256¾	2 8 0	Do.	640 10 0	6 0 0	Do.	1,537 8 0		
Cutstone-in-chunam ... ,,	765¾	7 0 0	Do.	5,359 6 0	12 0 0	Do.	9,187 8 0		
Brick-in-chunam... ... ,,	2,709¼	2 4 0	Do.	6,097 1 0	5 8 0	Do.	14,904 0 0		
Plastering ... ... Square feet.	17,051¼	2 0 0	Square feet 100	341 0 0	3 0 0	100 Square feet.	511 9 0		
Jungle wood ... ... Cubic feet.	217¾	1 4 0	Cubic foot.	272 0 0	3 8 0	Cubic foot.	761 11 0		
Removing old work ... Cubic yards.	11¾	0 4 0	Cubic yard.	2 13 0	0 8 0	Cubic yard.	5 10 0		
Rough stone ... ... ,,	2,617¾	1 4 0	Do.	3,271 10 0	2 8 0	Do.	6,543 3 0		
Turfing ... ... ,,	1,114¾	0 2 0	Do.	139 5 0	0 6 0	Do.	417 14 0		
Earth ... ... ,,	45,765¾	0 0 8	Do.	1,906 15 0	0 2 0	Do.	5,720 12 0		
Centerings to bridges	...	...	...	570 0 0	...	...	1,140 0 0		
Scaffolding and sundries	...	...	...	1,942 11 0	...	...	3,874 4 0		
Total for North Channel...	...	...	...	85,493 12 0	...	...	2,32,600 0 0	1,47,106 4 0	
South Channel from Streeviguntum to Trichendore and Coolasagaraputnum.									
Earth ... ... Cubic yards.	10,69,088¾	0 0 8	Cubic yard.	44,545 6 0	0 2 0	Cubic yard.	1,33,636 2 0		
Kunker ... ... ,,	34,165½	0 12 0	Do.	25,624 1 0	1 8 0	...	51,248 1 0		
Excavating a channel 10 yards broad at bottom for a length of one mile, side slopes 2 to 1, average depth 2 yards ...	...	...	...	2,000 0 0	...	...	6,160 0 0		
Repairs to bund of Ellapanaiken tank. Earth .. .. Cubic yards.	21,896¾	0 0 8	Cubic yard.	912 6 0	0 2 0	Cubic yard.	2,737 2 0		
Tamping and sundries	...	...	...	109 8 0	...	...	136 0 0		
Repairs to Avudyaur ruined tank and cutting a branch channel for its supply. Earth ... ... Cubic yards.	17,392¾	0 0 8	Do.	724 11 0	0 2 0	Cubic yard.	2,174 1 0		

Abstract Estimate or Statement showing the probable amount required, &c.—*(Concluded.)*

Particulars.	As per sanctioned Estimate.			As per revised Estimate.			Excess.
	Quantity.	Price.	Rate per	Amount.	Price.	Rate per	Amount.	
		Rs. A. P.		Rs. A. P.	Rs. A. P.		Rs. A. P.	
Tamping and sundries	...	...	...	23 13 0	...	...	23 13 0	
Repairs to Shonauncautvaly ruined tank and cutting a branch channel for its supply. Earth... ... Cubic yards.	43,640	0 0 8	Cubic yard.	1,818 5 0	0 2 0	Cubic yard.	5,454 15 0	
Tamping and sundries	...	...	...	193 3 0	...	...	193 3 0	
Masonary works in the main and branch channels.								
Brick-in-chunam... ... Cubic yards.	2,670	2 0 0	Cubic yard.	5,340 1 0	5 0 0	C ubic yard.	13,350 2 0	
Rough stone in do. ... ,,	10	2 0 0	Do.	21 10 0	3 8 0	Do.	37 14 0	
Archwork, brick in do. ... ,,	207	2 8 0	Do.	517 14 0	6 0 0	Do.	1,242 15 0	
Cut-stone in do. ... ... ,,	147	7 0 0	Do.	1,029 0 0	12 0 0	Do.	1,764 0 0	
Do. in do. ... ... ,,	4	6 0 0	Do.	29 4 0	10 0 0	Do.	48 12 0	
Jungle wood ... ... Cubic feet.	30	1 4 0	Cubic foot.	38 5 0	3 8 0	...	107 6 0	
Plastering ... ... Square feet.	11,062	2 0 0	100 Square feet.	221 4 0	3 0 0	...	331 14 0	
Removing old work ... Cubic yards.	18	0 4 0	...	4 11 0	0 8 0	...	9 6 0	
Earth ... ... ,,	1,800	0 0 9	Cubic yard.	84 6 0	0 2 0	Cubic yard.	225 0 0	
Gravel ... ... ,,	45	0 6 0	Do.	16 15 0	1 0 0	Do.	45 3 0	
Earth ... ... ,,	941	0 0 8	Do.	39 4 0	0 2 0	Do.	117 11 0	
Centerings to bridges	...	...	...	415 0 0	...	...	830 0 0	
Rough stone ... ... Cubic yards.	70	2 4 0	...	158 10 0	3 8 0	...	246 12 0	
A new calingulah west end of Kadambakulam tank	...	...	...	...	...	...	5,000 0 0	
Sundries	...	...	...	554 12 0	...	...	879 12 0	
Total for South Channel ...	...	...	...	84,422 5 0	...	...	2,26,000 0 0	1,41,577 11 0
Superintendence, &c.								
1 Assistant Engineer's pay for 3 years...	...	191 5 4	Mensem.	6,888 0 0	200 0 0	Mensem.	7,200 0 0	
1 Writer's pay for 3 years	...	35 0 0	Do.	1,260 0 0	40 0 0	Do.	1,440 0 0	
3 Overseers' do.	...	43 15 1	Each per mensem	9,491 10 0	60 0 0	Each per mensem	6,480 0 0	
1 Head Maistry's do.	...	35 0 0	Mensem.	1,260 0 0	35 0 0	Mensem.	1,260 0 8	
6 Assistant do. do.	...	14 0 0	Each per mensem	3,024 0 0	20 0 0	Each per mensem	4,320 0 0	
6 Gumastahs' do.	...	10 8 0	Do.	2,268 0 0	14 0 0	Do.	3,024 0 0	
Contingencies and Plant	...	...	...	22,299 1 0	...	...	37,676 0 0	
Total for Superintendence, &c....	...	...	...	52,970 11 0	...	...	61,400 0 0	8,429 5 0
Grand Total of Estimate...	...	...	...	3,28,954 7 0	...	...	7,50,000 0 0	4,21,045 9 0

Courtallum,
15th *August* 1867.

(Signed) H. L. PRENDERGAST, Captain, R. E.,
Offg. Superintending Engineer, 8th Division.

Specification to accompany the Estimate for the Streeviguntum Anicut project.

Estimate of Rupees 7,50,000 for constructing an anicut and bridge across the Tambrapoorny river at Streeviguntum, in the district of Tinnevelly, with channels proceeding from it to the port of Tuticorin on the north, and that of Coolasagaraputnum on the south. The anicut is to be 1,382 feet in length between the wing-walls, the foundations, both of the body of the work, and of the apron in rear, to be of brick-in-chunam, laid on 823 wells, (each 4 feet diameter and 6 feet deep,) sunk 10½ feet in the sand, and raised above the wells 4½ feet, including the thickness of the cut-stone covering to the latter. The height of the anicut above the average level of the river bed is to be 6 feet, and the width at the crown 7½ feet. It is to be faced throughout with cut-stone, and furnished with five sets of under-sluices to let off sand and surplus water when necessary. The breadth of the cut-stone apron in rear is to be 24 feet, and the depth 4½ feet, and beyond it there is to be a rough stone apron 4½ feet in depth and 36 feet in breadth, including the retaining wall of stone-in-chunam, which latter will rest on a line of wells sunk to the same depth as above-mentioned. Thirty-two piers, each 6 feet thick, and 15 feet in height above the apron, are to be constructed at intervals of 42 feet from centre to centre, and on these and the two abutments at the extremities of the anicut are to be turned thirty-three arches of 36 feet span, and 9 feet rise, to carry a roadway 15 feet in width between the parapets.

The northern channel has a bottom breadth of 36 feet, with side slopes of 2 to 1, and a fall of 10½ feet in the first seven miles or 1½ feet per mile, the area of section, therefore, would be $13 \times \frac{1}{2} = 6\frac{1}{2}$ square yards, and the hydraulic mean depth $\frac{6\frac{1}{2}}{14\frac{1}{2}} = \frac{13}{28\frac{1}{2}}$ of a yard, or about 16 inches.

3. The southern channel will have the same sectional area as the northern, and the same slope for the first 5½ miles.

The subsidiary works required on the northern channel for irrigation are as follow:—

1. Constructing a dam across a sandy stream falling into the channel, 270 yards below the Keelpadagay head sluice. The body is to be built of brick-in-chunam 30 feet long, and raised 2½ feet above the foundations, which are to be sunk 4½ feet. The apron is to be 6 feet broad and 2½ feet in depth, built of rough stone-in-chunam.

2. Constructing a bridge of 36 feet span across the channel in lieu of the present imperfect stone platform bridge, to keep open the communication between the villages to the north of the channel and the river. The foundations of the bridge are to be of brick-in-chunam 6 feet deep, resting on clay. A flooring of brick-in-chunam is provided 1½ feet deep, with retaining walls both in front and rear, 1½ feet thick, and 5½ feet in depth, of the same material. The abutments are to be 10½ feet thick, and raised to a uniform height of 5 feet, the versed sine of the arch to be 9 feet, giving a total height of 14 feet to the soffit. The roadway will have a clear width of 6 feet between parapets, and between the wing walls 12 feet.

3. Constructing a division sluice with two vents of 2 feet width and 4 feet height each, with an apron 7½ feet broad of rough stone-in-chunam, and rear retaining wall for the irrigation of the Keelpadagay lands, at the point where the new channel leaves the old one at D in the Sketch Map.

4. Constructing a small supply sluice of one vent 1½ feet square with cut-stone facing, at the head of the breach channel to the same land.

5. Constructing a bridge of 30 feet span on the cross road leading from Paroongolum to Mungalacoorchy, on the river bank. The foundations of the bridge are to be of brick-in-chunam 6 feet deep resting on clay, and the abutments are to be 9 feet thick, raised to a uniform height of 3 feet; the versed sine of the arch to be 7½ feet, giving a total height of 10½ feet to its soffit. Over the arch the clear width of roadway between parapets will be 15 feet, and between the wing-walls 21 feet.

6. Constructing ten small irrigating sluices, each of one vent 9 inches square, for new land to be brought under cultivation between the points marked E and D on the Sketch Map.

7. Constructing a bridge of 30 feet span, with causeway 471 feet in length, and a calingulah across the Auroomoogamungalum channel at Yerul. The foundations of the bridge are to be of brick-in-chunam 6 feet deep, resting on clay; the abutments are to be 7½ feet thick, raised to a height of 6½ feet; the versed sine of the arch to be 7½ feet, giving a total height of 14½ feet to its soffit. The roadway over the bridge is to be horizontal, as well as the approaches to it. Over the arch the clear width between parapets will be 16½ feet. The calingulah will have a body 30 feet long, 5 feet broad, and 6 feet deep in foundation, and containing three sluice vents, each 4 × 4½ feet.

8. Constructing a double dam of 150 feet, with ten surplus sluices, and flooring between, across a jungle stream falling into Auroomoogamungalum tank, at G in the sketch. On the left bank the body of the dam is 1½ feet thick, resting on foundations 4½ feet deep; on the right bank the body is 2½ feet thick, on foundations 4½ feet deep, all of brick-in-chunam; in the body of the latter there are provided ten sluice vents of 4½ feet, to let off water to the Auroomoogamungalum tank: below the right dam there is an apron 6 feet wide of rough stone-in-chunam, with rear retaining wall: the flooring between the two dams is of rough stone-in-chunam, with retaining walls at both ends.

9. Constructing a bridge of 30 feet span for the Pullayacoil Salt Pan road, and similar to that on the Mungalacoorchy Road No. 5.

10. Constructing a dam 600 feet in length, 3½ feet high, and resting on foundations 9 feet deep, with 20 under-sluices, and a double apron across the Oop Oday, a large jungle stream which crosses the line at I. in the Sketch Map. The sluice vents are each 4 feet in width, the apron below has a retaining wall of rough stone-in-chunam, and is protected by a second apron in rear also with retaining wall.

11. Constructing a sluice with 1 vent, 2 feet square, for supplying the Korumpullum tank on the right bank.

12. Constructing a head sluice 350 yards below the proposed bridge calingulah at Yerul for the supply of Coorkay tank, and of the same dimensions as that provided for the Keelpaddagay lands No. 3.

The subsidiary works required on the southern channel for irrigation, are as follow :—

1. Constructing 2 Syphon sluices, one above, and another below the small bridge to the west of Tricaloor, in lieu of the present aqueduct. The body of the sluice to be 84 feet long, 6 feet broad, and 6½ feet deep, with front and rear cisterns built of brick-in-chunam ; the vent and basins being faced with stone.

2. Constructing a bridge of 36 feet span on the west of Tricaloor in lieu of the present stone platform bridge. The foundations of the bridge are to be of brick-in-chunam 6 feet deep, resting on clay. The abutments are to be 9 feet thick, raised to a uniform height of 5 feet, the versed sine of the arch to be 9 feet, giving a total height of 14 feet to its soffit. The roadway over the bridge is to be made horizontal, as well as the approaches. Over the arch the clear width of roadway between parapets will be 6 feet, and between the wing walls, 13 feet.

3. Constructing a bridge of three arches at Tricaloor. The foundations of the bridge are to be of brick-in-chunam 6 feet deep, resting on clay. The piers are to be 6 feet thick, and the abutments 4½ feet, raised to a uniform height of 5 feet; the versed sine of the centre arch to be 9 feet, and of the side arches to be 7½ feet, giving a total height of 14 feet for the former, and 12½ feet for the latter, to their soffits. The roadway over the bridge and approaches is to be horizontal. Over the arches, the clear width of roadway between parapets will be 15 feet, and between wing walls, 24 feet.

4. Constructing a sluice in the left bank of the channel to supply the Ammenpoorum and Canam, &c., tanks. Particulars the same as those given for the sluice for supplying the Keelpadagay lands, on the Northern Channel No. 3.

5. Constructing ten sluices for irrigation in the portion of channel between Canum and Ellapanaicken tank: the length of body of each to be 30 feet, breadth 3¾ feet, and depth 3½ feet. The front and rear walls are 21 feet long, 1½ feet thick, and 7½ feet high, all of brick-in-chunam.

6. Constructing two irrigating sluices in Ellapanaickencolum, length of body to be 72 feet, and depth 3½ feet with water-way of 9 inches square. The front and rear walls to be 24 feet long, 1½ feet thick, and 7½ feet deep, to be built of brick-in-chunam. A surplus calingulah is provided for the same tank. Length of body 30 feet, breadth 4½ feet, and height 6 feet, to be built of brick-in-chunam, with an apron in rear of rough stone-in-chunam 7½ feet broad, and 3 feet deep, supported by a retaining wall 1½ feet thick, and 6 feet deep.

7. Alterations to the eastern calingulah in Cudambah tank to prevent waste of water. The flooring of the calingulah is to be raised, and 10 vents to be opened out in the body, each 4½ feet.

8. Constructing a head sluice for the branch channel to Auvoodayar ruined, tank; length of body, 15 feet, breadth 4½ feet, and depth of foundation 6 feet ; to be built of brick-in-chunam, with an apron in rear, of rough stone-in-chunam, 7½ feet broad and 3 feet deep, protected by a retaining wall 1½ feet broad and 6 feet deep.

9. Constructing an irrigating sluice and a calingulah of discharge in Auvoodayaurcolum tank, the dimensions of the sluice to be similar to those given for the Ellapanaicken tank No. 6. The calingulah will have a body 18 feet long, 4½ feet broad, and 6 feet deep in foundation, to be built of brick-in-chunam, with a rear apron 21 feet long, 6 feet broad, and 3 feet deep, of rough stone-in-chunam, supported by a retaining wall 24 feet in length, 1½ feet in breadth, and 6 feet deep.

10. Constructing two irrigating sluices and a calingulah of discharge in Shonancautvalay tank, the dimensions of the sluice being the same as those given for the Ellapanaicken tank, and the calingulah to be similar to that provided for the same tank.

(Signed) H. L. PRENDERGAST, Captain, R. E.,
Offg. Supg. Engr., 8th Division.

COURTALLUM,
15th August 1867.

Ed. T. Cartledge

Proceedings of the Madras Government, Public Works Department, 25th September 1867.

Read the following papers :—

No. 625. From the Superintending Engineer, 8th Division.
(Here enter No. 976, dated 15th August 1867.)

No. 626. Proceedings of the Madras Government in the Revenue Department, dated 11th September 1867, No. 2,143.

Read the following Proceedings of the Board of Revenue, dated 29th August 1867, No. 5,610.

Read the following letter from the Collector of Tinnevelly, to the Secretary to the Board of Revenue, dated 24th June 1867, No. 334.

1. Upwards of ten years ago Colonel Horsley proposed an anicut at Streevycuntam on the Tambrapurny and the project was pronounced well devised and feasible; the mutiny unfortunately stopped the work, and the Government have since remitted upwards of a lac of Rupees for withered crops on the very area that would have been so fertile and flourishing had the anicut been built. The Revenue lost to Government, and the profits foregone by the ryots of the villages that would have been irrigated, may, at a very low computation, be estimated at upwards of 11 lacs of Rupees; while the want of grain during the recent scarcity was more severely felt in this neighbourhood and along the sea-board to the south than anywhere else in the district.

Extract from Minutes of Consultation, No. 116, dated 25th January 1856, Public Works Department.

Calculating that 4,500 acres of irrigable waste and dry land might have been converted into single crop, that 3,000 acres of single crop might have been converted into double crop, and that each acre might have produced 20 Cullums of grain, this gives 15 lacs of Cullums of the gross produce. 15 lacs of Cullums at 12 Annas a Cullum, (or one Anna a measure for cleaned rice,) are worth 11¼ lacs of Rupees. Taking one-third as the Government share of the produce, the Government have lost 3¾ lacs, and the ryots 7½ lacs, by the non-execution of this work ten years ago.

2. There is no anicut lower than Marudur, nine miles above Streevycuntam, and 27 miles from the sea, and during both the south-west and north-east monsoons, an enormous body of water flows over the Marudur anicut, and is entirely lost to the district.

3. Comparatively speaking the Tambrapurny is a better river than the Cauvery; the freshes are far more frequent, but instead of being utilized to the last drop, as is the case in the Cauvery, there is no anicut in the Tambrapurny for the last 27 miles of its course, and millions of cubic yards of water are allowed to flow out to the sea. The people are so impressed with the advantage of the work proposed, and are so anxious that it should be sanctioned before the revision of assessment, and the registry of lands at the settlement, that they have subscribed and paid into the Treasury 20,000 Rupees as a donation towards the work, and as an inducement to Government, to accord their sanction at once.

4. We are just now peculiarly well situated for commencing a work of this sort. The fort at Palamcottah has been recently dismantled, and allowing a large margin for works in the neighbourhood, there are 25,000 cut stones that I should be only too glad to see moved. The money subscribed is sufficient to cart these to Streevycuntam, and if the Government will advance a like sum now, and accord a general sanction for the work when it has been properly budgetted for, I might

at once collect supplies and assist the Engineer greatly in getting the channels laid out. These channels will pass through a series of villages where the Pullers, a low class of laborers, enjoy "Puller Maniyam" for the performance of Maramut work; and if the channels are dug, as they must be at the dry season when the Pullers have nothing to do, each village will gladly contribute 200 or 300 men to work at much lower rates than those paid for labor during the cultivating season.

5. Cheap labor, the free gift of stone, and the free cartage of stone to the work, will save the Government at least half a lac of Rupees.

6. The Superintending Engineer is now revising the original estimate to suit the altered prices of to-day, and I am not aware of the aggregate cost proposed; but whatever the cost may be, the return will amount to about a lac of Rupees per annum, as explained in the following extract from my letter to the Engineer:—

24th April 1867, No 95.

"I have been over most of the villages likely to be affected by the Streevy-
"cuntam anicut, and have seen the enormous benefits likely to be conferred by the
"work; between Streevycuntam and the sea, a distance of twenty miles, the crops
"are now on the ground (at the end of April), and are not reaped till May, instead
"of in February, as is the case higher up the stream. The tanks from which these
"lands are irrigated receive their supply from the overflow of other tanks supplied
"from the Maradur anicut, some ten miles above Streevycuntam, and many good
"freshes come and go before the lower tanks receive a drop of water; in fact, the
"cultivating season far down the river is three months later than it need be, and
"the remissions made for failure of crops below the proposed anicut during the
"last ten years amount to upwards of a lac of Rupees. The proposed anicut will
"bring under cultivation 1,500 acres of nunjei waste assessed at 7,500 Rupees,
"will convert 3,000 acres of single crop
"land into double crop, which at 2½
"Rs. an acre represents 7,500 Rupees,
"and will irrigate 3,000 acres of dry
"land, which at 5 Rupees an acre, represents 15,000 Rupees; total 30,000.

These are the rates that would probably be imposed at the settlement; the existing rates are very much higher.

"There is, moreover, a tract of marsh extending from Kulasegaraputnam to
"Vypar, almost entirely uncultivated, but capable of growing rice crops if supplied
"with fresh water to wash out the salt.

"I have lately ridden over the whole length of this with the Inspector General
"of Police, and we both agreed that this barren tract, some forty miles in length,
"by an average of one in breadth, might be irrigated apparently with the greatest
"ease. The level is low, almost the sea level, and if the flood water that collects
"there during the monsoon had but an exit through the sand hills, this alone would
"wash out the salt. An exit is easily provided, and here are 25,000 acres that the
"people would readily take up at 3 Rupees an acre, lying waste from want of the
"water that fills the river day after day and week after week during the several
"months of the year."

7. It is not by irrigating fresh land only that the Government and the ryots will profit; the lands now poorly irrigated from the surplus of the Maradur anicut will receive an abundant supply direct; the harvest will be some months earlier, and the annual settlement may be early in proportion; the kists will be paid with

greater promptitude, and should the irrigation extend as far as proposed and bring fresh water to Tuticorin, the aspect of the country will be changed, and the condition of the people in our most important sea-port town will be very greatly improved.

Fresh water is now sold in Tuticorin at 4 pies per chatty full.

8. The enclosed plan exhibits the general direction of the channels, and the area proposed to be irrigated; but I think this area may be greatly extended, particularly if the channel from the Marudur anicut on the northern bank of the river after having passed through the Streevycuntam and Perur tanks is relieved from supplying the Sevali, Perungulam, Arumugamangalam, Inuvapapuram, and Korkei tanks as it does at present, and is taken away from Perur on a high level to irrigate the whole of the sandy waste that stretches for miles round Tuticorin. The feasibility of this can, however, only be determined by levelling, and I would suggest that an Officer be at once deputed to take the requisite levels.

Enclosure No. 1.—Sketch.

1. The Board are much obliged to Mr. Puckle for bringing forward the very important work to which he refers in the foregoing letter, and they resolve to submit the matter to Government, with their recommendation that, if possible, a grant of funds for the early prosecution of the work be sanctioned, or that, at any rate, authority be given for the expenditure of the sum subscribed by the ryots likely to benefit by the project.

2. It is quite evident that the anicut with its subsidiary channels will be a remunerative work, but the Board request Mr. Puckle to forward a rough estimate of the probable cost as soon as possible, with a statement giving the area of the dry and wet land likely to be affected by the work.

3. The liberality of the ryots in raising so large a subscription for the prosecution of the work merits the commendation of Government, and evinces their confidence in the project.

Irrigation, No. 8.

Transferr… the Department Public Works, with
the opinion of G… ment in this Department that as the
project has be… eady approved, as well devised and
feasible, and promises to be very beneficia… the people and sufficiently remunera-
tive, the equivalent of the sum subscribed … the ryots towards its execution should
be at once placed at the disposal of the … intending Engineer to enable him
to start the work, and no effort should be … ed to expedite its completion.

(True E… tict.)

(Signed) W. HUDLESTON,
Secretary to Government.

No. 627. ORDER THEREON, 2… eptember 1867, No. 2,987.

IRRIGATION, No. 30.

1. A project, estimated to cost …es 3,85,000, for the construction … anicut across the Tumbrapoorney … river in the Tinnevelly District with … ain channels, designed both for irri-
gation and navigation, to be taken f… her flank to the port of Tuticorin

on the north and Colasagarapatnum on the south respectively, and with branch channels for the supply of numerous tanks, was matured by Colonel Horsley when Civil Engineer of the 8th Division, and received the approval of Government in Extract Minutes of Consultation No. 136 of the 25th January 1856.

2. An assignment of funds was made for the commencement of the work in the year 1862, but was subsequently withdrawn as it was represented that in consequence of the long interval which had elapsed since the preparation of the estimates and the great rise which had taken place in prices, some time would be occupied in a careful re-consideration and revision of them. The re-investigation of the scheme has at length been made by Captain Prendergast, and the result is now laid before Government in the papers read at the head of these Proceedings.

3. The project, as now submitted is identical with that prepared in 1855 by Colonel Horsley, except in so far as it excludes all provision for making the main channels navigable. Its cost, however, is now estimated at Rupees 7,50,000, or nearly three times the amount* which would have been required under the former estimate for carrying out the project as one of irrigation only.

* Rupees 2,85,000.

4. The returns likely to be derived are estimated by the Collector at 30,000 Rupees from 4,500 acres of new cultivation and 3,000 acres of second crop, the former assessed at 5 Rupees, and the latter at Rupees 2-8-0, to which is added Rupees 10,000 by savings on remissions, giving a total return on 7½ lacs of 5½ per cent., not deducting anything for maintenance or repairs. If the channels be extended at an additional cost of a lac of Rupees, the Collector considers that the returns may be increased by Rupees 75,000 from the cultivation of some 25,000 acres of waste land situated in large tracts of salt swamp, which it is believed may be drained, and after thorough irrigation by fresh water, may be made capable of producing crops. In the latter case, taking the expenditure at 8½ lacs and supposing the salt swamps culturable and that the Manikcherry Zemindar uses the water, the returns may be raised to Rupees 1,23,100 or nearly 14½ per cent. even from the low munjah assessment proposed by the Collector.

5. The project is further stated to recommend itself as one which will be the means of introducing into the town of Cuddalore a supply of fresh water, the want of which is now felt throughout the year; and the people are reported to be so impressed with the advantages of the undertaking that they have subscribed and paid into the Treasury 20,000 Rupees as a donation towards its cost.

6. On the grounds thus urged Government are satisfied that the scheme will be highly beneficial; but as it is incomplete in its present form, they resolve to return it to the Superintending Engineer for re-submission with the estimates framed to provide for the necessary extension of the channels and all requisite works to give the fullest possible development to irrigation from the Tandrapoorney. In the meanwhile, as there can be no doubt of the propriety of making a commencement of the work, the Governor in Council authorizes the appropriation of the amount subscribed towards removing the stone of the dismantled fort at Palamcottah to the site of the proposed cut.

Proceedings of the Ma

7. The amended proje
Board of Revenue, wh

• See orders of Se
16th June 1863,
partment.

and if so, to what e

ublic Works Department.

67.

or should be submitted through the
ng it to Government, report whether
se work in question is not one to which
he principle• of charging a separate
ater-rate in addition to the land assess-
ment, may with propriety be applied,
scheme will probably be affected.

(Extract.)

Major, R. E.,
etary to Government.

To the Superintending Engineer, 8th Divisi
" Board of Revenue.
" Revenue Department.
" Controller of Public Works Account
" Accountant General.