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Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
11th September 1867.*

Read the following papers:—

No. 244. From W. FRASER, Esq., C. E., Executive Engineer.

Submitting his Report on the project for en- } (Here enter 17th April 1867, No. 14.)
larging Chembrumbakum tank.

No. 245. Proceedings of the Board of Revenue.

(Here enter 20th August 1867, No. 5,380.)

No. 246. ORDER THEREON, 11th September 1867, No. 2,797.

IRRIGATION, No. 7.

1. The Chembrumbakam tank, situated about seventeen miles south west of Madras, is one of the finest irrigation works of the Carnatic, being formed by an embankment 7,100 yards in length connecting high ground on one side with a rocky spur on the other, and creating thereby a reservoir covering when full an area of nearly seven square-miles, and commanding for irrigation the lands of eighty-six villages capable of wet cultivation to the extent of 14,570 acres.

	Acres.
Within the Ayacut	11,378
Outside the Ayacut	3,192
	14,570

2. The tank is provided with ample waste water outlets in six calingulabs, aggregating 643½ feet in length, and is furnished with eleven irrigating sluices. It is, however, incapable of containing in its present state sufficient water for the irrigation of much more than half its Nunjah Ayacut, and, in consequence, the revenue derived from it has averaged, at the low rate of assessment now charged, only Rupees 21,725 during the past fourteen years, instead of Rupees 63,842 which it would have yielded had it been possible to store in it sufficient water. This defect seems to have induced Colonel Lawford in 1857-58 to recommend its enlargement, but no details of his proposals can be found on record, and the scheme now submitted by Mr. Fraser appears to have been suggested by the necessity of providing the means of supplying from some artificial source or another water to the high level Junction Canal, which he has for some years past been projecting, to connect Cochrane's Canal on the north with the Sadras Canal on the south of the Presidency.

3. The Chembrumbakam tank is well situated for this purpose, being on such a level as to have full command of the whole of Madras, and after the requirements of irrigation to the whole available land under the tank are fully supplied by its enlargement, there will probably be a sufficient surplus to keep the Junction Canal full if, instead of being made a tidal canal, it be carried out as a high level fresh water canal.

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11th September 1867.

4. The scheme therefore comes before Government as a very beneficial and remunerative undertaking. It consists of—

Raising the bund sufficiently to enable the tank to retain five yards additional depth of water	Rs. 2,41,286
Constructing a new calingulah 700 feet in length and removing the present six calingulahs	13,889
Alteration of present sluices and construction of two additional sluices	8,517
Raising portion of Trunk Road No. 1 at the west end of tank	15,768
Compensation for lands	58,851
Contingencies and Sundries	14,124
	<u>3,55,435</u>

5. For this expenditure of Rupees 3,55,435, which includes a large sum for the payment of compensation for lands to be submerged, Mr. Fraser calculates upon increasing the capacity of the tank from 55,605,462 cubic yards, which it now holds when full to the crest of the calingulah, to 196,873,925 cubic yards. Thus 141 million cubic yards of water would be stored in addition to the quantity now retained, and estimating the value of water so stored on the usually accepted data of 9,000 cubic yards being sufficient for the irrigation of a Cawny of rice land, he shows that the proposed outlay ought to yield a return of Rupees 78,330 at the low charge as water rate of Rupees 5 per Cawny or Rupees 3-12-6 per acre. This may very fairly be taken as the real value of the additional water to be stored, and Mr. Fraser shows that nearly that amount will be obtained by the complete irrigation for two crops of the total wet lands under the fifty-eight villages contained in the Ayacut of the tank and under the twenty-eight villages outside of that Ayacut, but possessing land so situated as to be readily irrigated from the tank.

6. The Collector, however, taking some exception to the rate of 5 Rupees per Cawny assumed by Mr. Fraser as the rate to be paid for water, shows, in accordance with the actual results of irrigation which at present exists under the tank, that the probable increase of revenue which will be derived in consequence of the storage of a large additional quantity of water will be 62,705 Rupees, as compared with the revenue collected in the year 1865-66, (which was rather a good year) or Rupees 66,887 as contrasted with the average collections of the last five years, or Rupees 63,982 on the average of the past fourteen years.

7. These estimates by the Revenue Officers are sufficient to confirm Mr. Fraser's calculations of the favorable financial results to be expected from the enlargement of the tank, and the Government have little doubt that the work will be remunerative.

8. The Government have no reason to believe that the means of fully supplying the tank will be wanting. It is described as so situated as necessarily to receive the surplus drainage of a tract of country of itself sufficiently extensive to yield a full supply of water in all ordinary years, and the tank is now not only connected with the Cortilliar, but has lately been brought under the influence of the Palar anicut by means of the Kumbum kal channel. The dam across the Cortilliar to

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divert water into the Bungairoo channel which flows towards Chembrumbakam, has lately been renewed and strengthened, the head of the channel has been improved, and operations are in progress for removing obstructions in it. The supply of the tank from this source will therefore be improved and increased, and by the contemplated raising of the Koratoor anicut, it will be greatly perfected. On the other hand the supply from the Palar will year by year be in the same manner augmented in consequence of the improvement of the channels taking off from the anicut across that river, and is practically capable of any requisite expansion.

9. Viewed then from all points, the project is one which, in the opinion of Government, it is very desirable to carry out as speedily as possible, and they accordingly resolve to submit Mr. Fraser's project for the sanction of the Government of India, and, in anticipation of its approval, to direct the entry of an appropriation in the outgoing Budget to admit of the commencement of the work next year.

(Here enter No. 2,798, dated 11th September 1867.)

(True Extract.)

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

To the Superintending Engineer, 4th Division.
,, Board of Revenue.
,, Revenue Department.
To W. Fraser, Esq., C. E.
To the Controller of Public Works Accounts.
,, Accountant General.

Ed. S. T. Augustin.

No. 2,798.

No. 247.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
PUBLIC WORKS DEPARTMENT.

SIR,

IRRIGATION, No. 8.

1. I am directed to forward herewith a project prepared by Mr. Fraser, Executive Engineer, for the enlarge-

ment of the Chembrumbakum tank which is situated about seventeen miles southwest of Madras. This tank is admittedly one of the finest in the Madras Presidency, being formed by an embankment 7,100 yards in length connecting high ground on one side with a rocky spur on the other, and being well situated to receive a good supply of water in all ordinary years. As, however, in its present condition, it does not hold sufficient water for much more than half the area of the land which is suitably situated for irrigation by it and included in its Nunjah Ayacut, the expediency of its enlargement has long engaged attention, but no definite proposals can be traced till notice was attracted to the scheme as a means of affording a supply of water to Madras. On another source, however, being selected for that supply, Mr. Fraser was entrusted with the investigation of the Chembrumbakum tank enlargement as an irrigational project, on his completing the scheme known as the Madras Water Supply project for bringing water into Madras from tank.

2. Mr. Fraser's scheme embraces the following works:—

	RS.
Raising the bund sufficiently to enable the tank to retain 5 yards additional depth of water	2,44,286
Constructing a new calingulah 700 feet in length and removing the present six calingulahs	13,889
Alteration of present sluices and construction of two additional sluices	8,517
Raising portion of Trunk Road No. 1 at the west end of tank	15,768
Compensation for lands	58,851
Contingencies and Sundries	14,124
	3,55,435

with this outlay it is proposed to increase the capacity of the tank to 196 million cubic yards, or to 141 million cubic yards in excess of the quantity which is now stored when the tank is full to the crest of the calingulah; and, estimating the value of water so stored on the generally accepted data of 9,000 cubic yards being sufficient for the irrigation of a Cawny (or 132 acre) of rice land, Mr. Fraser shows that the proposed outlay ought to yield a return of 78,330 Rupees, or nearly that sum at the low water rate of Rupees 5 per Cawny or Rupees 3-12-6 per acre, if the total wet lands under the 58 villages comprised in the Ayacut of the tank and under the 28 villages outside of that Ayacut, but containing land capable of being watered from the same source, be completely irrigated for two crops.

3. While acquiescing in the correctness of the particulars given by Mr. Fraser of the area of land under cultivation, the Collector takes some exception to

the uniform rate of Rupees 3-12-6 per acre assumed by that Officer as the rate to be paid for water. Mr. Fraser estimates the return as follows :—

<i>Ayacut land.</i>	
First crop on 4,257 cawnies, or 5,629 acres, at Rs. 5 per cawny, or Rupees 3-12-6 per acre.	Rs. 21,235
Second crop on 8,604 cawnies, or 11,378 acres, at Rs. 3 per cawny, or Rs. 2-4-4 per acre	25,812
	<u>47,037</u>
<i>Land outside the Ayacut.</i>	
First crop on 2,414 cawnies, or 3,192 acres, at Rs. 5 per cawny, or Rupees 3-12-6 per acre	12,070
Second crop on 4,615 cawnies, or 6,102 acres, at Rs. 3 per cawny, or Rs. 2-4-4 per acre	13,845
	<u>25,915</u>

73,011 = 20½ per cent. on estimate.

The Collector, basing his calculations on the actual results of the irrigation which at present exists under the tank, shows that the probable increase will be—
Rupees 62,705 or 18 per cent. on the proposed outlay as compared with the revenue collected in 1865-66.

" 66,837 or 19 per cent. on do. as contrasted with the average collections of the last five years.

" 63,932 or 18 per cent. on do. on the average of the past 14 years.

4. These various estimates of the returns likely to be derived do not materially affect the remunerative aspect of the proposed work, as the lowest will give a per-centage on the outlay sufficient to make the project highly reproductive.

5. The tank is so situated as to receive a large proportion of the surplus rain-fall of a considerable tract of country, and, lying between the two rivers Adyar and Cortilliar much waste water passes into it from numerous tanks which are supplied from those rivers. It is also directly connected with a channel taking off from an anicut across the Cortilliar near Kasaveram, and on the other hand it is directly in communication with the Palar by means of the anicut across that river near Arcot through the Kumbum kal channel, which, being enlarged and improved, will year by year afford a more full and certain supply. Measures are in progress for improving and perfecting the means of supply on the side of the Cortilliar by clearing and enlarging the Bungairoo channel and adding to the height of the Koratoor dam, and there is no reason to doubt that any quantity of water that the Chembrambakam tank may be rendered capable of storing will be available.

6. I am accordingly to request that the project, as designed by Mr. Fraser, may meet with the favorable consideration of the Government of India and that sanction may be accorded to it.

I have the honor to be,
Sir,

Your most obedient servant,

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

Ed. S. T. Augustin.

Read the following letter from W. FRASER, Esq., C. E., Executive Engineer, to the Secretary to Government, Public Works Department, dated Mount Road, Madras, 17th April 1867, No. 14 :—

1. I have the honour to forward the Plans and Report of the project for enlarging Chembrambakkam tank.

I was informed yesterday that I should have the Rain Table that afternoon, and I considered it better to wait for it. It was received too late to be copied until this morning.

2. The detailed Estimate and general Specification will be sent up in a few days.

3. Trusting that the Report will be found satisfactory.

REPORT ON THE PROPOSED ENLARGEMENT OF CHEMBRAMBAKKAM TANK.

By WILLIAM FRASER, Esq., C. E.

1. With this Report twenty-three sheets of plans are forwarded, as follows :—

Description of Plans.

SHEET No. 1.—Index Map showing the country with the rivers, tanks, channels, &c., between the Poiny river (a tributary of the Palar) and Madras. This map has been compiled from the old Military Survey and such other maps as I could procure, for the purpose of showing, at a glance, how Chembrambakkam and other tanks, the improvement of which will form the subject of another Report, are supplied with water, and how they are connected with, and dependent upon, each other, so that the Government may, without difficulty, form an opinion on the entire question of the improvement of these tanks, channels, &c.

The Madras Water Works, now under execution, are drawn in red on this map; as also the position of the proposed Mount tank, the old Pammal tank, the proposed Junction canal, &c.

I have to request that this map may be returned when the Government have examined it, as I shall have to refer to it when I send in a report on the enlargement of Streepermatu and other tanks.

SHEET No. 2.—Contour map of Chembrambakkam tank.—The red contour line on this map shows the form and extent of the natural basin at the level of the present calingulah. The red contour, shaded blue, is at the level of the top of the dam stones, to which height the Merassidars can raise the water whenever the rain-fall is sufficient. All the contour lines are one yard apart in height, and the fifth one from the present calingulah, shaded red, is at the level of the proposed calingulah; and this line shows the form and extent the tank will have when the water stands at that height.

This line also shows how the villages lands—cultivated and waste—roads, &c., will be affected by the proposed enlargement. During very heavy and sudden rains the water may rise higher than this line, but provision will be made for preventing it ever rising more than a foot or two.

On this map the proposed extension of the bund at the north and south ends is shown in red.

SHEET No. 3.—Longitudinal Section of the present bund.—On this plan the section of the top of the present bund is shown; as also that of the land along the foot of the slopes inside and outside of the tank. The blue line along the section shows the height of the present calingulah, and the red lines show, respectively, the height of the proposed calingulah, top of proposed bund, and the top of the proposed parapet.

At sluice No. 5, the Merassidars have certain marks to show when the tank contains three, six, nine, or twelve months' supply of water. The heights of those marks are shown on this section.

The datum line drawn upon this section is seventy feet above my general datum, which is twenty feet below mean sea level, as marked by Colonel DeHavilland, R. E., upon the north wall of the fort; so that by adding fifty feet to the heights figured upon the section, the height of any of these points above mean sea level can be ascertained. The same datum is used for all the sections.

SHEETS 1 to 9 contain twenty-four cross sections of the tank bund, showing its present height and shape, and, in red, the manner in which it is proposed to be enlarged.

SHEETS 10 to 21.—Plans of the present eleven sluices, showing how they are proposed to be altered.

SHEET 22.—Plans of the proposed calingulah.

SHEET 23.—Sections showing how Trunk Road No. 1 to Bangalore is proposed to be raised where it crosses the west end of the tank.

History of the Tank.

2. Chembrambakkam tank lies about sixteen miles S. W. by W. from Madras. There is no record of its construction; indeed, it is so very old that there is scarcely even a tradition of its origin. Upon four of the sluices there are Tamil inscriptions, three of those are not more than forty-four years old; the fourth is only partially visible, but it is evidently not of a very ancient date.

Breach in 1818.

3. I have not been able to obtain any record of this tank older than January 1818, on the 3rd of which month a most serious breach occurred in the bund at Manapakkam sluice, when the tank was quite full. This sluice is figured No. 6 on the map and longitudinal section.

The Collector of that time, Mr. W. Cooke, in reporting the circumstance to the Board of Revenue on the 8th idem, says, "This tank has been repeatedly filled this year, and after sufficient water had run off, the calingulahs were shut, retaining the usual supply of water in the tank. This has occurred several times during the season."

"3. The last time it was found requisite to re-open the calingulahs was on the 27th ultimo, and they were again closed when the mamul quantity of water only remained."

He then goes on to state that the persons watching the tank during the morning saw the water coming through Manapakkam sluice. They immediately proceeded to report the circumstance and obtain assistance, but before their return the bank had given way. The Collector is at a loss to account for this accident, as the tank had been repeatedly filled during the season without the appearance of any defect.

It appears, however, that twelve or fourteen years previously this sluice had sunk, and was repaired by Colonel Caldwell, and it was supposed that there remained some defect in the foundations.

4. On the 10th February 1818, Major DeHavilland, R. E., then Inspector of Tank Estimates, was directed to report, which he did on the 16th of April.

"Paragraph 6. The breach which was made in its bank on the 3rd January last is tremendous; indeed, not less than 218 feet in extent, and excavated about fifteen feet below the natural level of the ground." He attributes the accident to the undermining of the foundation by the water giving admission to a small quantity at first, until "At length both sluice and bank tumbling in, every impediment to the rush of a terrible torrent was soon removed; and the flood, which thence made its way to the Adyar river, carrying destruction before it for some days, was so powerful as to remove large stones, blocks of masonry, trees, &c., to a very considerable distance."

5. Major DeHavilland prepared plans and estimates for the re-construction of this sluice, and also for the alteration and strengthening of the other sluices, as he considered that they were all faulty in construction, by their heads being run out so far into the tank and away from the bund, by which he considered the water more easily made its way between the earth of the bund and the masonry of the sluices. The estimated cost of all these works was Rupees 30,817-3-1, but the expenditure, as we learn from a letter of Mr. C. D. Campbell, Secretary to the Board of Revenue, dated 25th November 1819, was only Rupees 24,979-13-2.

Great storm on the 24th October 1818.

6. From a report by Lieutenant-General D. Sim, R. E., Civil Engineer Central Division, we learn that the works were still incomplete when they had to resist—

"The effects of the terrible storm which visited us on the 24th of October 1818, when very many tanks of long standing in the Jaghire were unable to withstand the shock; but our unceasing attention and solicitude in the prosecution of the work has been fully rewarded."*

"Paragraph 5. I will give your Board an idea of the rapidity of the influx of water into the reservoir on the awful day of this visitation, to state that at 7 o'clock in the morning, when it began, the water was at two months' mark; and that at 3 in the afternoon of the same day a messenger was dispatched thence in haste to inform me that it had reached above the ten months' mark: measures were immediately taken by cutting the ends of the banks for their relief."

7. The height of these two water marks will be seen upon the longitudinal section of the bund. I find, by calculating from the contoured map, that the quantity of water which flowed into the tank in the eight hours given above was 48 millions of cubic yards, or six millions of cubic yards an hour.

8. Through the courtesy of Mr. Pogson I have been enabled to examine the daily rain register of that period, and I find that when the breach took place on the 3rd of January, it could not have arisen from any sudden accession to the quantity of water in the tank, for although 19 inches of rain fell in October, and over 24 inches in November, but 6½ inches fell in December. In this month there was no rain from the 17th to the 21st; 2½ inches fell between the 22nd and 26th, and none at all from that date to the end of the month. There was no rain in 1818 until the month of April, so that the breach must have occurred from the foundations of the sluice having gradually succumbed to the pressure of the water, which shows how carefully the sluices of large tanks should be watched.

There has been no breach in the bund of this tank since 1818.

Rain-fall since 1803.

9. I have considered that it would be useful to place on record, for the purpose of easy reference hereafter, the half monthly rain-fall at Madras from the earliest period it has been registered. For this purpose Mr. Pogson has kindly permitted me to include in my report the following table:—

* Mr J Goldingham, Astronomer and F. R. S., who had then charge of the Observatory at Madras, gives the following description of this storm.—On the 24th of October 1818, a second violent storm occurred at Madras, the moon had passed the last quarter about two days, and was at nearly her greatest distance from the earth. The wind, which was a strong northerly gale early in the morning, before 10 in the forenoon, had increased to a storm. An awful pause of half an hour occurred about this time, after which it blew a complete hurricane from the south, with a fury never perhaps before experienced at Madras, some of the oldest trees, which had resisted the former storm, were rooted up, and the largest branches of others were torn off by the force of the wind. In some trees of a tough description of wood, such branches were seen hanging down and twisted, having been whirled round and round by the fury of the storm. Such a scene of desolation was presented as had hardly been witnessed here. Numbers of native habitations were levelled, many of the large buildings injured, and some lives lost. Several ships and brigs were at anchor in the Roads; all these got under weigh, but the latter was driven on shore, and one of the ships foundered, another was driven on shore to the northward, and a third rendered not sea-worthy, while the others generally sustained great damage. The fall of rain was about 5 inches. The Barometer had fallen between 8 o'clock P. M. of the 23rd and daylight of the 24th nearly three-tenths of an inch, standing at about 29.5; but during the awful lull at 10 A. M. it was at 28.780 inches—a most extraordinary and terrific depression, such as I never before heard of at this place. Towards noon it had risen about half an inch, and at sunset was at 29.65 inches.

Rain-fall at *M. tras*

	January.		February.		March.		April.		May.		June.	
1803	...	...	...	...	...	...	...	...	...	...	1.73	0.16
4	...	...	1.05	...	...	...	...	...	...	...	0.65	0.34
5	2.35	0.03	...	...	...	0.03	...	...	...	...	0.55	0.85
6	...	0.43	...	...	...	...	...	...	0.34	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	0.05	...	...	0.07	...	...	1.70	...	...
14	...	0.08	...	...	4.68	...	0.15	...	16.38	...	0.56	...
15	...	1.64	...	...	0.13	...	...	...	0.12	0.18	2.10	0.60
16	0.10	...	...	...	...	...	...	...	...	...	...	...
17	0.35	...	0.73	...	...	...	...	...	...	...	...	0.45
18	...	...	...	...	...	...	...	...	0.20	...	0.11	0.05
19	...	...	...	...	...	...	...	...	0.20	...	...	0.74
20	...	...	...	...	...	0.60	...	...	...	...	0.13	...
21	3.55	0.05	...	...	...	...	2.55	...	...	...	0.55	0.30
22	2.30	...	...	...	0.32	0.75	0.50	17.17	...	...	...	1.10
23	1.45	...	...	...	...	...	...	...	...	...	...	1.37
24	0.17	1.10	...	...	0.92	...	0.62	...	...	...	0.40	2.05
25	0.17	...	...	...	...	...	...	0.27	...	...	0.30	0.15
26	...	...	...	...	...	...	...	0.05	0.30	...	1.02	0.48
27	8.58	0.02	...	...	...	...	...	4.25	4.07	3.70	...	...
28	0.82	0.80	0.07	...	...	...	...	1.05	0.73	2.29	...	...
29	...	...	...	...	...	...	...	...	...	...	0.05	0.08
30	...	0.27	3.06	0.10	...	4.36	0.70	0.02	...	0.40	0.01	2.74
31	...	...	...	...	0.14	0.89	0.05	...	1.42	0.24	0.26	2.63
32	...	0.04	...	...	0.17	0.06	...	0.31	0.05	...	...	1.62
33	0.18	...	...	0.10	...	...	...	0.94	...	...	2.28	0.51
34	0.06	...	...	...	...	...	...	0.63	...	...	...	0.57
35	...	...	...	...	...	...	...	...	0.33	0.89	...	1.81
36	...	0.06	...	...	...	...	3.65	...	0.20	0.62	...	0.47
37	...	...	0.32	...	...	...	...	...	1.75	0.39	...	0.38
38	...	...	...	...	...	...	...	...	...	0.12	...	0.18
39	0.09	3.25	1.33	...	0.59	...	1.53	0.70	...	2.56	...	0.71
40	...	...	...	...	...	...	...	0.77	...	0.54	0.17	0.13
41	1.99	...	...	...	...	...	0.58	1.04	...	0.69	2.45	0.25
42	1.74	...	...	...	...	...	...	0.03	...	0.23	0.23	2.40
43	1.82	4.68	...	...	...	...	...	0.47	0.27	4.30	1.57	0.98
44	0.21	0.55	0.02	...	...	0.28	...	...	0.34	...	0.43	0.06
45	1.64	...	0.52	...	0.74	...	0.04	...	0.05	14.06	1.84	2.72
46	2.94	...	...	...	...	...	...	1.00	1.66	0.01	0.01	0.92
47	...	...	...	0.23	0.02	...	...	0.04	1.04	1.31	1.54	...
48	...	...	...	...	...	...	...	...	1.34	0.54	2.65	...
49	2.50	...	...	...	...	...	...	0.45	0.73	1.14	0.77	...
50	...	...	...	...	...	...	1.16	5.22	...	0.10	1.09	0.90
51	...	0.04	4.27	...	...	...	...	1.12	...	0.04	3.00	1.84
52	...	...	...	...	...	...	0.98	...	...	2.94	1.08	1.13
53	0.15	2.10	...	...	...	...	...	...	18.45	0.15	0.13	1.45
54	0.42	...	...	...	2.62	...	...	...	2.21	0.01	0.44	0.57
55	0.74	0.20	0.30	...	3.37	0.77	...	...	...	0.05	0.05	0.72
56	...	...	...	0.68	0.09	...	...	...	...	0.43	0.29	0.83
57	0.32	...	...	0.03	0.26	...	...	0.07	...	0.29	0.10	0.72
58	...	...	...	...	...	...	...	0.01	1.59	3.92	2.31	0.62
59	0.62	...	0.02	...	0.10	...	...	0.12	...	0.07	0.32	1.31
60	...	...	...	...	...	...	0.83	1.99	1.04	1.73	0.78	...
61	...	...	...	...	...	0.28	4.64	0.11	0.74	0.63	1.12	...
62	0.38	0.11	...	0.16	0.88	...	...	...	1.28	0.14	0.52	...
63	...	1.95	...	...	0.01	...	...	...	0.60	0.42	3.25	...
64	...	...	...	...	0.67	...	...	...	0.12	0.46	0.61	...
65	0.20	...	...	...	...	...	0.05	...	0.23	0.03	1.78	0.17
66	...	...	...	...	...	...	0.02	0.09	0.29	0.33	1.29	...
Means.	0.60	0.29	0.20	0.02	0.14	0.34	0.25	0.43	1.43	0.83	0.70	0.95

Observatory for sixty years.

July.		August.		September.		October		November		December.		Annual
0 24	1·46	0 21	0 62	3 74	3 95	1 04	10 55	7 63	22 79	0 37	11·60	66 09
0·37	0 38	0·85	2 32	0 91	0·61	3 59	8 82	4 52	1 41	5 26	...	31·11
1 91	0 75	1 09	2 31	1·28	2·14	4 15	2 31	4 84	1 32	2 19	2 80	31 21
2·70	0 65	14·10	0 18	1·55	...	23 70	7 20	...	7 30	2 70	1 00	61·51
0·12	1 34	...	1 05	...	2 28	3·02	1 48	...	...	14 25	0·30	25 65
...	0·31	1·03	...	0 51	0·73	1 62	2 10	10 30	0 42	0 58	0 25	39 67
0 08	1·20	0·35	0·48	2 32	...	3·10	2 03	16 60	14 00	3·36	0·62	47 27
...	1·59	3 76	1·15	2·42	6·07	3·05	4 05	0 97	5 75	1 64	2 07	32 60
5 17	1·30	0 27	0·53	0·90	2 00	0 24	6 02	9 30	23 88	...	4 80	56 05
1·57	3 50	3 38	1·83	3·70	5 35	1 15	5 43	9 60	2 72	1 45	...	41 16
1·45	0·15	0 55	2 92	1·60	6·07	2 18	17·34	12 25	12 08	2 40	3 85	63 55
1·95	9 80	0·98	5·47	2·52	2·87	6·24	11·64	11 56	14 06	6 50	1 27	76 20
3 28	...	0·71	0·39	13·19	1·70	1·10	1 90	10 42	0 25	0·71	...	36 33
0·74	2·68	1·87	1·07	0 60	1·10	...	11 84	0 67	3 52	5·42	7 00	61 78
0·18	1 02	2 33	0·85	6·72	0·58	0 68	7 85	10 40	0 95	0 75	3 60	42 63
0 25	0·30	2·10	4 60	2·35	0 08	10 20	10·37	10 45	10 95	2 50	0 77	59 61
0·30	2 57	0·15	3 00	3·87	0·53	2 75	7·65	0 80	0 10	...	0·20	26 61
0 03	0·22	1·95	0 70	0·32	0·15	8 10	6·25	4 60	5·67	0 13	3 82	33·71
0·60	2·47	1·20	6·47	1·07	2·43	1·95	15 52	11 08	0 03	4·92	2 43	56 09
0 95	1·15	0 90	6 72	2·07	0·25	0 20	0 62	17·29	8 75	5 23	5 82	58 77
1·65	3 25	0 38	1·90	3·50	0·94	1 12	12 59	7·74	14 38	5·76	0 22	88 42
1·85	1·52	5·59	1 71	4·72	1·00	8 32	0 88	1·79	0 82	0 29	2 17	37 89
1·29	0·48	1 10	1·84	1·06	1 93	5·75	0 40	4 28	4 71	5 37	0 12	36 87
4·15	3 05	0 55	2 18	2 70	1·57	1 24	4 98	0 17	3 70	1·45	3 00	32 43
1 28	1·85	1 60	7·90	4·89	2·31	3 12	6 23	0 24	7 69	0 68	1 51	44 35
0 66	0 89	1·57	0 69	2 23	5·48	1 27	4·01	0 07	0 34	...	...	18 45
0 40	0·77	0·17	6·94	2·42	1 52	2 88	6 81	8 31	1 66	0 21	3 06	37·12
4 05	3 03	0 28	3 82	4 70	0·17	5 34	1 70	1·31	6 65	1 31	0 30	39 00
2·43	2 88	0 75	2·26	2 17	1 09	6·56	3 12	6 58	4 38	1·33	0·24	40 06
2 11	2 49	5·46	3 54	0 29	0 65	...	8 51	1 05	17·59	0 84	1·18	44 68
0 58	2 07	1·28	0·41	1·55	2 25	0 37	15·42	14 02	3 15	2·82	0·37	49·26
1·58	0 79	2 94	1·75	...	8·78	1·06	5·21	21 54	0 35	4 22	...	52 33
1 95	2 66	3·08	3·75	10 10	1 04	...	0·99	21·11	0 16	...	...	53 07
0 50	3·93	1 03	6 79	5 87	2 49	0 69	9·47	26 72	0 53	...	0 12	58 65
1·05	0 39	1·93	6 73	3 68	1·33	12·34	12·39	5 08	1 20	0·17	1 06	58 35
1·35	1 94	0 99	2·13	1·67	3·93	0 34	7 57	11 41	1 19	0 03	0 16	36 48
0 07	1 30	0 81	1·42	0 75	3·45	4 15	2 16	5 27	...	7 10	0·49	50·28
0·81	2 56	1 23	1·49	3 86	8 65	10·75	3 14	2 38	1 01	6 33	16 48	65·36
0 99	1 91	1·69	0 26	2 15	1·90	3·01	0 29	1 12	3 79	5 69	9 41	37 65
7 34	1·78	4 47	0·21	0 86	0 06	2 51	28 08	1 04	18 35	3 60	3 30	78 19
0 97	2·12	6·12	3 59	0 47	5·40	5 48	10 84	13 42	5 24	20 51	1 64	80 99
1·24	2·63	3 42	1·71	0 56	2 53	4 16	9 77	7 14	10 15	3 11	...	54 76
1 05	2·53	2 85	2 04	1 48	0 17	9 18	0 01	1 44	4 70	0 09	6 71	39 81
0·24	1·29	1·36	1·70	2·89	0 15	1 95	2 37	4 31	3·81	5·47	0 19	36 88
3 67	2 83	2 90	1·44	0 33	1·36	5 06	0 57	19 57	5 28	1 39	0 06	64·32
2 04	5 96	0 86	1·40	6·49	0 29	9 40	11 20	10 59	8·81	5 78	3·14	72·69
3 64	0 50	1 27	0 11	1·57	0 66	0 35	8 72	11 88	0 11	...	...	35·82
2 46	1 84	6 16	0·89	4·80	1 57	0 32	9·90	3 28	6 00	1 83	2·19	43 20
0 40	2 29	0·55	1·10	2 36	1 39	6 60	4 01	0 92	0 55	7 10	1·98	32 32
1·20	2 12	0 50	5 18	0·51	0 55	2 39	1·49	2 92	14 05	9 70	0 01	46 99
0·81	1·58	0 55	0 37	0 29	1 26	10 20	27·53	4 61	1 21	0 56	0 44	52 95
2 08	1·00	1·64	0·47	2 82	0·79	10·12	1 95	13 89	8 23	...	...	48 50
6 85	1 19	1·03	1 43	3 32	5 24	2 11	5 61	4 25	15 21	...	...	55·14
0 34	1·73	0·53	1·94	1·79	3 18	2 71	11·36	0 86	1 22	0·03	0·20	27 64
2 19	0 99	4·33	3 55	2·51	6·74	0 02	1·52	12 32	...	0 04	...	37·19
4·23	0 30	3 82	0·74	0 84	2 76	1·43	6·77	1 59	3 93	4 69	2 31	38 18
6 30	0·77	1 75	1 39	1 83	1 21	5·31	11 78	...	2 03	13 34	0·04	54 61
1·16	1·04	3·93	3 39	0·46	0 37	0 97	12·79	2 37	16·11	1·59	6·84	47·23
1 42	0 60	3 65	3·54	0 27	1·01	0 64	5·18	3 01	14·75	5·57	...	41 86
0 25	1·22	0 89	3 28	1 48	0 99	6 19	2·51	3 33	8 60	20 54	1 26	51 39
1·75	1·78	2 05	2 33	2 46	2 12	3 89	7 01	6 94	5 96	3 48	1·94	47·82

Reasons for making the enquiry.

10. I have been enabled to give this sketch of so much of the history of Chembrambakkam tank through the kindness of the Acting Collector, Mr. Cockerell, who had the old records of his Office examined for the purpose. I was induced to seek this information, because in proposing to increase the head of water in the tank by 15 feet, a very important question arises as to whether the foundations of the sluices are sufficiently sound to bear the additional pressure. I had heard, when making inquiry on the ground, that the heads of all the sluices had been reconstructed according to plans prepared by Colonel DeHavilland and under his superintendence, and it is satisfactory to know, from the records of the period, that they were re-constructed by so skilful, cautious, and careful an Engineer as he was. Had I discovered that this was not the case, I should have hesitated to build the necessary additions upon the old work.

11. There are only ten sluices included in Colonel DeHavilland's estimate. The eleventh one was probably constructed since his time. On inspecting it I decided on re-constructing its head, as also that of the tenth sluice.

In April 1820 the foundations of the Chetty sluice, No. 10, showed signs of weakness, but from a report of Lieutenant-General Sim, who was then Civil Engineer of the Central Division, I am led to believe they were carefully repaired under his superintendence.

Former proposition for enlarging the tank.

12. I had supposed that several propositions had been made, from time to time, for the enlargement of the Chembrambakkam tank, but the only one of which I can get any record was made by Colonel Lawford, R. E., towards the end of 1857 or the beginning of 1858. I have been unable to procure Colonel Lawford's report, but this is of the less importance, as I find from a letter of Mr. C. J. Shubrick, then the Collector of the Madras District, (No. 162, dated 14th June 1858,) written in opposition to the scheme, that Colonel Lawford proposed to increase the quantity of water in the tank by 20 millions of cubic yards,* but that no surveys had ever been made and no plans prepared.

Description of tank.

13. Chembrambakkam tank is so well known that I need not occupy much space in describing it. The bund, which is about 7,100 yards, or four miles and sixty yards, in length, runs for the most part in a nearly north and south direction; the north end resting upon the high ground which lies on the south side of the Bangalore road, and about three miles west of Poonamallee; and the south end running out upon a ridge of gneiss rock near Sirrukallattur, on the old road to Bangalore.

The extreme west end of the tank is crossed by the present Bangalore road between the 19th and 20th miles.

14. The greater part of the land around the tank and in the bed is waste. Close around the margin of the present limits there are twelve or thirteen small tanks, and under these small patches of land, mostly in the bed of the tank, are irrigated. See the map, sheet No. 2, upon which these tanks and lands are shown. When the main tank is full the greater part of those lands is swamped, but as the water recedes, the Merassidars extend the cultivation.

All the cultivated land within the limits of the proposed extension will, of course, be under water when the tank is filled to the proposed height, and must be purchased; but it will not cease to be available for cultivation.

* In another place the additional quantity is stated to be 74 millions.

The small tanks will still be filled either as they are now, or, independently of local rains, by being submerged in the main tank; and, as the water recedes, the land can be cultivated as it is at present. The crops, however, may not be so valuable as they are now, as they will probably be produced later in the season. For this reason, that the lands will still be available either for cultivation or grazing, the amount of damage done by enlarging a tank is not so great as it is generally supposed to be.

Present supply.

15. Besides receiving the rain-fall from the laterite hills which nearly encompass it on three sides, Chembrambakkam tank is now supplied with water from the Palar and the Cortilliar.

The supply channel, which was cut from the Palar anicut to Streepermatur tank* (see sheet No. 1), was intended to convey the Palar water so far; but I am informed that until the time of the last monsoon, when a dam at Malasur was removed, no Palar water had ever reached Streepermatur.

There is a direct surplus channel from Streepermatur into Chembrambakkam tank, which gets also the surplus water from Pillipakkam tank.

16. On the north side there is a regular system of supply from the Cortilliar, across which a dam is built at Kesavaram, from whence a channel, the old Bungairoo, connects the river with the surplus channel from Kuam tank.

These two channels form the head of the Kuam river.

17. At Koratur a dam is built across the Kuam for the purpose of sending the water, by the new Bungairoo channel, to Chembrambakkam tank. As the Kuam tank has lately been supplied with water from the Palar, Chembrambakkam is thus now supplied with Palar water on two sides.

It receives also the surplus water of Nemam, and of nearly all the other tanks which lie on the south of the Kuam and west of the new Bungairoo channel. It is, in fact, most favourably situated for receiving an abundant supply of water; for the map, sheet No. 1, will show that it must get the surplus water from nearly all the tanks, and the lands which lie within the Kumbankal on the south, the Poiny river and the Cortilliar on the west, and the Kuam and Bungairoo channels on the north and east.

18. The area of this tract of country is about 400 square miles, or 1,239 millions of square yards, over which about four inches in depth of rain in the year would yield the additional 141 millions of cubic yards, which I propose to store in Chembrambakkam tank. This would probably not be one-tenth or one-twelfth of the annual rain-fall. Within the limits of this area there are about 320 irrigation tanks. Many of these, however, are but partially supplied by local rains, as the Poiny and Palar waters are now made available for this purpose; and it is probable that their use will increase as the channels and tanks become better regulated.

19. The surplus channel from Streepermatur and Pillipakkam tanks requires rectification; on sidelong ground it is embanked on the lower side and the water spreads on the upper side, occasioning accumulations of sand which lead to the bursting of the banks and consequent loss of water.

* This channel is known by different names at different parts of its course; near Streepermatur tank it is called the Kumbankal.

Old Bungairoo channel.

The old Bungairoo channel, which connects the Cortilliar with the surplus channel from the Kuam tank, and which is about six miles in length, is also in great need of improvement. The upper part is too narrow, and lower down it is too shallow, and thus the water is prevented from passing down the channel freely, so that when there is a tolerable fresh in the river, the water passes over or breaches the dam, the latter which occurred last year. The dam has been repaired and on estimate framed by the Executive Engineer for removing the obstructions in the channel.

The Kuam river.

20. The channel of the Kuam is tolerably free from obstructions to Koratur dam, a distance of about fourteen miles. In this reach of the river nineteen supply channels are taken off, fourteen to tanks on the north, and five to tanks on the south side. Off the new Bungairoo channel four tanks are supplied. In the following table is given a statement of these supply channels, showing that five only have head sluices:—

Statement of supply Channels taken off the old Bungairoo Channel and the Kuam river between Kasaveram and Koratur Anicuts.

No.	Name of Channels.	TAKEN OFF		Remarks.
		North side.	South side.	
1	Condanjarry channel			
2	Pinjivakkam do.		1	No Head Sluice.
3	Athigathore do.		1	Do. do.
4	Agamy do.		1	Do. do.
5	Kasam Nullatore do.	1		Do. do.
6	Cadumbathore do.	1		Do. do.
7	Yagatore do.	1		Do. do.
8	Poongatore do.	1		Do. do.
9	Salay do.	1		Do. do.
10	Peryacooppam do.	1		Do. do.
11	Pooliyancooppam do.	1		Do. do.
12	Cacalore do.	1		Do. do.
13	Poottore do.	1		Do. do.
14	Thunneercolam do.	1		Do. do.
15	Tholoovoor do.	1		Head Sluice and Shutters.
16	Thiroovoor do.	1		No do. do.
17	Aranvoyal do.	1		Do. do.
18	Goodapakkam do.		1	Do. do.
19	Thinnanore do.		1	Do. do.
Total channels both on north and south		1	1	Head Sluice and Shutters.
		19		Do. do.

Supply Channels taken off the new Bungairoo Channel between Koratur Anicut and Chembrambakkam lake.

No.	Name of Channels.	TAKEN OFF		Remarks.
		East side.	West side.	
1	Nadoonjary channel			
2	Peroymbet do.			
3	Thiroomalishy do.	1		Head Sluice and Shutters.
4	Manumbedoo do.	1		No do. do.
Total channels ...		1		Head Sluice and Shutters.
		4		No do. do.

From the absence of head sluices, the supply to these tanks cannot be regulated I believe the Superintending Engineer has directed an estimate to be prepared for this work, which must be done, and the sluices put under proper control if Chembrambakkam is enlarged.

Koratur Dam.

21. Koratur dam, which turns the water down to Chembrambakkam, is 392 feet in length and 3 feet in height above the bed of the river. Near the north end there are eight openings for sluices, amounting to 24½ feet in width; and, near the south end, eleven openings, amounting to 55 feet in width; at this end there is a solid mass of mason work 107 feet in length, and nearly 12 feet in height, which separates the dam from the head sluice of the new Bungairoo channel.

Koratur Head Sluice.

22. The head sluice consists of three bays arched over; each bay being divided into three semi-circular headed openings, 5 feet 2 inches in width, and about 7 feet 9 inches in extreme height. The whole water-way is 46 feet 6 inches in width by 7 feet 9 inches in height; but the area is diminished by a horizontal stone laid along the face of the sluice, 12 inches in height, with its under surface at the level of the springing of the small arches. Under the floor of the head sluice there is a small under sluice 3 feet 2 inches in height and 2 feet 6 inches in width, for drawing off spring water from the deep bed of the river.

23. The highest flood known at this head sluice rose to the top of the cross stones, at which time there must have been 3 feet 1 inch depth of water passing over the dam. The bed of the river at the dam is greatly silted up, as is also the channel to the head sluice.

Proposed works at Koratur.

24. Whether Chembrambakkam tank be enlarged or not there are certain alterations and improvements which should be made, but they would be imperatively necessary if the tank were increased in capacity.

The dam should be raised 1½ or 2 feet, and another set of sluices put in the middle.

These, as well as the present sluice openings, should be provided with proper gates, which could be raised to any required extent, so that the sand which now accumulates above the dam might be removed by the under current. During the freshes a few coolies with rakes could dispose of the sand with the gates only slightly raised. This arrangement of gates would involve the construction of a gang-way or foot-bridge over the dam. This foot-bridge would be a great convenience, not only to the parties in charge of the dam and sluice, but also to the villagers on both sides of the river, which is impassable during floods.

25. The head sluice is not capacious enough. Another bay of three openings should be added at the south end, and the cross stones should be removed, so as to leave whole area of the openings available for the discharge of the water.

To these openings proper sluice gates should be fitted to work with screws, so that they could be opened or shut readily to any extent, as occasion required.

I had the advantage of examining Koratur dam, the Kuam, and the old Bungairoo channel to Kesavaram dam on the Cortilliar, with Colonel Boileau, R. E., the Superintending Engineer, and I think we are agreed as to the necessity for executing the works I have suggested.

New Bungairoo channel.

26. The new Bungairoo channel from Koratur to Chembrambakkam Tank is greatly obstructed throughout its course. Its length is about $7\frac{1}{2}$ miles, and its entire fall from the floor of the head sluice to the level of the calingulah is $24\frac{1}{2}$ feet, or an average of 3.30 feet per mile, a fall which is sufficient if it were properly distributed. At Vellavetty Chuttrum a bridge of three arches crosses the channel. I have not seen this bridge during a flood, but I am of opinion, from the information I received at the place regarding the head of water it creates, that it is not of sufficient capacity to discharge even the present required supply.

As it approaches the bridge by which it is crossed by Trunk Road No. 1, the Bungairoo ceases to be a channel at all, and the water flows across the fields in a natural hollow. Here it is joined by the surplus channel from Nemam tank.

The capacity of the bridge on the Bangalore road is ample, but the channel from it through the laterite ridge to the tank should be deepened.

Capacity of tank.

27. The following table shows, in a condensed form, the area, capacity, and circumference of the natural basin in which the tank is situated at each yard in height from a horizontal plane two yards below the level of the calingulah, to a height of seven yards above that level. The several columns show the area in square yards, acres, and square miles; the capacity, in cubic yards, at each yard in height, and the circumference, in miles, at each yard in height.

The figures are the result of a careful survey.

Table showing the capacity and area of the Basin in which Chembrambakkam Tank is situated at each Contour line on the Plan No. 2.

No. of contour yards.	Area at each contour in square yards.	Average area of each pair, average cubic yards between each pair of contours.	Total No. of cubic yards at each contour.	Area in square miles.	Area in acres.	Circumference in miles.	Remarks
7	40,842,468	39,296,758	272,396,301	13 185	8,438.526	23 325	Highest contour surveyed.
6	37,651,048	36,225,618	233,099,543	12 155	7,779 142	22 324	
5	34,800,188	33,602,195	196,873,925	11 234	7,190 121	21 275	Level of proposed calingulah.
4	32,404,203	31,348,746	163,271,730	10 461	6,695 083	20 525	
3	30,293,288	29,012,144	131,922,984	9 779	6,258 943	19 375	
2	27,731,000	25,113,600	102,910,840	8 952	5,729 545	18 575	
1	22,496,201	22,191,778	77,797,240	7 262	4,647 975	17 375	Level of top of dam stones.
0	21,887,356	20,224,317	55,605,462	6 715	4,298 035	16 093	Level of the three calingulahs at the south end of bund.
1	18,561,279	17,054,486	35,381,145	5 992	3,834 975	14 487	
2	15,547,693	4,839,193	18,326,659	5 019	3,212 333	13 606	
0	13,487,466		13,487,466	4 354	2,780 666	14 037	Capacity between the W. S. and lowest contour level of water surface when the survey was made.

Calingulahs.

28. There are six calingulahs to Chembrambakkam tank, five of them being near the south end, and one near the north end of the bund, as follows, counting from the south end :—

No.	1.	Vettumadday calingulah	Length—feet	No of dam stones.
"	2.	Rosanbeg do.	58	23
"	3.	Thattan do.	130	39
"	4.	Nalliaman do.	115½	36
"	5.	Poniaman do.	46	18
"	6.	Vettumaddy do.	223	48
			61	80
		Total length in feet	643½	164
		Deduct the aggregate width of the dam stones	82	

Total clear length 561½ feet.

Of these calingulahs, numbers 1, 2, and 3 are at the same level, 4 and 5 are 6 inches to 12 inches higher, and No. 6 is nearly 2 feet higher. They are all, with the exception of No. 6, very solidly built with dressed gneiss, and, with the same exception, they have all dam stones 3 feet in height; as these calingulahs are all to be removed, plans of them are not sent up.

Sluices.

29. The sluices are eleven in number, and are of the usual description found in first class tanks, with a needlessly heavy mass of masonry at the heads, and vents stopped with posts or plugs of timber in the ordinary way. The following is a statement of the dimensions, &c., counting from the south end :—

Number from south end.	Name of sluices.	Bottom of culvert below present Calingulah.	Dimensions of Culvert.
1	Palanthandilam	Feet.	Feet.
2	Kavanur	14'50	56 × 2 × 4
3	Therrumuddhvakum	14'80	65½ × 2½ × 4
4	Kunatur	17'50	54 × 2 × 3'3"
5	Mangadu	19'	59 × 2 -5" × 6'-0"
6	Manapakkum	16'	116'-6" × 2' × 4'-3"
7	Chetty sluice	21'75	81-6 × 2 × 5'-6"
8	Malayambakkam Muttu	13'30	125'-3" × 2'-3" × 5
9	Poonamallee	9'40	6'1-9" × 2'-3" × 3'-3"
10	Maypur	8'70	58'-9" × 3'-6" × 2'-6"
11	Agaram	8'30	53'-6" × 1'-6" × 2'-3"
		3 75	52' × 1'-6" × 2'-3"

It is said that in two or three of these sluices the culverts are leaky. They were not leaking when I examined them, but at that time the tank was not more than one-fourth filled.

Bund.

30. The tank bund is revetted on the water side, for the greater part, with undressed blocks of gneiss, the remainder with laterite stone. The thickness of the mass of stone ranges from 2 to 4½ feet, and is generally loosely put together.

The greater part of the bund is covered with palmyra and other trees. The northern portion has lately been raised and repaired at a cost of, I believe, ten thousand Rupees.

Land now irrigated.

31. Chembrambakkam has always been highly valued as an irrigation tank, as the cultivation of a large portion of the irrigated land lying on the west of Madras depends on it. It irrigates the whole, or parts of fifty-eight villages, the Nunjah Ayacut* of which is 8,604 cawnies, assessed at 63,842 Rupees. This includes 1,163 cawnies of Inam land, assessed at 10,190 Rupees.

Very seldom, however, has there been sufficient water to irrigate the whole Ayacut. I have obtained, from the Tahsildar's Cutcherry, such information as has enabled me to give the following table, showing the numbers and names of the fifty-eight villages; the Ayacut in each of the Circar and Inam lands; the average area irrigated during the last fourteen years; and the number of cawnies in each Circar village under dry cultivation or of waste land, or of both, which could be converted into wet cultivation if there was sufficient water.

* Nunjah Ayacut means the whole or greatest quantity of land in a village, or under a tank, supposed to be capable of being irrigated with the ordinary full supply of water.

The Punjah Ayacut means the greatest quantity of land under dry cultivation.

Statement of the Ayacut Assessment, &c., of the fifty-eight villages irrigated from Chembrambakkam Tank.

Statement of the Ayacut Assessment, &c., of the fifty-eight villages irrigated from Chembrambakkam Tank.									
Registered number of village	Names of villages under the tank.	CHIEF LANDS.		INAM LANDS.		The average number of cawnies under wet cultivation for the last 14 years.	The number of cawnies of either dry cultivation or waste in each village that could be converted into wet cultivation.		
		The Ayacut of each village	The assessment of each village	Ayacut.	Assessment.				
								3	4	5	6
1	2	3	4	5	6	7	8		
156	Mangadoo...	423	3,566	153 5	1,723 8	337 4	14		
157	Matavelagam	37	261	10 11	86 12	29 6	2		
158	Ragoonathapooram	40	326	13 8	104 14	34 7	2		
159	Chukkaroyapooram	44	315	15 13	126 8	33 1	15		
160	Olagamcathavelagam	34	227	5 14	28 4	27 15	1		
161	Keelaperoomalpattagaram	13	114	8 0	73 11	9 4	.....		
162	Nalamcuttalay	41	255	9 11	53 7	32 0	4		
163	Malayambakkam	312	2,429	44 9	402 5	129 9	266		
164	Chinnapunnichary	29	225	5 0	39 9	25 11	1		
165	Sathampallam	4	28	.....	.....	3 11	.....		
166	Kalacattoochary	89	372	.....	.....	7 12	32		
167	Malaperoomalpattagaram	38	311	3 2	43 14	29 9	8		
168	Vellauthangal	25	181	17 9	127 9	13 11	1		
169	Kolunanyakkam	97	752	17 11	215 7	67 0	2		
170	Siryanthangal	3	24	.....	.....	2 8	2		
171	Canampully	30	210	4 6	46 8	16 6	44		
172	Catoepakkam	39	633	21 7	138 15	66 7	34		
173	Ponparappi	7	282	5 11	39 4	24 1	2		
174	Thiroovroonathavelagam	74	45	1 0	6 6	6 15	3		
175	Thiroovroonathavelagam	69	582	11 14	107 1	47 14	3		
176	Thiroovroonathavelagam	1,258	542	18 0	152 5	53 3	19		
177	Thiroovroonathavelagam	48	8,532	92 0	744 12	612 15	76		
178	Thiroovroonathavelagam	31	305	4 9	41 5	35 11	12		
179	Thiroovroonathavelagam	79	239	3 9	32 5	19 10	11		
180	Thiroovroonathavelagam	49	678	9 11	115 8	59 4	4		
181	Thiroovroonathavelagam		361	4 6	43 9	30 5	13		

201	Malayadycherry	12	91	3 12	42 6	8 2	11
202	Moanamcuttalay	66	500	6 8	69 1	49 12	57
203	Cavoor	283	2,116	59 3	555 15	162 1	40
204	Poothavadoo	9	78	2 10	25 12	9 8	4
205	Ponparappi	22	151	1 13	13 9	10 10	10
206	Sirocalathoor	217	1,633	35 8	284 4	138 4	134
207	Palanthandalan	149	1,002	19 9	139 7	74 14	60
208	Thiroomoodavakkam	478	3,612	42 13	564 11	287 11	5
209	Nunthiambakkam	601	4,284	38 2	334 14	388 11	44
210	Mathanunthapooram	219	1,642	23 14	186 8	117 6	3
211	Iyepenthangal	161	900	19 14	181 5	95 12	34
212	Colathoovanjary	134	930	24 15	153 10	85 14	2
213	Manappakkam	97	531	40 3	203 7	39 4	94
214	Ettavaly	127	1,026	27 5	390 11	80 7	7
215	Mittanamilly	21	137	3 5	21 11	9 14	4
216	Ponnavadoo	17	66	1 7	4 6	10 6	4
217	Thundlam	28	155	9 10	51 3	10 15	131
218	Peryapannicherry	141	954	9 13	105 11	89 15	2
219	Reddancuttalay	69	528	14 5	125 14	55 6	44
220	Tharappakkam	110	769	20 8	195 2	86 0	35
221	Poonthamally	106	708	12 0	79 11	72 11	87
222	Agraharam	324	2,930	86 6	873 10	174 15	7
223	Mooppathoovetty	47	350	6 13	62 2	21 13	2
224	Mappoor	30	148	2 10	15 15	16 5	10
225	Agaram	190	1,516	12 6	102 9	46 12	15
226	Peroombady	60	498	9 3	106 8	32 9	6
227	Garagumbakkam	32	220	7 4	36 7	14 1	40
228	Candiy	371	2,578	93 14	508 8	235 2	.....
229	Chithathore	42	313	6 2	45 12	33 4	18
230	Mavoolivakkam	42	243	3 4	7 5	19 12	20
231	Mogalivakkam	102	207	16 11	80 8	27 15	.....
232		177	960	20 0	105 14	86 4	.....
Total villages 58 ...		7,441	53,652	1,163 0	10,189 14	4,347 10	1,534

32. It will be seen from Column No. 7, that the average area irrigated during the last fourteen years was only 4,345 cawnies, or little more than one-half of the Ayacut; and even over this area there was generally but one crop obtained in the year.

The average annual revenue received during these fourteen years was 33,975 Rs., but this includes a period at which the assessment was much higher than it is now. If we take the average number of cawnies cultivated at the present rate, the average annual revenue will be 21,725 Rupees.

I cannot help expressing the opinion that the diminished revenue is greatly due to the supply channels and other subsidiary works not being kept in proper order, and to the reckless waste of water by the cultivators. I have no doubt but that if the channels, dams, and head sluices were put into proper condition, and the tank sluices altered and put under proper control, there would be water enough for the whole Ayacut.

Proposed works.

33. It is proposed to enlarge the tank by placing the new calingulah 15 feet above the level of the present three southern calingulahs. This would be 12 feet above the top of the dam stones, to which height the Merassidars are permitted to raise the water when they can; but it is evident from what has been already stated, that during the last fourteen years the average height of the water has but little exceeded that of the six months' mark, above which the proposed height is 19 feet, or equivalent to an additional quantity of water of nearly 200 millions of cubic yards. But we will take the level of the present calingulah as our starting point.

Height of proposed calingulah.

34. By referring to the table of capacity, appended to paragraph 27, it will be seen that at the level of the calingulah the capacity of the tank is 55,605,462 cubic yards, and that at the fifth contour, or five yards above the present calingulah, the capacity is 196,873,925 cubic yards. This is the height at which I propose to place the new calingulah, thus giving an additional quantity of water equal to 141 millions of cubic yards.

35. The table will show that if the new calingulah were placed one yard higher, the quantity would be increased by 36 millions of cubic yards, and if two yards higher, at the seventh contour, which is the highest one surveyed, there would be an additional quantity of over 75 millions of cubic yards. I stopped at the fifth contour, because if raised higher the water would swamp portions of several villages, and, besides, I considered it safer to feel our way as regards the probable quantity of water available. If the experience of a few years shows that with the calingulah at the fifth contour a certain quantity of surplus water passes away, it will be a very simple and inexpensive matter to increase the height to such an extent as will reserve the whole or a portion of the surplus. The principal expence attending any increased height would probably be the necessary compensation for damages, as the quantity of material required for the additional work would be trifling.

Bund.

36. The bund is proposed to be raised to a height of 6 feet above the new calingulah, and over this there will be a rough stone parapet 2 feet higher. I consider the parapet necessary, as with so great a water area as 11½ square miles, the wash upon the bund with strong westerly winds will be considerable.

The top width of the bund at the base of the parapet will be 9 feet, or 6 feet in clear of the parapet.

Road upon top of Bund.

37. This width is sufficient for the stability of the tank, but as the bund almost connects the old and new Bangalore roads, and as it lies in the line of a considerable amount of bandy and other traffic between a large number of villages, and as the present road is often impassable, having to cross rice fields, supply and surplus channels, it seems desirable that the bund should be made to serve the purpose of a public road.

I have consulted the Superintending Engineer on this point, and he agrees that a road along the top of the bund would be very useful. To accomplish this the top should be widened, as shown on cross section No. 4, sheet No. 4, which would add about 7,000 Rupees to the estimate.

38. The inner or revetted slope of the bund is proposed to be 1½ to 1. The outer slope, which is to be turfed, is to be 2½ to 1.

Trees on Bund.

I have already mentioned that the greater part of the bund is covered with palmyra and other trees.

I have ascertained that old palmyra trees may have their stems covered up with earth for 10 or 12 feet without suffering any injury; many of those on this bund were so treated some years ago, and they are now healthy and vigorous. All such trees as can bear this treatment I propose to leave standing, but all others are to be dug out by the roots.

39. The manner in which the bund is to be enlarged is shown on the cross sections, sheets No. 4 to No. 9. For a more particular description as to how all the work is to be done, see the general specification.

Sluices to be altered

40. The sluices are proposed to be altered as shown on plans Nos. 10 to 21.

It is said that the present sluices are too small for the irrigation of the whole Ayacut, even if there were water enough. I am of opinion that when the obstructions in the way of cross and covering stones are removed, and when altered as shown in detail on sheet No. 21, they will be found capacious enough.

The present system of closing the sluices with timber plugs is to be abandoned. Grooves are to be cut in the sides of the culverts, and proper sluice gates, worked with screws, as shown on plan No. 21, are to be substituted.

New sluices

As it may be found necessary to provide more sluicing power than at present exists, the cost of two additional sluices, with culverts 4 feet by 3 feet, is included in the estimate. These, if found necessary, can be built at such places as may hereafter be decided upon.

Old Calingulahs to be removed.

The present six calingulahs are to be removed, and their sites filled up uniformly with the rest of the bund. The cost of their removal is not included in the estimate, because the materials which can be used up in the new calingulah, and in the additions to the sluices, will be worth more than the cost of removal.

New Calingulah.

The new calingulah is to be built at the north end of the bund. It is to be 700 feet in length, and 3 feet in height above the apron. The whole will be in solid cutting where the foundation is nearly altogether of gneiss rock. Should the excavation turn out sufficiently hard and homogeneous, one-half or more of the building may be dispensed with, but I have estimated for the full dimensions.

Importance of having a long Calingulah:

41. In fixing the length of the new calingulah, the following points have to be taken into consideration:—

In all reservoirs their safety very much depends on their calingulahs (or "waste weirs" as they are called in England) having length enough to discharge, at a low level, any sudden accession of water when the reservoir is full. Many of the disastrous accidents we have read of, have arisen from neglect to provide sufficient length of waste weir; the result of which is, that if the tank is full, and if a sudden rain-storm occurs, the short weir is unable to discharge the water fast enough, which then rises upon the face of the bund, and is washed over where the waves are heaviest, until a small breach is made, which goes on increasing until at length no power on earth can cope with the resistless torrent which carries destruction and ruin in its course. Major DeHavilland has given us a description of the "terrible torrent" which burst from this tank on the 3rd of January 1818, when it could not have contained more than 77 millions of cubic yards of water. This "terrible torrent" would be but a mill stream in comparison with that which would be poured towards the Adyar if the tank burst when filled with 197 millions of cubic yards of water, as is now proposed.

42. I write this for the purpose of showing that the utmost care must be observed not only in the designing, but in the construction of a work of this nature; but especially where it is situated so close to, and at the higher part of, a populous district such as that which lies to the west of Madras. In all works where water is to be dealt with, the greatest care and caution are necessary, but in constructing works for the storage of a large body of water under such circumstances as obtain in this case, there is one maxim which should never be absent from the mind of the Engineer, that "the strength of the whole is the strength of the weakest point."

43. I have already stated, paragraph 7, that on the occasion of the great storm on the 24th October 1818, the quantity of water poured into this tank in eight hours was about 48 millions of cubic yards, or an average of six millions per hour.

This was evidently a very exceptional case, as appears both from General Sim's remarks and those of Mr. Goldingham.

When making inquiry on this part of the subject amongst the Merassidars, I ascertained that, on some rare occasions, the tank had been filled to the level of the calingulah in twenty-four hours. This is equal to 55½ millions of cubic yards in twenty-four hours, or an average of nearly 2·31 millions per hour.

The Merassidars also stated that, on other occasions, the water had risen from the level of the calingulah to the top of the dam stones in twelve hours. The quantity between those two contours is over 21½ millions of cubic yards, showing an average of nearly two millions of yards per hour.

But in all these cases the maximum hourly influx will be greater than the average.

44. We shall have a good idea of how the tank would be affected by any sudden influx of water, by supposing that it was full to the level of the proposed calingulah, and that, in eight hours, 48 millions of cubic yards were added to it; and that, until the 48 millions were in, no water was allowed to flow out. It will be seen by the table of capacities appended to paragraph 27, that between the fifth and sixth contours the tank would hold 36½ millions of cubic yards, and that one foot

higher would provide for the remaining 11½ millions; thus the whole 48 millions would raise the surface of the tank about four feet above the calingulah. But during all this time the discharge over the calingulah would be rapidly increasing, and should the depth over it reach three feet, the discharge per hour would be nearly 1·75 millions of cubic yards, whilst, at the same time, all the sluices might be kept open.

It is evident from this that, even under the very exceptional conditions supposed, conditions not likely to arise more than once in fifty years, the water could never rise so high as to endanger the stability of the bund.

Alteration of Trunk Road No. 1.

45. Where Trunk Road No. 1 to Bangalore crosses the west end of the tank, it must be either diverted along the high lands on the west or raised upon its present line. I had not an opportunity of deciding upon the ground, which of these plans is the best; but as the raising of the road does not increase its length, and as this is the most expensive plan, I have estimated for it. The present road is embanked across the valley, and there are several small culverts under it. These may be closed, as I propose to build one large culvert of three arches at the lowest part. This will be sufficient to carry off all the water.

The embankment is to be revetted with rough stone on the tank or south-east side.

Length of Bund unfavourable.

46. In one respect, the great length of bund to be raised, this project is unfavourable; but this is, perhaps, balanced by the advantage it possesses of presenting, at the level of the present calingulah, a plane of 22 millions of square yards, or 6½ square miles, upon which can be raised the additional water we propose to store.

Materials for the work convenient.

The materials for the work can be readily procured. Earth for the bund can be got for a great part of the length from the bed of the tank, at places where its excavation will not be injurious; and I am informed that all along the outside of the bund a strip of land, 30 yards in width from the toe of the slope, has been reserved for the use of the bund. In the hill which lies upon the north-west side of the surplus channel from Streepermatur tank, and close to the margin of Chembrambakkam tank, any required quantity of laterite stone can be had; it can be carted across to the bund when the tank is dry, or boated across when it is wholly or partially filled.

Clay for puddle can be had near the centre of the bund, and turfing under the village of Chembrambakkam on the north side of the tank.

Estimate.

47. The following abstract of the detailed estimate will show the cost of the proposed works. The prices are a little higher than those which prevail in that locality at present.

Abstract of the Estimate for enlarging Chembrambakkam Lake.

Number of Items on estimate.	Description of Works.	No.	Amount of each Work.	Total.
	<i>Lake Bund.</i>			
			RS. A. P.	Ls. A. P.
1	Removing the present revetment ...	...	1,615 14 0	
2	Removal of unsound earth behind the present revetment, and carrying the same to bund ...	...	510 2 3	
3	Excavating for foot of new revetment and carrying the excavated earth to the bund ...	...	2,022 6 0	
4	Puddling ...	...	45,603 6 0	
5	Graveling at rear of revetment ...	...	8,707 6 0	
6	Revetment, new ...	...	1,02,194 12 0	
7	Do. with old materials. ...	...	8,618 0 0	
8	Earth-work for the bund ...	...	69,519 10 0	
9	Turfing ...	...	5,494 14 4	
10	Total for the Bund ...	...		2,41,286 0 0
11 to 22	New calingulah ...	1		13,889 0 0
23	Irrigation sluices, old ...	11		4,871 0 0
	Irrigation sluices, new... ..	2		3,616 0 0
24	<i>Alteration of Trunk Road No 1, on the 20th mile.</i>			
	Raising the embankment ...	...	6,221 0 0	
	Metaling ...	...	732 0 0	
	Turfing ...	...	456 0 0	
	Revetment ...	...	5,618 0 0	
	Three-arched bridge ...	1	2,681 0 0	15,768 0 0
25	Total cost of altering road ...	...		2,82,160 0 0
	Contingencies and sundries at 5 per cent ...	...		14,124 0 0
26	Compensation for land ...	...		2,96,584 0 0
	Total ...	...		58,851 0 0
				3,55,435 0 0

Value of project.

48. We have now come to a very important part of this inquiry, namely, the financial aspect of the project; and we have to answer the question *will it pay?* On this part of the subject I have to make the following remarks:—

In answer to this question I might fall back upon an old idea, suggested in connection with the re-construction of the old Pammal tank, and say that the water proposed to be stored in Chembrambakkam tank would or might be used for the water supply of that portion of Madras which lies south of the Kuam. If I put the scheme forward in this way, there would be no necessity for me to go into its merits in an agricultural point of view; for if looked upon as a means of supplying a portion of Madras with wholesome water, the value of the project would cease to be tested by money consideration only. But I am of opinion that if proper measures are taken to conserve the rain-fall upon the Nagiry hills, the project which I have already submitted, and which is now being executed, will be found ample not only for the supply of Madras, but for the irrigation of all the waste land lying to the east of the Red Hill and Cholavaram lakes, and between the Cortilliar river and the railway.

Water can be brought to Madras.

49. As it is possible, however, that the Nagiry supply might sometimes fail, it is satisfactory to know that there is another source from which Madras could be

supplied with water; for there would be no difficulty in connecting Chembrambakkam tank with the Spur tank in Madras, where I propose the filters and pure water basin shall be.

The bed of Chembrambakkam tank is about 46 feet higher than the general level of the Spur tank, and as the distance is about thirteen miles, the fall would be ample. At the same time, except in a case of emergency, I would not recommend drawing from the Chembrambakkam tank for the supply of Madras with drinking water; because, being supplied principally by the surplus water from irrigation tanks and the drainage from rice and other fields, its water must be flat and wanting in that briskness and sparkle which are so much desired in drinking water.

50. The additional quantity of water proposed to be stored is 141 millions of cubic yards. A simple way of estimating the value of this quantity is to see how many cawnies of land it would irrigate under rice cultivation. If we assume that nine thousand cubic yards of water are required to mature one crop of rice on one cawny of land, then 141 millions of yards would be sufficient for 15,666 cawnies, which, at 5 Rupees a cawny, amounts to 78,330 Rupees. This may be taken as the annual value of the project estimated in this way; and on the probable cost of the works it would be equal to 22 per cent. per annum.

Cultivation of Ayacut.

51. It is probable, however, that the first use made of the water would be to complete the cultivation of the present Ayacut, and of the other irrigated lands which lie between it and Madras, and bounded by the Kuam on one side and the Adyar on the other.

Whatever quantity of water remained after this could be used partly in the cultivation of the whole or a portion of the dry cultivated or waste lands within the same limits, and partly for other purposes which will be suggested hereafter.

52. I have already shown that of the 8,604 cawnies of the Ayacut, only 4,347 have been cultivated on an average during the last fourteen years, leaving 4,257 cawnies uncultivated.

The additional cultivation of the Ayacut would stand thus:—

	RS.
I. First crop off 4,257 cawnies at 5 Rupees per cawny ...	21,285
II. Second crop off 8,604 cawnies at 3 Rupees ...	25,812

Total additional Revenue off Chembrambakkam Ayacut ... 47,097

Other villages may be cultivated.

53. Between the Chembrambakkam Ayacut and Madras (or rather Nungambakkam and Mylapore tanks) and within the rivers Kuam and Adyar, there are twenty-eight villages, regarding which the following table is a statement similar to that given of Chembrambakkam Ayacut appended to paragraph 31, with the exception that the average cultivation is given for only five years.

Statement of the Ayacut Assessment, &c., of twenty-eight Villages lying between the Kuam, the Adyar, the fifty-eight Villages of Chembrambakkam, and Mylapore Tank.

Number of Villages.	Names of villages not under the tank.	Circar.		Inam.		Circar.		The number of cawnies of either cultivation or waste in each village that could be converted into wet cultivation
		The Ayacut of each village (the whole)	The assessment of each village (the whole)	Ayacut.	Assessment.	The average number of cawnies under wet cultivation for the last five years	The average revenue during the last five years.	
1	2	3	4	5	6	7	8	9
249	Teroomyoor	717	2,814	8	46	199	883	63
68	Colappakkam	287	1,314	32	167	93	567	88
2	Senjary	56	148	2	6	18	59	3
3	Nessappakkam	39	176	2	12	30	147	24
4	Agaram	31	125	2	8	10	40	15
5	Matavelagam	4	21	..	..	4	21	..
11	Aroombakkam	195	910	26	132	35	168	28
253	Valasaravakkam	85	402	98	276	67	312	205
253	Kodambakkam	422	1,416	63	266	364	1,257	301
13	Saligramam	294	946	15	64	21	98	99
1	Poroor	267	1,545	193	1,215	121	931	41
16	Vanagaram	217	1,239	167	566	130	1,005	20
17	Carumbakkam	35	275	27	197	16	162	23
22	Chettyaragaram	70	522	12	95	56	403	4
18	Velluoothum	13	108	1	11	12	102	..
19	Sivabootham	37	207	4	16	34	210	9
20	Ramapootam	160	760	21	121	83	388	135
21	Thelayaragam	86	531	7	44	10	88	9
69	Theonlam	120	689	15	108	65	382	5
12	Viragambakkam	313	1,413	26	158	55	348	80
251	Mathoorvoyal	579	2,515	42	201	410	1,900	111
174	Pidaculacoppam	79	502	9	56	40	322	18
175	Varootherajapooram	127	622	9	45	69	355	10
184	Paryyakkam	180	822	45	264	155	693	27
185	Keelparyyakkam	11	71	3	22	8	56	..
182	Pedarythungal	65	398	11	88	54	331	20
181	Vadacundlam	16	100	2	15	8	55	..
155	Arjamanalloor	80	358	9	62	31	198	6
Total Villages 28		4,615	20,949	851	4,661	2,201	11,181	1,317

This statement shows that of 4,615 cawnies only 2,201 have been under cultivation (and one crop only has been produced), leaving 2,414 cawnies uncultivated:—

I. First crop off 2,414 cawnies, at 5 Rupees per cawny	12,070
II. Second crop off 4,615 cawnies, at 3 Rupees per cawny	13,845

Total additional revenue off the wet Ayacut of these twenty-eight villages ... 25,915

55. These two calculations show, if the figures are correct, that if used in the complete cultivation of the wet Ayacuts of these eighty-six villages alone, the value of the water stored would be 73,012 Rupees, equal to 20½ per cent. on the estimated cost of the works.

There would be one great advantage in applying the water to those lands which are already prepared for wet cultivation, that no expensive works of distribution would be necessary, as in most cases the water could be applied direct, without delay and without additional cost.

56. The two revenue tables show that in the eighty-six villages there are 2,881 cawnies of land under dry cultivation or waste, which are so situated as regards relative height, &c., that they could be converted into wet cultivation. I do not know whether it would be desirable to irrigate these lands beyond that which would be necessary to enable them to produce first class dry crops. My own opinion is, that when so large a proportion of the land is irrigated for the cultivation of various description of rice, it is not only more profitable, but is more to the advantage of the community, that a small quantity of water should be expended over a large area of the remaining land in the production of the several description of dry grains, oil-seeds, &c., &c. A few thousands of cubic yards of water judiciously expended in this way would, I believe, be of immense value.

Water may be applied to the Junction Canal, &c. 57. I must not omit to point out that one of the uses to which a portion

of the water stored in Chembrambakkam tank is proposed to be put, is the supplying of the junction canal with fresh water should that work ever be executed. The Mylapore and Nungambakkam tanks, or at all events portions of them, might be kept full for the whole or a greater part of the year, which would be invaluable to the garden cultivation of that part of Madras.

The proposed Mount tank could also be kept full, and a portion of the water might be brought across the valley of the Adyar, at a high level, to the neighbourhood of Palaveram and the Mount; but all these questions will be fully discussed in a subsequent report.

Quantity of water required for one Acre. 58. In dealing with this part of an irrigation project, that is, the appro-

priation and value of the water, we have always a great difficulty to contend with in not knowing how much water is required for the cultivation of rice or any other crop, wet or dry.

In this Presidency we are in the habit of assuming on, I believe, a statement made by Major-General Sir Arthur Cotton, R. E., that 7,000 cubic yards per acre are required for the cultivation of one crop of rice during the hot season, and 5,000 yards during the monsoon. I believe that Sir Arthur Cotton considered this estimate too high, and I am of opinion that if the water were carefully distributed, a much smaller quantity would be found sufficient.

As regards the value of this project, I should be glad if the opinion of the Collector was obtained, as he is better able to judge correctly on a question of this kind than I am.

Comparison with other projects.

59. It would be satisfactory if I could compare the merits and demerits of this project with those of any other, but I am not aware that any similar one has been put forward in this Presidency.

The Nairgoonamaudoo (Neilgherry) reservoir, for which I sent up plans in 1857, is of a different character, being intended for the storage of water for the irrigation of lands, at a great distance, through the medium of a large river, and the site being in a locality where no land could be irrigated within many miles of it.

Proposed tank at Ekrookh, Bombay.

60. The only project I can discover which at all resembles this one of Chembrambakkam, is the proposed tank at Ekrookh near Sholapore, in the Bombay Presidency.

It is described in "Selections from the Records of the Bombay Government, "Irrigation Series, No. 1."

The Report, with plans, was published last year, and I believe it is looked upon as descriptive of a class of work which, so far as it is possible, should be undertaken, or at all events reported on, in the other Presidencies.

61. The following table gives a brief comparison of the two projects:—

No.	Description.	Ekrookh.	Chembrambakkam.
1	Bund, length Yards.	2,400	7,100
2	Do., maximum height Feet.	72	45
3	Do., height above calingulah "	3}	6}
4	Parapet, height above bund "	3} = 6	2} = 8
5	Sluices No.	3	13, two new.
6	Calingulah, length Feet.	250	700
7	Do., depth of flood over "	5	say 3
8	Water, quantity stored and available ... Cubic yards.	81,560,726	141,278,463
9	Do., total quantity in tank available for irrigation "	81,560,726	196,873,925
10	Land to be irrigated, one crop Acres.	8,000	8,659
11	Do., do. two crop "	8,000	8,821
		16,000	17,480
12	Estimate for reservoir works only, cost of distribution left out Rupees	7,06,112	3,55,435
13	Area, at level of calingulah "	58,333,333	34,800,188

62. The simplest way of comparing these two projects is to see how many cubic yards of water each will store for one Rupee. In making this comparison, I will contrast the whole Ekrookh tank capacity, minus the twenty millions of cubic feet "lost in the bottom," with the capacity of the Chembrambakkam tank between the present and proposed calingulah levels.

At Ekrookh the quantity of water available for irrigation is 81,560,726 cubic yards, and the estimated cost, leaving out the cost of works for distribution, is 7,06,112 Rupees: dividing the former by the latter number we get 115, which is the number of cubic yards stored for one Rupee.

The additional quantity of water proposed to be stored at Chembrambakkam is 141,268,463 cubic yards, and the estimated cost is 3,55,435 Rupees. These figures

give us 397 cubic yards for one Rupee. I do not consider this a very favourable case of storage, but it is probably as favourable as it is possible for any case to be in the plains, and so near to the coast. It is, at all events, much more favourable than the Ekrookh project.

63. There seems to be a great difference between Bombay and Madras in the estimated quantity of water required for the cultivation of one acre.

I have ascertained from the Revenue Inspectors here, that the second crop will require about three-fourths of the quantity of water necessary for the first crop.

If we assume that General Sir Arthur Cotton's estimates of 7,000 cubic yards for one crop is correct, the quantity required for the cultivation of the land at Ekrookh would stand thus:—

	Acres	Cubic yards	Cubic yards
One crop land	8,000	$\times 7,000 =$	56 millions.
Two crop land...	8,000	$\times 12,250 =$	98 "
	16,000		154 millions.

Showing that to cultivate the 16,000 acres, as proposed, they should provide 154 millions of cubic yards of water instead of 81½ millions.

If we assume that the 81½ millions is sufficient, and adopt the proportions given above, the quantity required for each acre would be—

One crop land	3,705 cubic yards per acre.
Two crop land	6,483 do. do.

These figures show but a little over one-half the quantity we are in the habit of calculating as necessary for the cultivation of one acre.

If these quantities are correct, the Chembrambakkam project would yield nearly double the amount of revenue I have estimated.

(Signed) W. FRASER, C. E.,
Executive Engineer.

MADRAS,
April 1867.

N^o 14

Mount Road, Madras
17th April 1867 17

From

W. Fraser Esqre C.E.
Executive Engineer

To

Colonel C.A. Orr R.E.

Secretary to Government P.W.D.

Sir-

I have the honor to forward the
Plans and report of the Project for
enlarging Chembambakkam Tank -

I was informed yesterday that I
should have the Ruin Table that afternoon
- noon, and I considered it better to wait
for it: It was received too late to be copied
until this morning: -

I - The detailed Estimate and general
specification will be sent up in a few days

Trusting that the Report will be
found satisfactory. -

I have the honor to be

Sir

Your Most Obedt Servt

William Fraser C.E.

Executive Engineer

18
J N 1000/64

Report
on the proposed Enlargement
of
Chembrambakkam Lake

by
William Fraser C.E.
Executive Engineer

April 1887-

From

W. Fraser Esq. C.E.

Executive Engineer

To
Colonel E. H. D. O. S. B.

Secretary to Government

Madras

Dated 19th June 1887

Recd

Forwarding the Plans

and report of the District

for enlarging Chembrambakkam

Lake Main Drain. 17/

Forwarded

Report on the proposed enlargement. 19

of Chembrambakkam Tank by William

Fraser, C.E., April 1867.

With this Report 23 sheets of Plans are

forwarded, as follows:—

Description of Plans. Sheet No. 1. Index Map, showing the Country, with the Rivers, Tanks, Channels &c. between

the Piny River (a tributary of the Palar) and Madras.

This Map has been compiled from the old

Military, survey and Dutch, other Maps, as I could procure, for the purpose of showing, at a glance,

how Chembrambakkam and other Tanks,

the improvement of which will form the subject

of another Report, are supplied with water, and

how they are connected with, and dependent

upon, each other; so that the Government

may without difficulty form an opinion on the

entire

Report on the proposed enlargement. 19

of Chembrambakkam Tank by William

Fraser, C. E., April 1867.

With this Report 23 sheets of Plans are

forwarded, as follows:—

Description Sheet No. 1. Index Map, showing the Country,

of Plans. with the Rivers, Tanks, Channels &c. between

the Piny River (a tributary of the Palar) and Madras.

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how Chembrambakkam and other Tanks,

the improvement of which will form the subject

of another Report, are supplied with water, and

how they are connected with, and dependent

upon, each other; so that the Government

may without difficulty form an opinion on the

entire

Sheet No. 3. Longitudinal

Section of the present Bund.

In this Plan the section of the

top of the present Bund is shown, as also that of

the land along the foot of the slope inside and

outside of the Tank: The blue line along the

section shows the height of the present Kalingula,

and the red lines show, respectively, the heights

of the proposed Kalingula, top of proposed Bund,

and the top of the proposed Parapet.

At sluice No. 5, the Munsiff has certain

marks to show where the Tank contains 3, 6, 9,

or 12 months supply of water. The heights of these

marks are shown on this section.

The Datum line drawn upon this section

is 70 feet above my general datum, which is

20 feet below mean sea level as marked by

Colonel

Colonel De Harland R.E. upon the North

wall of the Fort; so that by adding 50 feet to the

heights figured upon the section, the height of any of

these points above mean sea level can be ascertained:

The same datum is used for all the sections.

Sheets 4 to 9, contain 24 cross sections of the Tank

Bund, showing its present height and shape, and in

red, the manner in which it is proposed to be

enlarged.

Sheets 10 to 21: Plans of the present eleven

sluices, showing how they are proposed to be

altered.

Sheet 22: Plans of the proposed Kalingula.

Sheet 23: Sections showing how Tank Road

from Bangalore is proposed to be raised where

it crosses the west end of the Tank.

History of the Tank

2 — Chembra Babkhan Tank lies about

16 miles S.W. by W. from Madras; there is no

record of its construction, indeed it is so very old

that there is scarcely even a tradition of its origin.

Upon four of the sluices there are Tamil

Inscriptions, three of these are not more than 44 years old; the fourth is only partially visible, but it is evidently not of a very ancient date.

I have not been able to obtain any record of this Tank older than January 1818, on the 3^d of which

Breach
in 1818

Month a most serious breach occurred in the Bund at Manapakkam sluice, when the Tank was quite full: This sluice is figured N^o 6 on the Map and Longitudinal section: -

The collector of that time Mr W Cooke, in reporting the circumstance to the Board of Revenue on the 8th idem, says: "This Tank has been repeatedly filled this year, and after sufficient water had run off the 'Kalingul' wire shut retaining the usual supply of water in the Tank. This has occurred several times during the season."

The last time it was found requisite to

"respice the Calingul was on the 27th ultimo, and they were again closed when the usual quantity of water only remained."

He then goes on to state that the persons watching the Tank during the morning saw the water coming through Manapakkam sluice: They immediately proceeded to report the circumstance and obtain assistance; but before their return the Bank had given way. The collector is at a loss to account for this accident, as the Tank had been repeatedly filled during the season without the appearance of any defect.

It appears however that 12 or 14 years previously this sluice had sunk and was repaired by Colonel Caldwell and it was supposed that there remained some defect in the foundations known on the 10th February 1818 Major

De Havilland

Major De Havilland R. E., then inspector
of Tank Estimates, was directed to report, which
he did on the 16th of April.

Para 6. The breach which was made in its
bank on the 3rd January last is tremendous,
indeed not less than 248 feet in extent,
and excavated about 16 feet below the
natural level of the ground. He
attributes the accident to the undermining
of the foundation by the water, giving
admission to a small quantity at first,
until at length both sluice and
bank, tumbling in, every impediment to
the rush of a terrible torrent was removed,
and the flood which thence
made its way to the Adyar River,
carrying destruction before it for some
days.

Breach
Repaired

days was so powerful as to remove large stones, blocks
of masonry, trees &c. to a very considerable distance.
Major De Havilland prepared plans and
estimates for the reconstruction of this sluice and
also for the alteration and strengthening of the
other sluices as he considered that they were all
faulty in construction, by their heads being run
out so far into the Tank and away from the Bund,
by which he considered the water more easily made
its way between the earth of the Bund and the
masonry of the sluices. The estimated cost of
all these works was Rupees 30,817-3-1 but the
expenditure, as we learn from a letter of Mr C. D.

Campbell Secretary to the Board of Revenue dated
2nd November 1819, was only 24,979-2-11

Great Storm - in Form of Report by D. Thomas, Civil Engineer
on the 26th October 1818. Central Division, we learn that the works were
still

still incomplete when they had to resist.

The effects of the terrible storm which visited us

on the 24th of October 1818, when very many Tanks

of long standing in the Saggers were unable to

withstand the shock; but our unremitting attention

and solicitude in the prosecution of the work has

been fully rewarded.

Parent. I will give your Board an idea of the

rapidity of the influx of water into the River on

on the awful day of this visitation, to state that

at 7 o'clock in the morning when it began the

water was at 2 months mark; and that at 3

* Notes. Mr. J. Goldingham, Astronomer, and

J. R. S. who had then charge of the observatory

at Madras, gives the following description of this

Storm: On the 24th of October 1818. A second violent storm occurred at Madras, - the Moon had passed the last quarter about two days, and was at nearly her greatest distance from the earth. The wind, which

the afternoon of the same day a messenger was dispatched thence in haste to inform me

was a strong N.E. Gale early in the morning; before 10 in the forenoon had increased to a storm; an awful raise of half an hour occurred about this time, after which it blew a complete Hurricane from the South, with a fury never perhaps before experienced at Madras. Some of the oldest trees, which had resisted the former storm, were rooted up; and the largest branches of others were torn off, by the force of the wind. - In some trees of a tough description of wood, such branches were seen hanging down and twisted, having been whirled round and round by the fury of the storm. Such a scene of desolation was presented, as had hardly been witnessed before. Numbers of native habitations were levelled, many of the large Buildings injured, and some lives lost. Several ships and Brigs were at anchor in the Roads. all these got under weigh - but the latter was driven on shore, and one of the ships foundered; another was driven on shore to the Northward, and a third rendered not seaworthy - while the others generally sustained great damage. - The fall of rain was about 5 Inches. This Barometer had fallen between 8 o'clock P.M. of the 23 and daylight of the 24 nearly three tenths of an inch standing at about 29.5 but during the awful lull at 10 A.M. it was at 28.780 Inches - a most extraordinary and terrific depression - such as I never before heard of at this place - towards noon it had risen about half an inch, and at sunset was at 29.65 Inches.

that it had reached above the 10 month mark: -

measures were immediately taken by cutting the ends

"on of the banks for their relief" was a gentle man

of 7th p.m. The height of these two water marks will

be seen upon the longitudinal section of the hair.

"I find by calculating from the Contoured Map

that the quantity of water which flowed into the

be that the quantity of water which flowed into the
river during a recent period, at least some extent, pointed
towards the right, being given above, viz. 8 millions.

2. Sanctum in the eight boxes given above, was 48 millions.

of Cubic yards or 6 millions of Cubic yards in hour.

9. Through the courtesy of Mr. Rigdon I have

9. a. been enabled to examine the daily rain register of
 1871 & 1872, & to see, directly or indirectly, the
 effect of the rain on the crops, & the effect of the crops on the soil.

that period, and I find that where the breach took

place on the 3 of January, it could not have arisen

from any sudden accession to the quantity of water.

a in the Tank, for although 12 inches of rain fell, it is now as dry as dust, & will be so for some time.

in October and over 24 inches in November, but
Month

6 1/4 inches fell in December: In this ^{Month} there was

—in. *Wormwood*

Year	Month	Day	Time	Location	Event	Remarks
1901	Jan	1	10:00	St. Paul	Arrival	From New York
1901	Jan	2	10:00	St. Paul	Departure	To New York
1901	Jan	3	10:00	St. Paul	Arrival	From New York
1901	Jan	4	10:00	St. Paul	Departure	To New York
1901	Jan	5	10:00	St. Paul	Arrival	From New York
1901	Jan	6	10:00	St. Paul	Departure	To New York
1901	Jan	7	10:00	St. Paul	Arrival	From New York
1901	Jan	8	10:00	St. Paul	Departure	To New York
1901	Jan	9	10:00	St. Paul	Arrival	From New York
1901	Jan	10	10:00	St. Paul	Departure	To New York
1901	Jan	11	10:00	St. Paul	Arrival	From New York
1901	Jan	12	10:00	St. Paul	Departure	To New York
1901	Jan	13	10:00	St. Paul	Arrival	From New York
1901	Jan	14	10:00	St. Paul	Departure	To New York
1901	Jan	15	10:00	St. Paul	Arrival	From New York
1901	Jan	16	10:00	St. Paul	Departure	To New York
1901	Jan	17	10:00	St. Paul	Arrival	From New York
1901	Jan	18	10:00	St. Paul	Departure	To New York
1901	Jan	19	10:00	St. Paul	Arrival	From New York
1901	Jan	20	10:00	St. Paul	Departure	To New York
1901	Jan	21	10:00	St. Paul	Arrival	From New York
1901	Jan	22	10:00	St. Paul	Departure	To New York
1901	Jan	23	10:00	St. Paul	Arrival	From New York
1901	Jan	24	10:00	St. Paul	Departure	To New York
1901	Jan	25	10:00	St. Paul	Arrival	From New York
1901	Jan	26	10:00	St. Paul	Departure	To New York
1901	Jan	27	10:00	St. Paul	Arrival	From New York
1901	Jan	28	10:00	St. Paul	Departure	To New York
1901	Jan	29	10:00	St. Paul	Arrival	From New York
1901	Jan	30	10:00	St. Paul	Departure	To New York
1901	Jan	31	10:00	St. Paul	Arrival	From New York

Rain Fall in

	January	February	March	April	May	June
1803						1.73 0.16
4		1.05	0.03			0.65 0.34
5	2.35 0.03				0.34	0.55 0.85
6	0.23					
7				0.07	1.70	
11		0.05	4.68	0.15	16.38	0.56
13			0.13		0.12	0.18 2.10 0.60
14	0.08					
15	1.64					
16	0.10	0.73			0.20	0.45
17	0.35				0.20	0.11 0.05
18				0.60		0.74
19					2.55	
20			6.75	0.50	17.17	0.55 0.30
21	3.55 0.05		0.32	1.70		1.13
22	2.30			0.62		0.10 1.37
23	1.45		0.92		0.27	2.05
24	0.17 1.10				0.05	0.30 0.15
25	0.17				4.25	1.02 0.48
26					1.05	1.07 3.70
27	4.58 0.02	0.07			23.30	0.73 2.29
28	0.82 0.80		4.36	0.70 0.02	0.40	0.05 0.08
29	0.27 3.06	0.10	0.89	0.05	1.42	0.01 2.74
30			0.14	0.06	0.31	0.05 0.24 0.26 2.63
31	0.04		0.17		0.94	2.28 1.62
32		0.10			0.63	0.51
33	0.18				0.33	0.89 0.57
34	0.06			3.65	0.20	0.62 1.81
35	0.06			3.37	0.23	1.75 0.39 0.47
36		0.32		0.15		0.12 0.38

Madras Observatory for Sixty Years.

July	August	September	October	November	December	Annual						
0.24	1.46	0.21	0.62	3.74	3.95	10.4	10.55	7.63	22.79	0.37	11.60	66.09
0.37	0.38	0.85	2.32	0.91	0.61	3.59	8.82	4.52	1.41	5.26		31.11
1.91	0.75	1.09	2.31	1.28	2.14	4.15	2.31	4.84	1.32	2.79	2.80	31.21
2.70	0.65	11.10	0.18	1.55		23.70	7.20		7.30	2.70	1.00	61.51
0.12	1.38		1.05		2.28	3.02	1.48			1.25	0.30	25.65
	0.31	1.03		0.51	0.73	1.62	2.10	10.30	0.42	0.58	0.25	39.6
0.08	1.20	0.35	0.48	2.32		3.10	2.03	16.60	14.00	3.36	0.62	47.27
	1.59	3.76	1.15	2.42	6.07	3.05	4.05	0.97	5.75	1.64	2.07	32.6
5.17	1.30	0.27	0.53	0.90	2.00	0.24	6.02	9.30	23.88		4.80	56.03
1.57	3.50	3.38	1.83	3.70	5.35	1.15	5.13	9.60	2.72	1.45		41.16
1.45	0.15	0.55	2.92	1.60	6.07	2.18	17.34	12.25	12.08	2.40	3.85	63.55
1.95	4.80	0.98	5.47	2.52	2.87	6.24	11.64	11.56	14.06	6.50	1.27	76.2
3.28		0.71	0.39	13.19	1.70	1.10	1.90	10.42	0.25	0.71		36.33
0.74	2.68	1.87	1.07	0.60	1.10		11.84	0.67	3.52	5.42	7.00	61.78
2.48	1.02	2.33	0.85	6.72	0.58	0.68	7.85	10.40	0.95	0.75	3.60	42.6
0.25	0.30	2.10	4.60	2.35	0.08	10.20	10.37	10.45	10.95	2.50	0.77	59.6
0.30	2.57	0.15	3.00	3.87	0.53	2.75	7.65	0.80	0.10		0.20	26.6
0.03	0.22	1.95	0.70	0.32	0.15	8.10	6.25	4.60	5.67	0.13	3.82	33.71
0.69	2.67	1.20	6.47	1.07	2.43	1.95	15.52	11.08	0.03	4.92	2.43	56.0
0.95	1.15	0.90	6.72	2.07	0.25	0.20	0.62	17.29	8.75	5.23	5.82	58.7
1.65	3.25	0.38	1.90	3.50	0.94	1.12	12.59	7.74	14.38	5.76	0.22	88.4
1.85	1.52	5.59	1.71	4.72	1.00	8.32	0.88	1.79	0.82	0.29	2.17	37.89
1.29	0.48	1.10	1.84	1.06	1.93	5.75	0.40	4.28	4.71	5.37	0.12	36.87
4.15	3.05	0.55	2.18	2.70	1.57	1.24	4.98	0.17	3.70	1.45	3.00	32.4
1.28	1.85	1.60	7.90	4.89	2.31	3.12	6.23	0.24	7.69	0.68	1.51	44.3
0.66	0.89	1.57	0.69	2.23	5.48	1.27	4.01	0.07	0.34			18.45
0.40	0.77	0.17	6.94	2.42	1.52	2.88	6.81	8.31	1.66	0.21	3.06	37.12
4.05	3.03	0.28	3.82	4.70	0.17	5.34	1.70	1.31	6.65	1.31	0.30	39.00
2.43	2.88	0.75	2.26	2.17	1.09	6.56	3.12	6.58	4.38	1.33	0.24	40.00
2.11	2.49	5.46	3.54	0.29	0.65		8.51	1.05	17.59	0.84	1.18	44.4

Rain fall at Madras

Observatory for Sixty Years.

New Fall at Madras													
	January		February		March		April		May		June		
1837													
38			1.33		0.59		1.53	0.70		2.56		0.78	
39	0.09	3.25						0.77		0.54	0.17	0.91	
40							0.58	1.04		0.69	2.45	0.13	
41	1.99							0.03			0.23	0.25	
42	1.74							0.47	0.27	4.30	2.57	2.40	
43	1.82	4.68	0.02		0.74	0.28			0.34		0.43	0.98	
44	0.21	0.55	0.32				0.04		0.05	14.06	7.82	0.06	
45	1.64				0.02				1.00	1.66	0.01	2.72	
46	2.94			0.23				0.04	0.47	1.04	1.31	0.92	
47			0.22							1.34	0.54	1.54	
48								0.45		0.73	7.14	2.65	
49	2.50						1.16	5.22		0.10	1.09	0.77	
50		0.04	4.27					1.12		0.04	3.00	0.90	
51							0.98			2.94	1.08	1.84	
52									18.25	0.15	0.13	4.13	
53	0.15	2.10				2.62			2.21	0.01	0.44	1.45	
54	0.42		0.30			3.37	0.77				0.05	0.37	
55	0.74	0.20		0.68	0.26	0.09					0.43	0.42	
56				0.03				0.07			0.29	0.83	
57	0.32							0.01	1.59	3.92	0.10	0.42	
58				0.02		0.10		0.12		0.07	2.31	0.62	
59	0.62							0.83	1.99	1.04	0.32	1.31	
60							0.28	4.64	0.11	0.74	1.73	0.78	
61					0.16	0.88					0.63	1.12	
62	0.38	0.11				0.01				1.28	0.14	0.52	
63		1.95								0.60	0.42	3.25	
64						0.67		5.05		0.12	0.46	0.61	
65	0.20							0.23	0.03		1.78	0.17	
66								0.02	0.09	0.29	0.33	2.29	
			0.21						0.08		0.25	0.51	
Means	0.60	0.29	0.20	0.02	0.14	0.34	0.25	0.43	1.43	0.83	0.70	0.95	

July -		August		September		October		November		December		Annual
0.58	2.07	1.28	0.41	1.55	2.25	0.37	15.42	11.02	3.15	2.82	0.37	49.26
1.58	0.74	2.94	1.75		8.78	1.06	5.21	21.54	0.35	4.22		52.33
1.95	2.66	~~3.25~~	3.75	10.10	1.04		0.99	21.11	0.16			53.07
0.50	3.93	1.03	6.79	5.87	2.49	0.69	9.47	26.72	0.53		0.12	58.65
1.05	0.39	1.93	6.73	3.68	1.33	12.34	12.39	5.08	1.20	0.17	1.06	58.35
1.35	1.94	0.99	2.13	1.67	3.93	0.34	7.57	11.41	1.19	0.03	0.16	36.48
0.07	1.30	0.81	1.42	0.75	3.45	4.15	2.16	5.27		7.10	0.49	50.28
0.81	2.56	1.23	1.49	3.86	8.65	10.75	3.14	2.38	1.01	6.33	16.48	65.36
0.99	1.91	1.69	0.26	2.15	1.90	3.01	0.29	1.12	3.79	5.69	9.41	37.65
7.34	1.78	4.47	0.21	0.86	0.06	2.51	28.08	1.04	18.35	3.60	3.30	78.19
0.97	2.12	6.12	3.59	0.47	5.40	5.48	10.84	13.42	5.24	20.51	1.64	80.99
1.24	2.63	3.42	1.71	0.56	2.53	4.16	9.77	7.14	10.15	3.11		54.76
1.05	2.53	2.85	2.04	1.48	0.17	9.18	0.01	1.44	4.70	0.29	6.71	39.81
0.24	1.29	1.36	1.70	2.89	0.15	1.95	2.37	4.31	3.81	5.47	0.19	36.88
3.67	2.83	2.90	1.44	0.33	1.36	5.06	0.57	19.57	5.28	1.39	0.06	64.32
2.04	5.96	0.86	1.40	6.49	0.29	9.40	11.20	10.59	8.81	5.78	3.14	72.69
3.64	0.50	1.27	0.11	1.57	0.66	0.35	8.72	11.88	0.11			35.82
2.46	1.84	6.16	0.89	4.80	1.57	0.32	9.90	3.28	6.00	1.83	2.19	43.20
0.40	2.29	0.55	1.10	2.36	1.39	6.60	4.01	0.92	0.55	7.10	1.98	32.32
1.20	2.12	0.50	5.18	0.51	0.55	2.39	1.49	2.92	14.05	9.70	0.01	46.99
0.81	1.58	0.55	0.37	0.29	1.26	10.20	27.53	4.61	1.21	0.56	0.44	52.95
2.08	1.00	1.64	0.47	2.82	0.79	10.12	1.95	13.89	8.23			48.50
6.85	1.19	1.03	1.43	3.32	5.24	2.11	5.61	4.25	15.21			55.14
0.34	1.73	0.53	1.94	1.79	3.18	2.71	11.36	0.86	1.22	0.03	0.20	27.64
2.19	0.99	4.33	3.55	2.51	6.74	0.02	1.52	12.32		0.04		37.19
4.23	0.30	3.82	0.74	0.84	2.76	1.43	6.77	1.59	3.93	4.69	2.31	38.18
6.30	0.77	1.75	1.39	1.83	1.21	5.31	11.78		2.03	13.34	0.04	54.61
1.16	1.04	3.93	3.39	0.46	0.37	0.97	12.79	2.37	16.11	1.59	0.84	47.23
1.42	0.60	3.65	3.54	0.27	1.01	0.64	5.18	3.01	14.75	5.57		41.86
0.25	1.22	0.89	3.25	1.48	0.99	6.19	2.51	3.33	8.60	20.54	1.26	51.39
1.75	1.78	2.05	2.33	2.46	2.12	3.89	7.01	6.94	5.96	3.48	1.94	47.82

13 21
no rain; from the 17th to the 21st, $2\frac{1}{2}$ inches fell between the 22^d and 26th, and none at all from that date to the end of the Month. There was no rain in 1818 until the Month of April; so that the breach must have occurred from the foundation of the sluice having gradually succumbed to the pressure of the water, which shows how carefully the sluices of large Banks should be watched:

There has been no breach in the Bank of this Bank since 1818:

Rain fall
since 1803

I have considered that it would be useful to place on record for the purpose of easy reference hereafter, the half monthly rain fall at Madras from the earliest period it has been registered:

For this purpose Mr. Pogson has kindly permitted me to include in my report the following Table. —

Reasons for 10 I have been enabled to give this sketch of so much
Marling
the enquiry of the History of Chembrambakkam Tank through the

the kindness of the Acting Collector Mr. Lockwell
who had the old records of his office examined for
the purpose. I was induced to seek this information
in proposing to increase the head of water
in the Tank by 15 feet, a very important question
arises as to whether the foundations of the sluices
are sufficiently sound to bear the additional
pressure. I had heard, when making enquiry on
the ground, that the Heads of all the sluices had
been reconstructed according to plans prepared by
Colonel D. Hailland and under his superintendence
and it is satisfactory to know from the records of the
period, that they were reconstructed by so skilful
cautious and careful an Engineer as he was.
Had I discovered that this was not the case...

From
interview
with Mr. Hailland

I should have hesitated to build the necessary additions upon the old work: and I regret that I have not done so. There are only 10 sluices included in Col. De Havilland's estimate. The 11th one was partially constructed since that time. On inspecting it, I decided on reconstructing its head, as also that of the 10th sluice:

In April 1820, the foundations of the Chetty sluice No. 10 showed signs of weakness, but from a report of Lt. Genl. Simms, who was then Civil Engineer of the Central Division, I was led to believe they were carefully repaired under his superintendence. I supposed that several propositions

had been made from time to time for the enlargement of Chimbrambakam Tank, but the only one of which I can get any record was made by Colonel Lawford R.E. towards the

former proposition for enlarging the Tank.

end of 1857 or the beginning of 1858. I have been unable to procure Colonel Lawford's Report, but this is of the less importance as I find from a letter of Mr. Sir J. Shurbuck, then the collector of the Madras District, No 162 dated 14th June 1858, written in opposition to the scheme, that Colonel Lawford proposed to increase the quantity of water in the Tank by 20 millions of cubic yards*, but that no surveys had been made and no plans prepared.

* In another place the additional quantity is stated to be 74 millions

13 Chembrambakkam Tank is so well known that Description
of Tank. -
I need not occupy much space in describing it.

The Bund which is about 7,100 yards, or four miles, and sixty yards in length, runs for the most part in a nearly north and south direction, the north end resting upon the high ground which lies on the south side of the Bangalore road and about 3 miles west of Poramals; and the south end running out upon a ridge of Gneiss Rock near Sirrukallattur on the old road to Bangalore.

The extreme west end of the Tank is crossed by the present Bangalore Road between the 19th and 20 miles.

14 The greater part of the land around the Tank and in the bed is waste. Close

around the Margin of the present limits there are twelve or thirteen small Tanks, and under

under these small patches of land mostly in the bed of the Tank, are irrigated. See the Map, Sheet No. 2, upon which these Tanks and lands are shown. When the main Tank is full the greater part of those lands is swamped, but as the water exceeds the Mercantile extent, the Cultivation of all the cultivated lands within the limits of the proposed extension, will of course be under water when the Tank is filled to its proposed height, and must be purchased, but it will not cease to be available for Cultivation and in 1898 the small Tanks will still be filled either as they are now, or independently of local rains, by being submerged in the main Tank; and as the water recedes, the land can be cultivated as it is at present. The crops however may not be so valuable as they are now as they will probably be produced later in the season.

For this reason, that the land will still be available either for cultivation or grazing, the amount of damage done by enlarging a tank is not so great as it is generally supposed to be. Besides receiving the rain fall from the Laterite Hills which nearly encompass it on three sides, Chembrambakkam Tank is now supplied with water from the Palur and the Corallier.

The Supply Channel which was cut from the Palur Unnithat to the Permatu Tank (see sheet No 1) was intended to convey the Palur water so far. But I am informed, that until the time of the last monsoon when a Dam at Malazur was destroyed, no Palur water had ever reached

* Note. This channel is known by different names at different parts of its course: Near the Permatu Tank it is called the Kambal. —

Present
Supply.

deep water. There is a direct surplus Channel from the Permatu into Chembrambakkam Tank, which gets also the surplus water from Piliyakkam Tank. On the north side there is a regular system of supply from the Corallier across which a Dam is built at Kesavaram from whence a channel, The old Bungairo, connects the River with the surplus Channel from the Permatu Tank.

These two Channels from the head of the Kiam River.

At Horatur a Dam is built across the Kiam for the purpose of sending the water by the new Bungairo Channel to Chembrambakkam Tank.

As the Kiam Tank has lately been supplied with water from the Palur, Chembrambakkam is thus

supplied and now supplied with Palur water on two sides.

It

It receives also the surplus water of *Chamambakkam* of nearly all the other Tanks which lie on the south of the *Thamir* and west of the new *Bungairi* Channels. It is, in fact, most favourably situated for receiving an abundant supply of water for the *Thamir*. Sheet No. 1 will show that it must get the surplus water from nearly all the Tanks and the lands which lie within the *Thamir* *Kanal* on the south. The *Piny* River and the *Cottiar* on the west, and the *Thamir* and *Bungairi* Channels on the north and east.

The area of this tract of country is about 400 square miles, or 1236 Millions of square yards, over which about 16 inches in depth of rain in the year would yield the additional 14 Millions of square yards, which I propose to store in *Chamambakkam* Tank. This would probably not be one tenth or one twelfth of the

of the

of the Annual Rain falls within the limits of this area there are about 320 Irrigation Tanks. Many of these, however, are but partially supplied by local rains, as the *Piny* and *Palar* waters are now made available for this purpose; and it is probable that their use will increase, as the Channels and Tanks become better regulated.

19 The surplus channel from *Thamir* *Kanal* and *Pillipakkam* Tanks requires rectification on a long ground it is embanked on the lower side and the water spreads on the upper side, occasioning accumulations of sand, which lead to the bursting of the banks and consequent loss of water.

Old *Bungairi* Channel

The old *Bungairi* Channel, that which connects the *Cottiar* with the surplus Channel from the *Thamir* Tank, and which is about 6

miles in length, is also of great need of improvement:

The upper part is too narrow, and lower down, it is too shallow and thus the water is prevented

from passing down the channel freely, so that when

there is a tolerable fresh in the river the water passes

over or breaches the dam, the latter of which occurred

last year. The dam has been repaired and is

an estimate framed by the Executive Engineer

for removing the obstructions in the channel.

The channel of the Kuvam is tolerably free from obstructions to Horatur Dam at distance of

about 14 miles. The Kuvam River.

Along the reach of the River 19 supply channels

are taken off 14 to Tanks on the North and

5 to Tanks on the South side. Off the new channel 23

New Bungairoo Channel & Tanks are supplied.

In the following Table is given a statement of these

supply channels, showing that 5 only have Head Sluices.

Statement of supply channels taken off the old Bungairoo channel and the Kuvam River between Horatur and Horatur Amicuts

No.	Name of Channels	Taken off		Remarks
		North side	South side	
1	Gondanary channel	.	1	No Head Sluice
2	Pinjibetram S.	.	1	S. S.
3	Athigathore S.	.	1	S. S.
4	Agamy S.	1	.	S. S.
5	Kasam nullators S.	1	.	S. S.
6	Madumbathore S.	1	.	S. S.
7	Yagalore S.	1	.	S. S.
8	Pongatore S.	1	.	S. S.
9	Galay S.	1	.	S. S.
10	Puyacoppam S.	1	.	S. S.
11	Pooliyancoppam S.	1	.	S. S.
12	Cacalore S.	1	.	Head Sluice & Shutter
13	Pootlora S.	1	.	No S. S.
14	Thumucolam S.	1	.	S. S.
15	Thilovoor S.	1	.	S. S.
16	Thionoor S.	1	.	S. S.
17	Anuvoyal S.	.	1	S. S.
18	Goodpattaram S.	.	1	Head Sluice & Shutter
19	Thimucure S.	1	.	S. S.
Total channels both on N. & S.		--- 19		

Supply channels taken off the New Bungairoo channel between Horatur Amicut and Chembambakram Lake

No.	Name of Channels	East side	West side	Remarks
1	Kadonjary channel	1	.	Head Sluice & Shutter
2	Perumbet S.	1	.	No S. S.
3	Thoomalishy S.	1	.	Head Sluice & Shutter
4	Manambidor S.	1	.	No S. S.
Total channels		4	.	

From the absence of Head Sluices the supply to these tanks cannot be regulated. I believe the Superintendent Engineer has directed an estimator to be prepared for this work, which must be done and the sluice put under proper control. If Chumbrambakkam is enlarged - still for 1904 still

Koratun Dams.

From the absence of Head Sluices the supply to these tanks cannot be regulated. I believe the Superintendent Engineer has directed an estimator to be prepared for this work, which must be done and the sluice put under proper control. If Chumbrambakkam is enlarged - still for 1904 still

21. Koratun Dam which turns the water down to Chumbrambakkam is 392 feet in length and 3 feet in height above the bed of the river. Near the north end there are 8 openings for sluices amounting to 24 1/2 feet in width; and near the south end, 11 openings, amounting to 55 feet in width. At this end there is a solid mass of masonry work 10 feet in length, and nearly 2 feet in height, which separates the Dam from the Head Sluice of the new Bangalore Channel. It is now still to

22 The Head Sluice consists of 3 bays or heads, each bay being divided into 3 semicircular headsluices.

Sluice	Length	Width	Height	Area	Volume	Remarks
1	10	10	10	100	1000	
2	10	10	10	100	1000	
3	10	10	10	100	1000	
4	10	10	10	100	1000	
5	10	10	10	100	1000	
6	10	10	10	100	1000	
7	10	10	10	100	1000	
8	10	10	10	100	1000	
9	10	10	10	100	1000	
10	10	10	10	100	1000	
11	10	10	10	100	1000	
12	10	10	10	100	1000	
13	10	10	10	100	1000	
14	10	10	10	100	1000	
15	10	10	10	100	1000	
16	10	10	10	100	1000	
17	10	10	10	100	1000	
18	10	10	10	100	1000	
19	10	10	10	100	1000	
20	10	10	10	100	1000	
21	10	10	10	100	1000	
22	10	10	10	100	1000	
23	10	10	10	100	1000	
24	10	10	10	100	1000	
25	10	10	10	100	1000	
26	10	10	10	100	1000	
27	10	10	10	100	1000	
28	10	10	10	100	1000	
29	10	10	10	100	1000	
30	10	10	10	100	1000	
31	10	10	10	100	1000	
32	10	10	10	100	1000	
33	10	10	10	100	1000	
34	10	10	10	100	1000	
35	10	10	10	100	1000	
36	10	10	10	100	1000	
37	10	10	10	100	1000	
38	10	10	10	100	1000	
39	10	10	10	100	1000	
40	10	10	10	100	1000	
41	10	10	10	100	1000	
42	10	10	10	100	1000	
43	10	10	10	100	1000	
44	10	10	10	100	1000	
45	10	10	10	100	1000	
46	10	10	10	100	1000	
47	10	10	10	100	1000	
48	10	10	10	100	1000	
49	10	10	10	100	1000	
50	10	10	10	100	1000	
51	10	10	10	100	1000	
52	10	10	10	100	1000	
53	10	10	10	100	1000	
54	10	10	10	100	1000	
55	10	10	10	100	1000	
56	10	10	10	100	1000	
57	10	10	10	100	1000	
58	10	10	10	100	1000	
59	10	10	10	100	1000	
60	10	10	10	100	1000	
61	10	10	10	100	1000	
62	10	10	10	100	1000	
63	10	10	10	100	1000	
64	10	10	10	100	1000	
65	10	10	10	100	1000	
66	10	10	10	100	1000	
67	10	10	10	100	1000	
68	10	10	10	100	1000	
69	10	10	10	100	1000	
70	10	10	10	100	1000	
71	10	10	10	100	1000	
72	10	10	10	100	1000	
73	10	10	10	100	1000	
74	10	10	10	100	1000	
75	10	10	10	100	1000	
76	10	10	10	100	1000	
77	10	10	10	100	1000	
78	10	10	10	100	1000	
79	10	10	10	100	1000	
80	10	10	10	100	1000	
81	10	10	10	100	1000	
82	10	10	10	100	1000	
83	10	10	10	100	1000	
84	10	10	10	100	1000	
85	10	10	10	100	1000	
86	10	10	10	100	1000	
87	10	10	10	100	1000	
88	10	10	10	100	1000	
89	10	10	10	100	1000	
90	10	10	10	100	1000	
91	10	10	10	100	1000	
92	10	10	10	100	1000	
93	10	10	10	100	1000	
94	10	10	10	100	1000	
95	10	10	10	100	1000	
96	10	10	10	100	1000	
97	10	10	10	100	1000	
98	10	10	10	100	1000	
99	10	10	10	100	1000	
100	10	10	10	100	1000	

26. The width of the head openings is 22 ft in width, and about 7 ft in height.

in extreme height. The whole waterway is 46 ft 6 inches in width by 7 ft 4 in height, but the area is diminished by a horizontal stone laid along the face of the sluice 12 in height with its under surface at the level of the springing of the small arches.

Under the floor of the Head sluice there is a small under sluice 3 ft 2 in height and 2 ft 6 in width for drawing off spring water from the deep bed of the River.

The highest flood known at the Head sluice rose to the top of the cross stones, at which time, there must have been a depth of water passing over the Dam. The bed of the River at the Dam is greatly affected as is also the Channel to the Head sluice.

Whether Chinnambakkam Tank be enlarged or not, there are certain alterations and improvements which should be made, but they would be imperatively necessary if the Tank were increased in Capacity.

The Dam should be raised 1 1/2 or 2 feet, and another set of sluices put in the middle. These, as well as the present sluice openings should be provided with proper gates, which could be raised to any required extent, so that the sand which now accumulates above the Dam might be removed by the under current.

During the freshes a few Coolies with Rakes could dispose of the sand with the gates only slightly raised. This arrangement of gates would involve the construction of a gang-way or Foot Bridge over the Dam. This Foot Bridge would be a great convenience.

Proposed works at Kolatur enlarged

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not only to the parties in charge of the Dam and
 in Sluices, but also to the villagers on both sides of the
 River, which is impossible during floods.
 is 25 The Head Sluice is not conspicuous enough.
 Another Bay of 3 openings should be added at
 the south end, and the cross stones should be
 removed, so as to leave the whole area of the openings
 available for the discharge of the water.

To these openings proper sluice gates should
 be fitted to work with screws, so that they could
 be opened or shut readily to any extent as occasion

required. I had the advantage of examining Floratur
 Dam, The Kuam, and the old Bungairo channel
 to Kesavaram Dam on the Corbelli, with Colonel
 Boileau, R.E. the Superintending Engineer, and
 I think we are agreed as to the necessity for
 executing the works I have suggested.

New Bungairo Channel - 26. The new Bungairo Channel from Floratur to
 Chembrambakkam Tank is ^{very} greatly obstructed
 throughout its course. Its length is about 7 1/2 miles
 and its entire fall from the floor of the Head Sluice
 to the level of the Kalingula is 2 1/2 feet or an average
 of 3.30 feet per mile, a fall which is sufficient if it were
 properly distributed. ^{At} Vellavetty Chuttram a bridge of 3
 arches crosses the Channel. I have not seen this
 bridge during a flood, but I am of opinion from the
 information I received at the place regarding the
 head of water it creates, that it is not of sufficient
 capacity to discharge even the present required
 supply.

As it approaches the Bridge by which it is
 crossed by Trunk Road No. 1, the Bungairo ceases
 to be a Channel at all, and the water flows across
 the fields in a natural hollow. Here it is

Joined

- 20 -

Ch. 10

1947

Capacity

of Tank.

1

100

14.

1990

1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 26

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Table Shewing the Capacity and Area of the Basin
Contour line, on the Plan No 2

No of Contours Yards	Area at each Contour in Sq ^{rs} Yards	Average area of each Pair, average Cubic yards between each pair of Contours	Total No of Cubic Yards at each Contour	Area in Sq ^{rs} Miles
7	40,812,468		272,396,301	13.185
6	37,651,048	39,296,758	233,099,513	12.155
5	34,800,188	36,225,618	196,873,925	11.234
4	32,404,203	33,602,195	163,271,730	10.461
3	30,293,288	31,348,746	131,922,984	9.779
2	27,731,000	29,012,144	102,910,840	8.952
1	22,496,201	25,113,600	77,797,240	7.262
0	21,887,356	22,191,778	55,605,462	6.715
1	18,561,279	20,224,317	35,381,145	5.992
2	15,527,693	17,054,486	18,326,659	5.019
	13,487,466	14,839,193	13,487,466	4.354

in which Chembambakkam Tank is situated at each

Area in Acres	Circumference in Miles	Remarks
8438.526	23.325	Highest Contour Surveyed
7779.142	22.324	
7190.121	21.275	Level of Proposed Kalingula
6695.083	20.525	
6258.943	19.375	
5729.545	18.575	
4647.975	17.375	Level of Top of Dam Stones
4298.035	16.093	Level of the 3 Kalingulas at the South end of Bund
3834.975	14.487	
3212.333	13.606	
2786.666	11.037	Capacity between the 11th and 12th contours Level of Water Surface when the Survey was made

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33
Halingulas 28 There are six Halingulas to
Cheruvamalakham Tank, five of them being near the
south end, and one near the north end of the Bund as
follows, counting from the south end as was done

	Length	Width of Dam
	feet	Stones
1. Vellumadday Halingula	58	23
2. Roorinteyal	115 1/2	39
3. Thattan	46	18
4. Nalliaman	223	48
5. Poniaman	61	20
6. Vellumadday		

1 x 2 x 10	10 - 1	Total length in feet to the end of the Bund	643 1/2	164
2 x 2 x 10	10 - 1	Deduct the aggregate width of the Dam stones	82 1/2	2
3 x 2 x 10	10 - 1	Total Clear length	561 1/2	feet
4 x 2 x 10	10 - 1			
5 x 2 x 10	10 - 1			
6 x 2 x 10	10 - 1			
7 x 2 x 10	10 - 1			
8 x 2 x 10	10 - 1			
9 x 2 x 10	10 - 1			
10 x 2 x 10	10 - 1			
11 x 2 x 10	10 - 1			
12 x 2 x 10	10 - 1			
13 x 2 x 10	10 - 1			
14 x 2 x 10	10 - 1			
15 x 2 x 10	10 - 1			
16 x 2 x 10	10 - 1			
17 x 2 x 10	10 - 1			
18 x 2 x 10	10 - 1			
19 x 2 x 10	10 - 1			
20 x 2 x 10	10 - 1			

Of these Halingulas, numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 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1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 191

...of the usual description found in first class tanks,
with a needlessly heavy mass of masonry at the head,
and vents stopped with posts or Plugs of timber in the
ordinary way.

The following is a statement of the dimensions
counting from the South end:

Number from South end	Name of sluices	Bottom of Culvert below present Kalingula feet	Dimensions of Culvert Feet
1	Palanthandilam		
2	Kavanur	14-50	56 x 2 x 4
3	Therumaddivakam	14-30	65 x 2 x 4
4	Kudatur	17-50	54 x 2 x 3-3
5	Mangadu	19-	59 x 2-9 x 6-1
6	Manapakkam	16-	116-6 x 2 x 4-3
7	Chetty sluice	21-75	81-6 x 2 x 5-3
8	Maragambakkam	13-30	125-3 x 2 x 3-5
9	Pommalu	9-40	61-9 x 2-3 x 3-3
10	Alaypur	8-70	63-9 x 3-6 x 2-6
11	Agaram	8-30	53-6 x 1-6 x 2-3
		3-75	52 x 1-6 x 2-3

It is said that in 2 or 3 of these sluices the culverts are leaky.
They were not leaking when examined them, but at
that time the tank was not more than one fourth full.

30 The Tank Bund is revetted on the water side
for the

...for the greater part with undressed blocks of granite
the remainder with laterite stones. The thickness
of the mass of stone ranges from 2 to 2 1/2 feet,
and is generally loosely put together.

The greater part of the Bund is covered
with Palmyra and other trees. The Northern
portion has lately been raised and repaired at a
cost of I believe, ten thousand Rupees.

Land now
Irrigated. 3 1/2. Melchimbakkam has always been highly
valued as an Irrigation Tank, as the Cultivation
of a large portion of the Irrigated land lying
on the west of Madras depends on it. It
irrigates the whole or parts of 58 Villages, (the
Nudjas Ayakats of which is 8,604 Cawdis),
valued at Rs. 8,604 Rupees. This includes

* Punja Ayakat - means the whole or greatest quantity of
land in a village, or under a Tank, supposed to be capable of
being irrigated with the ordinary full supply of water.
The Punja Ayakat - means the greatest quantity of land
under dry cultivation.

1163. Quantities of Enam Land assessed at 10,190 Rupees:-

Very seldom, however, has there been sufficient

water to irrigate the whole Ayakat:-

I have obtained from the Tahildars, Catechings,

such information as has enabled me

to give the following Table showing

the number and names of the

Villages in the Ayakat in each

of the Catech and Enam lands; the

average area irrigated during the

last 14 years; and the number of

Cawnies in each Village under dry

cultivation or of waste land, or of

barren land which could be converted

into wet cultivation if there was sufficient

water supply.

The average area irrigated during the last 14 years

will be seen from Column 8.

the average area irrigated during the last 14 years

was only 4345 Cawnies, or little more than one half of

the Ayakat; and even over this area there was generally

but one crop obtained in the year:-

The average annual Revenue received during these

14 years was 38,975 Rupees, but this includes a

period at which the assessment was much higher

than it is now. If we take the average number

of Cawnies cultivated at the present rate the

average annual Revenue will be 21,725 Rupees

I cannot help expressing the opinion that the

diminished Revenue is greatly due to the supply

channels and other subsidiary works not being kept

in proper order, and to the reckless waste of water by

the Cultivators. I have no doubt but that if the channels

dams and Head Sluices were put into proper

condition; and the Tank Sluices altered and put

under proper control, there could be water enough

for the whole Ayakat:-

Statement of the Ryakut assessment of the 58

Registered Number of Village	Names of Villages under the Sante	Circar lands	
		The ayacut of each Village	The Assessment of each Village
1	2	3	4
156	Mangadoo	423	3566
157	Matavelagam	37	261
158	Poigoonathapuram	40	326
159	Chikkaroyapuram	44	315
160	Olagamkathavelagam	34	227
161	Kellaproomalpattagarani	13	114
162	Nalamenttalay	41	255
167	Malayambakkam	312	2429
163	Chinnapumichaiy	29	225
168	Satham pallam	4	28
169	Kalacatorchary	39	372
170	Malaproomalpattagarani	38	311
171	Vellanthalangal	25	181
172	Holimanybakkam	97	752
173	Siryanthalangal	3	24
176	Channampully	30	210
177	Catorpakkam	94	633
178	Ponparappu	39	282
179	Thiruviruthavelagam	7	45
180	Sturivassapuram	74	582
183	Paranypothoor	69	542
196	Coornathoor	1258	8532
197	Vengatapooram	48	366
198	Thiradannuram	31	239
199	Manerjary	79	678
200	Opplachary	49	361
201	Malayadychary	12	91
	Carried over..	2969	21947

Villages irrigated from Chembambakkam Sante

Irrigated lands		The average number of Canones under cult. in the last 10 years	The number of Canones of other dry cultivation waste in each village that could be converted into wet cultivation	Remarks	Total
Ayacut	Assessment				
5	6	7	8		
15255	1723-8	127-4	1	und irrigated	1
705-11	86-12	29-6	2	und irrigated	2
1548	104-7	34-7	2	und irrigated	2
1613	126-8	33-1	15	und irrigated	15
5234	28-4	27-15	1	und irrigated	1
8221	73-11	9-4	0	und irrigated	0
9301	55-4	32-0	4	und irrigated	4
1219	102-5	129-9	266	und irrigated	266
8221	39-7	25-11	0	und irrigated	0
2131	0-0	3-11	0	und irrigated	0
230	0-0	7-12	0	und irrigated	0
202	43-12	29-9	8	und irrigated	8
1769	127-9	13-11	0	und irrigated	0
17511	215-7	67-0	0	und irrigated	0
721	0-0	2-8	2	und irrigated	2
1106	46-8	16-6	44	und irrigated	44
2254	138-15	66-7	34	und irrigated	34
2221	39-4	24-1	2	und irrigated	2
7052	6-6	6-15	0	und irrigated	0
1724	104-1	147-14	0	und irrigated	0
7832	152-6	53-3	0	und irrigated	0
9280	744-12	612-15	76	und irrigated	76
8229	41-5	35-11	12	und irrigated	12
8219	32-5	19-10	0	und irrigated	0
9171	115-8	59-4	4	und irrigated	4
2916	43-9	30-5	13	und irrigated	13
3012	42-6	8-2	11	und irrigated	11
4557	458-0	773-9	0	und irrigated	0

Stat. malabar malabar malabar malabar

Registered number of Village	Names of Villages under the Stat.	Circar Lands			
		The agent	The agent	The agent	The agent
1	2	3	4	5	6
202	Brought over	2969	2194		
207	Moanacuttalag	16	15		
208	Govoor	283	210		
209	Poothavado	9	8		
203	Ponparappu	22	25		
204	Sirocala Moor	217	1653		
205	Govanon	142	1812		
206	Palanthandalam	78	3612		
248	Shiroomoodrakram	604	1287		
9	Nunthumbakram	219	764		
70	Mathanunthapozham	161	914		
71	Suppenthagol	134	914		
64	Colathorinjady	97	122		
65	Mainappakram	27	137		
66	Ettivaly	21	164		
67	Mittanamilly	17	155		
74	Punnavado	28	95		
75	Thundlam	47	52		
90	Peyapannicharay	69	469		
91	Reddancuttalag	101	401		
152	Tharappurukkam	106	2932		
153	Pontheumally	32	35		
154	Agraharam	47	44		
155	Mooppathooratty	30	251		
166	Mappoor	902	492		
250	Agaram	60	20		
	Thombady	32	20		
	Canis Siam	6897	956		

Inam lands		The average number of Cawnies under wet cultivation for the last 14 years	The number of Cawnies of the dry Cultivation for waste in each village that could be converted into wet cultivation	Remarks
5	6			
4832	4538	1763 - 9	582	
688	69-1	49 - 12	57	
5933	555-15	162 - 1	40	
2-20	25-12	9 - 8	4	
1-13	13-9	10 - 10	10	
3578	284-4	438 - 4	134	
19-9	159-7	74 - 14	33	
42-13	564-11	287 - 11	60	
385-2	334-14	388 - 11	15	
23-14	186-8	117 - 6	44	
19-14	181-5	95 - 12	3	
24-15	153-10	85 - 14	34	
40-3	203-7	39 - 4	2	
27-5	390-11	80 - 7	94	
3-5	21-11	9 - 14	7	
1-7	4-6	10 - 6	4	
9-10	51-3	10 - 15	131	
9-13	105-11	89 - 15	2	
14-5	125-14	55 - 6	4	
20-8	195-2	86 -	44	
12--	79-11	72 - 11	35	
86-6	873-10	174 - 15	87	
6-13	62-2	21 - 13	7	
2-10	15-15	16 - 5	2	
12-6	102-9	46 - 12	10	
9-3	106-8	32 - 9	15	
7-4	36-7	14 - 1	6	
1023-1	944-15	3945 - 5	1456	

Registered Number of Village	Names of Villages under the Tank	Circular Cauds	
		The amount of each Village	The Assess. of each Village
1	2	3	4
	Brought over	2,44,04	2,44,04
	Garagumbat Kaim	1,371	2578
	Candigg	1,421	3132
	Chithathore	1,421	2435
	Maroolisat Kaim	1,102	2271
	Mogalivat Kaim	1,277	9602
		1,111	1,111
	Total Villages 58	7,44,11	5,36,52

Indian Lands		The average number of Cawmies under wet Cultivation for the last 10 years	The number of Cawmies of either dry Cultivation or waste in each village that could be converted into wet cultivation	Remarks	
Agent.	Assess. ment	5	6	7	8
1023-1	9441-15	3945-5	1456		
93-14	508-8	235-2	40		
6-2	45-12	33-4	.		
3-4	7-5	19-12	18		
16-11	80-8	27-15	20		
20--	105-14	86-4	.		
1163--	10189-14	4347-10	1534		

It is proposed to enlarge the Lake by placing the new Kalingula 15 feet above the level of the present Southern Kalingula. This would be 12 feet above the top of the Dam Stones, to which height the Mercedians are permitted to raise the water when they so desire; but it is evident from what has been already stated that during the last 14 years, the average height of the water has but little exceeded that of the 6 months mark, & above which the proposed height is 19 feet, or equivalent to an additional quantity of water of nearly 200 millions of Cubic yards. But we will take the level of the present Kalingula as our starting point. It is said

Handwritten notes and a table of numbers, likely a ledger or account book. The text is mirrored and difficult to decipher, but appears to contain financial or inventory data.

12.21	2-21.52	2-11.15	1-22.11
12	2-21.52	2-11.15	1-22.11
11	2-21.52	2-11.15	1-22.11
10	2-21.52	2-11.15	1-22.11
9	2-21.52	2-11.15	1-22.11
8	2-21.52	2-11.15	1-22.11
7	2-21.52	2-11.15	1-22.11
6	2-21.52	2-11.15	1-22.11
5	2-21.52	2-11.15	1-22.11
4	2-21.52	2-11.15	1-22.11
3	2-21.52	2-11.15	1-22.11
2	2-21.52	2-11.15	1-22.11
1	2-21.52	2-11.15	1-22.11

34 By referring to the Table of Height of Capacity at page 31 it will be seen that Kalingula at the level of the Kalingula the capacity of the Tank is 58,605,462 Cubic yards, and that at the 5th Contour or 5 yards above the present Kalingula the Capacity is 15,973,925 Cubic yards. This is the height at which I propose to place the new Kalingula, thus giving an additional quantity of water equal to 14 Millions of Cubic Yards. The Table will show that if the new Kalingula were placed one yard higher, the quantity would be increased by 36 millions of Cubic yards, and if 2 yards higher, at the 7th Contour, which is the highest one surveyed.

1181

There would be an additional quantity of over 75 Millions of Cubic yards. I stopped at the 5th Contour because if raised higher, the water would swamp portions of several villages and herds. I considered it safer to feel our way as regards the probable quantity of water available. If the experience of a few years shows that with the Kalingula at the 5th Contour, a certain quantity of surplus water passing away it will be a very simple and inexpensive matter to increase the height to such an extent as will receive the whole or a portion of the surplus. The principal expense attending any increased heights would probably be the necessary

1182

Compensation for damages, as the quantity of material required for the additional work would be trifling.

3. The Bund is proposed to be raised to a height of 6 feet above the new Cadungula. ^{road} over this there will be a rough stone Parapet 2 feet higher. I consider the Parapet necessary as with so great a water area as $11\frac{1}{4}$ square miles, the wash upon the Bund with strong westerly winds will be considerable.

The top width of the Bund at the bases of the Parapet will be 9 feet, or 6 feet clear of the Parapet.

4. This width is sufficient for the stability of the Bank, but as ^{upon top of Bund}

Bund

the

the Bund almost connects the old and new Baingaloo Roads, and as it lies in the line of a considerable amount of Bandy and other traffic between a large number of Villages, and as the present road is often impassable, having to cross Rice fields ^{as a rule} and ^{supplies} ~~Supplies~~ Channels, it seems desirable that the Bund should be made to serve the purpose of a Public Road.

I have consulted the Superintending Engineer on this point, and he agrees that a road along the top of the Bund would be very useful. To accomplish this the top should be widened as shown in cross section No. 4 Sheet No. 4 which would add about 7000 Rupees to the Estimate.

38. The inner or revetted slope of the Bund is proposed to be $1\frac{1}{2}$ to 1; The outer slope, which is to be surfed, is to be $2\frac{1}{2}$ to 1; ~~which will be found~~ I have already mentioned that ^{the} greater part of the Bund is covered with ^{Palmyra} ~~Coccoloba~~ and other trees. I have ascertained that old ^{Palmyra} ~~Coccoloba~~ trees may have their stems covered up with earth for 10 or 12 feet without suffering any injury. Many of those on this Bund were so treated some years ago, and they are now healthy and vigorous. All such trees as can bear this treatment is proposed to leave standing, but all others are to be dug out by the roots.

39. The manner in which the Bund

is to be

is to be enlarged is shown on the cross sections; sheets N^o 4 to N^o 9. For a more particular description as to how all the work is to be done, see the general

Specification.

Sluices to 40 The sluices are proposed to be ^{be} altered, altered as shown on Plans N^o 10 to 21.

It is said that the present sluices are too small for the irrigation of the whole

Ayakut river if there were water enough.

I am of opinion that when the obstructions in the way of cross and covering stones are removed, and when altered as shown in

detail on sheet N^o 21 they will be found

capacious enough.

The present system of closing the sluices with timber plugs is to be abandoned.

It is proposed to have all the sluices closed with grooves

Grooves are to be cut in the sides of the culverts, and proper sluice gates, worked with screws, as shown on Plan N^o 21 are to be substituted.

As it may be found necessary to provide more sluicing power than at present exists, the cost of two additional sluices with culverts 4 feet by 3 feet is included in the Estimate. These, if found necessary, can be built at such places as may hereafter be decided upon.

The present six Kalingulas are to be removed, and their sites filled up uniformly with the rest of the Bund. The cost of their removal is not included in the Estimate because the materials, which can be used up in the new Kalingula and in the additions to the sluices, will be worth more than the cost of removal.

The new Kalingula is to be built at the North end of the Bund. It is to be 700 feet in length and 3 feet in height above the Apron. The whole will be in solid cutting where the foundation is nearly altogether of friable Rock. Should the excavation turn out sufficiently hard and homogeneous, one half or more of the building may be dispensed with, but I have estimated for the full dimensions.

Importance of having a long new Kalingula. The following points have to be taken into consideration.

In all Reservoirs their safety very much depends on their Kalingulas (or "water wires" as they are called in England) having length enough to discharge at a

low level, and sudden accession of water, which would
 when the Reservoir is full. Many of these
 disastrous accidents we have read of, and
 have arisen from neglect to provide suffi-
 -cient length of water weir; the results
 of which is, that if the Tank is full, and
 if a sudden rain storm occurs, the short
 weir is unable to discharge the water, and
 fast enough, which then rises up on the
 face of the Dam, and is washed over
 where the drains are heaviest, until a
 sudden breach is made, which goes on
 increasing until at length there is power and
 earth can cope with the irresistible torrent
 which carries destruction and ruin in its
 (course is filled Major De Hailland has
 given us a description of the "Terrible torrent"

which bursts from this Tank on the 3^d
 of January 1818 when it could not have
 contained more than 7 1/2 millions of cubic
 yards of water in this "Terrible torrent"
 would be but a mill stream in comparison
 with that which would be poured towards
 the Adyar if the Tank burst when filled
 with 197 millions of cubic yards of water
 as is now proposed. I have been told
 that, I will quote them for the purpose of
 showing that the utmost care must be ob-
 served not only in the designing, but in the
 construction of a work of this nature, but
 especially where it is situated so close to,
 and at the higher part of, a populous
 district, such as that which lies to the
 west of Madras and its small works where

44 We shall have a good idea of how the Tank would be affected by any sudden influx of water, by supposing that it was full to the level of the proposed Kalingula; and that, in 8 hours, 48 Millions of Cubic Yards, were added to it, and that, until the 48 Millions were in, no water was allowed to flow out. It will be seen by the Table of Capacities at page 3, that between the 5th and 6th Contours the Tank would hold $36\frac{1}{4}$ Millions of Cubic Yards, and that one foot higher would provide for the remaining $11\frac{1}{4}$ Millions. Hence the whole 48 Millions would raise the surface of the Tank about 14 feet above the Kalingula. But during all this time the discharge over the Kalingula would be rapidly increasing, and

Should the depth over it reach 2 feet, the discharge per hour would be nearly 16 Millions of Cubic Yards, whilst at the same time all the sluices might be kept open.

It is evident from this that, even under the very exceptional conditions supposed, conditions not likely to arise more than once in 50 years, the water could never rise so high as to endanger the stability of the Bund. It is therefore

Alteration 45. In the Where Shunk Road No. 10 of
of Jume
Road No. 1. Bangalore crosses the west end of the
Shunk Road. It must be either diverted along
the high lands on the west or raised upon
its present line. I had not an
opportunity of deciding upon the ground.

Which of these plans is the best, but as the raising of the road does not increase its length and as this is the most efficient river plan, I have estimated for it. The present road is embanked across the valley and there are several small culverts under it. These may be closed, as I propose to build one large culvert of three arches at the lowest part. This will be sufficient to carry off all the water.

The Embankment is to be revetted with rough stones on the bank or S. East side. In one respect, the great length of Bunds to be raised, this project is unfavourable, but this is perhaps balanced by the advantage it presents of presenting at the level of the present

Kalingula, a piece of 22 millions of square yards, or $6\frac{3}{4}$ square miles, upon which can be raised the additional water we propose to store.

Materials for the work convenient.

The materials for the work can be readily procured. Earth for the Bund can be got for a great part of the length from the bed of the tank, at places where its excavation will not be injurious; and I am informed that all along the outside of the Bund a strip of land 10 yards in width from the foot of the slope, has been reserved for the use of the Bund. In the hills which lie upon the west side of the surplus channel from Preeperma-tur tank, and close to the margin

of Chembambakkam, Lanka, and
 required quantity of Laterite stone
 can be had. It can be carted
 across to the Bund when the Lanka
 is dry, or boated across when it is
 wholly or partially filled with
 mud. Clay for puddle can be had
 near the center of the Bund and
 Surfing under the Village of Chembam-
 bakkam on the North side of the
 Lanka. The following abstract Estimate
 of the detailed Estimate will show
 the costs of the proposed works. The
 prices are a little higher than
 those which prevail in
 that locality at present.

Abstract of the Estimate for Enlarging Chembambakkam Lake

184 Rupees on English -/-	Description of works	No.	Amount of each work	Total
	<u>Lake Bund</u>		Rupees	Rupees
1	Removing the present Revetment		1,615 14 .	
2	Removal of unround Earth behind the present Revetment and carrying the same to Bund - - -		510 2 3	
3	Excavating for foot of New Revet- ment and carrying the Excavated Earth to the Bund - - -		2,022 6 .	
4	Puddling		45,603 6 "	
5	Gravelling at rear of revetment		8,707 6 "	
6	Revetment new		102,194 12 "	
7	do with old materials		8,618 . "	
8	Earthwork for the Bund		69,519 10 .	
9	Surfing		5,494 14 4	
	Total for the Bund			244,286 . .
10	New Balingulah	1		13,889 . .
11 to 22	Irrigation Sluices old	11		4,871 . .
23	Irrigation sluices new	2		3,646 . .
24	Alteration of Trunk Road No. 1 on the 20 th mile.			
	Raising the Embankment		6,221 . .	
	Metalling		732 . .	
	Surfing		486 . .	
	Revetment		5,648 . .	
	3 arched Bridge	1	2,681 . .	15,768 . .
	Total cost of altering Road			282,460 . .
25	Contingences, ~~superintendence~~ and Sundries @ 5 p cent			14,124 . .
26	Compensation for Land			296,584 . .
				58,851 . .
	Total			355,435 . .

Value of Project.

48 We have now come to a very important part of this enquiry, namely the financial aspect of the project, and we have to answer the question will it pay? on this part of the subject I have to make the following remarks.

In answer to this question I might fall back upon an old idea suggested in connection with the reconstruction of the old Pammal Tank, and say that the water proposed to be stored in Chembrambakkam Tank would or might be used for the water supply of that portion of Madras which lies south of the Kuami. If I put the scheme forward in this way there would be no necessity for me to go into its merits in an agricultural point of view, for if looked upon as a means of supplying a portion of Madras with wholesome water, the value of the project would cease to be tested by money consideration only.

But I am of opinion that if proper measures are taken to condense the rain fall upon the

✓ Naghery

58

Estimated expenditure proposed for the project as per the following table.

1. Land 100000

2. Buildings 100000

3. Machinery 100000

4. Water works 100000

5. Roads 100000

6. Fences 100000

7. Planting 100000

8. Miscellaneous 100000

9. Contingencies 100000

10. Total 1000000

Estimated income from the project as per the following table.

1. Land 100000

2. Buildings 100000

3. Machinery 100000

4. Water works 100000

5. Roads 100000

6. Fences 100000

7. Planting 100000

8. Miscellaneous 100000

9. Contingencies 100000

10. Total 1000000

Estimated net profit from the project as per the following table.

1. Land 100000

2. Buildings 100000

3. Machinery 100000

4. Water works 100000

5. Roads 100000

6. Fences 100000

7. Planting 100000

8. Miscellaneous 100000

9. Contingencies 100000

10. Total 1000000

Aggrey Hills, the Project which I
 have already submitted, and which is
 now being executed, will be found ample,
 not only for the supply of Madras,
 but for the irrigation of all the waste
 land lying to the East of the Red Hill
 and Cholavaram Lakes, and between
 the Coartliar River and the Railway:—

49. As it is possible however that the Aggrey supply might some-
 times fail, it is satisfactory to know
 that there is another source from which
 Madras could be supplied with water;
 for there would be no difficulty in
 connecting the Chembrambakkam Tank
 with the Spina Tank in Madras,
 where I propose the filters, and pure

Water ✓

Water Basin shall be:—

The bed of Chembrambakkam Tank
 is about 46 feet higher than the
 general level of the Spina Tank,
 and as the distance is about 13
 miles, the fall would be ample.
 At the same time, except in a case
 of emergency, I would not recommend
 drawing from the Chembrambakkam
 Tank for the supply of Madras with
 drinking water, because being supplied
 principally by the surplus water from
 irrigation tanks, and the Drainage
 from Rice and other fields, its water
 must be flat, and wanting in that
 briskness and sparkle which are so
 much desired in drinking water.

50 The additional quantity of water proposed to be stored in 141 millions of cubic yards. A simple way of estimating the value of this quantity is to see how many Cawnies of land it would irrigate under rice cultivation. If we assume that nine thousand cubic yards of water are required to mature one crop of rice on one Cawny of land, then 141 millions of yards would be sufficient for 15,666 Cawnies, which, at 5 Rupees a Cawny amounts to 78,330 Rupees. This may be taken as the annual value of the project estimated in this way; and on the probable cost of the works it would be equal to 22 per cent per

per annum. 51 It is probable, however, that the first use made of the water would be to complete the cultivation of the present Ayakats, and of the other irrigated lands which lie between it and Madras, and bounded by the Kurnool on one side, and the Adiyar on the other.

apart from
the part
cultivated

Whatever quantity of water remained after this, could be used partly in the cultivation of the whole or a portion of the dry cultivated or waste lands within the same limits, and partly for other purposes which will be suggested hereafter.

52 I have already shown that

of the 8,604 Cawnies of the Ayakat,
only 4,347 have been cultivated on an
average during the last 14 years;
leaving 4,257 Cawnies uncultivated:-

The additional cultivation of the
Ayakat would stand thus:-

I First crop off 4,257 Cawnies } Rupees
at 5 Rupees per Cawney } 21,285
II Second crop off 8,604 Cawnies }
at 3 Rupees } 25,812

Total additional Revenue off
Chembrambakkam Ayakat } 47,097

53 Between the Chembrambakkam Ayakat and Madras, (or rather Nungambakkam and Mylapore Tanks), and within the Rivers Ruam and Adyar, there are 28 Villages regarding which the following Table is a statement similar to that given of Chembrambakkam Ayakat at page 38, with the exception that the average Cultivation is given for only 5 years:-

No.		Cultivated		Uncultivated		Total		Remarks	
No.	Area	Cultivated	Uncultivated	Total	Remarks	No.	Area	Cultivated	Uncultivated
1	100	100	0	100		1	100	100	0
2	100	100	0	100		2	100	100	0
3	100	100	0	100		3	100	100	0
4	100	100	0	100		4	100	100	0
5	100	100	0	100		5	100	100	0
6	100	100	0	100		6	100	100	0
7	100	100	0	100		7	100	100	0
8	100	100	0	100		8	100	100	0
9	100	100	0	100		9	100	100	0
10	100	100	0	100		10	100	100	0
11	100	100	0	100		11	100	100	0
12	100	100	0	100		12	100	100	0
13	100	100	0	100		13	100	100	0
14	100	100	0	100		14	100	100	0
15	100	100	0	100		15	100	100	0
16	100	100	0	100		16	100	100	0
17	100	100	0	100		17	100	100	0
18	100	100	0	100		18	100	100	0
19	100	100	0	100		19	100	100	0
20	100	100	0	100		20	100	100	0
21	100	100	0	100		21	100	100	0
22	100	100	0	100		22	100	100	0
23	100	100	0	100		23	100	100	0
24	100	100	0	100		24	100	100	0
25	100	100	0	100		25	100	100	0
26	100	100	0	100		26	100	100	0
27	100	100	0	100		27	100	100	0
28	100	100	0	100		28	100	100	0
Total		2800	0	2800		Total		2800	0

69 Statement of the ayatul. assessment &c of 28 Villages lying

No of Village	Names of Villages not under the Sank	Cucan		Inam	
		The ayatul of each Village (the whole)	The Assessment of each Village (the whole)	Ayatul	Assessment
1	2	3	4	5	6
249	Irromyoor	717	2814	8	46
68	Colappattam	287	1314	32	167
2	Senjary	56	148	2	6
3	Kissappattam	39	176	2	12
4	Agaram	31	125	2	8
5	Katavilagam	4	21	.	.
11	Arumbattam	195	910	26	132
255	Valasaravattam	85	402	98	276
253	Kidambattam	422	1416	63	266
13	Saligramam	294	946	15	64
1	Poor	267	1545	193	1215
16	Vanagarani	217	1239	167	966
17	Carumbattam	35	275	27	197
22	Chethyargaram	70	522	12	95
18	Velliothum	13	108	1	11
19	Sivabrotham	37	207	4	16
20	Pamapooram	160	760	21	121
21	Thelayaragam	86	531	7	44
69	Thonlam	120	689	15	108
12	Virayambattam	343	1413	26	158
254	Mathooravoyal	579	2515	42	201
174	Pidacalaiyoppam	79	502	9	56
175	Varoosharojaranam	127	622	9	45
184	Piruvattam	180	822	45	264
185	Kelpiruvattam	11	71	3	22
182	Pidarythungal	65	398	11	88
181	Vadacumlam	16	100	2	15
185	Anyamanalloor	80	358	9	62
Total Villages. 28 =		4615	20949	851	4661

70 between the Huam, the adiyar, the 58 Villages of Chembambattam and Mylapore Sank

Cucan		The number of Census of either Cultivation or waste in each Village that could be converted into wet cultivation	Remarks
The average number of Cultivation in each Village for the last 5 years	The average Revenue during the last 5 years		
7	8	9	10
199	883	63	C.
93	567	88	
18	59	3	
30	147	24	
10	40	15	
4	21	.	
35	168	28	
67	312	205	
364	1257	301	
21	98	99	
121	931	41	
130	1005	20	
16	162	23	
56	403	4	
12	102	.	
34	210	9	
83	388	135	
10	88	9	
65	382	5	
55	348	80	
410	1900	114	
40	322	18	
69	355	10	
155	693	27	
8	56	.	
54	331	20	
8	55	.	
34	198	6	
2201	11481	1347	

Additional ... in ...

... ..

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2	2	2
3	3	3
4	4	4
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6	6	6
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10	10	10
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64	64	64
65	65	65
66	66	66
67	67	67
68	68	68
69	69	69
70	70	70
71	71	71
72	72	72
73	73	73
74	74	74
75	75	75
76	76	76
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79	79	79
80	80	80
81	81	81
82	82	82
83	83	83
84	84	84
85	85	85
86	86	86
87	87	87
88	88	88
89	89	89
90	90	90
91	91	91
92	92	92
93	93	93
94	94	94
95	95	95
96	96	96
97	97	97
98	98	98
99	99	99
100	100	100

54. This statement shows that of 4,615 Cawnies only 2,201 have been under cultivation, (and one crop only has been produced) leaving 2,414 Cawnies uncultivated.

I First crop off 2,414 Cawnies at 5 Rupees per Cawney - 12,070
 II Second crop off 4,615 Cawnies at 3 Rupees per Cawney - 13,845

Total additional Revenue off the wet Ayakat of these 86 Villages = 25,915

55. These two calculations show, if the figures are correct, that if used in the complete cultivation of the wet Ayakats of these 86 Villages alone, the value of the water stored would be 73,012 Rupees, equal to 20 1/2 per cent on the estimated cost of the works: —

Then

There would be one great advantage in applying the water to those lands which are already prepared for wet cultivation, that no expensive works of distribution would be necessary as in most cases, the water could be applied direct, without delay and without additional cost.

56. The Two Revenue Tables show that in the 86 Villages, there are 1,881 Cawnies of land under dry cultivation or waste, which are so situated as regards relative height, that they could be converted into wet cultivation. I do not know whether it would be desirable to irrigate these lands beyond that which

which would be necessary to enable them to produce first class dry crops? My own opinion is that when so large a proportion of the land is irrigated for the cultivation of various description of Rice, it is not only more profitable, but is more to the advantage of the Community, that a small quantity of water should be expended over a large area of the remaining land, in the production of the several descriptions of dry grains, Oil seeds &c. &c. A few thousands of Cubic yards of water judiciously expended in this way, would, I believe, be of immense value.

Water may be applied to the junction of the Canal with the Chembram. 57. I must not omit to point out that one of the uses to which a portion of the water stored in Chembram and Bakhram Tank is proposed to be put

is the supplying of the Junction Canal
with Fresh water. Should that work
ever be executed, the Mylapore and
Kungambakkam Tanks; or at all events
portions of them, might be kept full
for the whole, or a greater part of the year;
which would be invaluable to the garden
cultivation of that part of Madras.

The proposed Mount Tank could also
be kept full, and a portion of the water
might be brought across the valley of
the Adiyar at a high level, to the
Neighbourhood of Palavaram and the
Mount; but all these questions will be
fully discussed in a subsequent report.

58. In dealing with this part
of an Irrigation project, that is, the
appropriation of the water, and value
of water required for one
acre.

received
the total
of 1000

always a great difficulty to contend with
in not knowing how much water is required
for the cultivation of rice or any other
crop, wet or dry. In the Presidency we are in the habit
of assuming, or, I believe, a statement
made by Major General Sir Arthur Cotton
R. E., that 7000 cubic yards per acre, are
required for the cultivation of one crop of
Rice during the hot season; and 5000 yards
during the Monsoon. I believe that Sir
Arthur Cotton considered this estimate
too high, and I am of opinion that if
the water were carefully distributed a
much smaller quantity would be found suffi-
cient. As regards the value of this
project, I should be glad if the opinion of the
Collector was obtained as he is better able to judge

received
the total
of 1000

Correctly on a question of this kind than I am.

59. It would be satisfactory if I could compare the merits and demerits of this project with those of any other, but I am not aware that any similar one has been put forward in this Presidency.

Comparison with other Projects.

The Nairgoonamandoo (Neilgherry) Reservoir, for which I sent up Plans in 1857 is of a different Character, being intended for the storage of water for the irrigation of lands at a great distance through the medium of a large River, and the site being in a locality where no land could be irrigated within many miles of it.

60. The only project I can discover which at all resembles this one of Chembram is the proposed Tank at Ekrookh.

Proposed Tank at Ekrookh Bombay

near Golapore in the Bombay Presidency.

It is described in "Selections from the records of the Bombay Government. Irrigation Series No. 1."

The report with Plans was published last year, and I believe it is looked upon as descriptive of a class of work which, so far as it is possible, should be undertaken or at all events reported on in the other Presidencies.

61. The following Table gives a brief comparison of the two Projects:

Project	Area of Land irrigated	Cost of Project	Estimated Annual Income
Chembram	1,000 acres	Rs. 1,00,000	Rs. 10,000
Ekrookh	500 acres	Rs. 50,000	Rs. 5,000

No.	Description	Ekrookh	Chembambakkam
		yards	yards
1	Band - length	2,400	7,100
2	Do - max. height	72	45
3	Do - height above Kalingula	3	6
4	Parapet - height above Band	3	2
5	Sluices - Number	3	13, two new
6	Kalingula - Length	250	700
7	Do - Depth of flood over	5	say, 3
8	Water - Quantity stored and available	81,560,726	147,278,463
9	Do - Total quantity in Tank available for irrigation	81,560,726	196,873,925
10	Land - to be irrigated - one crop	8,000	8,659
11	Do - Do - two crops	8,000	8,821
		16,000	17,480
12	Estimate - for Reservoir works only - Cost of distribution left out	7,06,112	3,55,435
13	Area - at Level of Kalingula	58,333,333	34,800,188

66 79

62 The simplest way of comparing these two projects is to see how many cubic yards of water each will store for one Rupee. In making this comparison I will contrast the whole Ekrookh Tank Capacity minus the 20 millions of cubic feet "lost in the bottom" with the capacity of the Chembambakkam Tank between the present and proposed Kalingula levels.

At Ekrookh the quantity of water available for irrigation is 81,560,726 cubic yards, and the estimated cost, leaving out the cost of works for distribution, is 7,06,112 Rupees. Dividing the former by the latter number we get 115 which is the number of Cubic Yards stored for one Rupee.

The additional quantity of water proposed

to be stored at Chemburambakam is 141,268,463 cubic yards, and the estimated cost is 3,55,435 Rupees. These figures give us 397 cubic yards for one Rupee.

I do not consider this a very favourable case of storage, but it is probably as favourable as it is possible for any case to be in the Plains, and so near to the coast. It is, at all events, much more favourable than the Ekrookh Project.

63. There seems to be a great difference between Bombay and Madras in the estimated quantity of water required for the cultivation of one acre.

I have ascertained from the Revenue Inspectors here that the second crop will require about $\frac{3}{4}$ of the quantity of water

necessary.

necessary for the first crop.

If we assume that General Sir Arthur Cotton's estimates of 7,000 cubic yards for one crop is correct, the quantity required for the cultivation of the land at Ekrookh would stand thus:

	acres	c. yds	cubic yards
One Crop Land	8,000	$\times 7,000$	= 56 Millions

Two Crop Land	8,000	$\times 12,250$	= 98 Millions
	16,000		154 Millions

Showing that to cultivate the 16,000 acres as proposed, they should provide 154 millions of cubic yards of water instead of 81½ Millions.

If we assume that the 81½ Millions is sufficient, and adopt the proportions given above, the quantity required for each acre would be:—

One crop land 3,705 cubic yards per acre
Two crop land 6,483 " " " "

These figures show but a little over one half the quantity we are in the habit of calculating as necessary for the cultivation of one acre.

If these quantities are correct the Chembambakkam project would yield nearly double the amount of Revenue I have estimated.

William H. Miller, C.E.
Mechanical Engineer
April 1867

... ..
... ..
... ..
... ..

J H 1864 LCP

No 1803

From

W. Fraser Esq
Ex. Buzo

To the Secy to Govt

D. 14 April 1864
Recd 15 May

Encl. - No 14

Forwarding the report of
the Project for enlarging
Chembam bakkan Tank
Madras District

No 2497 & 2798 11

No 244

Statement Showing the probable increase of Revenue derivable by Government by the enlargement and further improvement of the Chembarambakunr Tank:

Kunja Circular Dyamut.		Cultivation.		Waste.		Punja land likely to be converted into Kunja.	Inam land likely to be cultivated.	2 ^d Crop charge on the Total Kunja Dyamut.	Deduct 2 ^d Crop charge as at present derived from the amount in col. 12.	Balance	Grand Total of Columns 7-9-11 and 14-	Percentage of annual profit on the total cost of the work.			
Ranis. Assessment.	Survey	Ranis. Assessment.	Ranis. Assessment.	Ranis. Assessment.	Ranis. Assessment.	Ranis. Assessment.	Kerody or Water charge on them.								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
12050	74601	1270	5332	40370	6724	53631									
		1271	5579	43784	6477	30817									
		1272	5954	46545	6102	28056									
		1273	6755	46964	5301	27637									
		1274	8268	59049	3783	15552									
			31888	237312	28392	135693									
		Average	6378	47462	5678	27139	2881	5752	1988	975	37300	4239	33011	66387	19
		1275-	6841	49906	5215	24695	2881	5752	1988	975	37300	6027	31273	62705	18
		14 years average from July 1262 to 1753	6547	50456	5509	24145	2881	5752	1988	975	37300	4200	33100	63982	18-

Madras District,
Collectors Office,
Saidapet 22nd July 1887-

Signature of J. Sharnhill
Collector.
(True Copy)

M. S. S. S.
Secretary.

Copy to the

The Secretary to
Government
Public Works Department

to be in the line of the
improvement of the
scheme, by Government, by
the outlay and further
improvement of the
scheme, by Government.

Q. W. 3138/67

Conclusion in Proceedings of
the Board of Revenue, to the
Secretary to Government, C. P. D.
dated 20th August 1867.

1867

No. 5,380.

PROCEEDINGS OF THE BOARD OF REVENUE, dated 20th August 1867.

Read the following letter from G. THORNHILL, Esq., Acting Collector of Madras, to the Acting Secretary to the Board of Revenue, dated Sydapet, 22nd July 1867, No. 227:—

1. I have the honour to acknowledge the receipt of the Board's Proceedings of the 17th May last, conveying the orders of Government, in the Public Works Department, dated the 15th idem, and calling for a report from me on the scheme submitted by Mr. W. Fraser, regarding the enlargement and further improvement of the Chembrambakam tank, and its various supplying channels.

2. The additions and improvements contained in Mr. Fraser's scheme are as follow:—

1st.—Raising the tank bund by fifteen feet above its present height.

2ndly.—To do away with the existing numerous calingulahs, and to have one only, 700 feet long.

3rdly.—To make certain alterations in the existing sluices, and to add to their number.

4thly.—To clear and widen the various supplying channels and to build head sluices to the branches from the main channels, which supply water to the minor tanks lying parallel to the Bungaru channel; and

5thly.—To make a road on the top of the bund when it has been raised to its proposed height.

3. Mr. Fraser appears to have given the subject every consideration, and to have established conclusively the possibility of constructing a reservoir of the proposed capacity, and of collecting a sufficient proportion of the rainfall to keep it fully supplied with water.

4. It is obvious that almost the entire area of land included between the Coovum and the Adyar, which lies to the eastward of Chembrambakam, would be under command of the water from the tank, and the twenty-eight villages named by Mr. Fraser will, of course, be open to its influence, in addition to the fifty-eight villages now watered from it.

5. Mr. Fraser calculates the probable increase of revenue to Government from all eighty-six villages at Rupees 73,042, or Rupees 20 per cent. of the estimated total cost of the work. His calculations are based on the last fourteen years' average cultivation, and agree with the returns received in this office so far as the area under cultivation is concerned, but, as regards assessment, I find he has taken 5 rupees as the average Nunjah assessment per cawny, and has calculated the increase at that rate upon the whole available waste both wet and dry including Inam lands under both heads.

6. I now beg to submit a Statement, showing, first, the actual cultivation of Fusly 1275; secondly, the average cultivation of the last five years; and, thirdly, the average cultivation of the last fourteen years with the increase in all the three cases calculated on the existing assessment of the land.

7. It will be seen from the Statement that the increase over the actual cultivation of Fusly 1275, rather a good year, for wet crops, is Rupees 62,705, or eighteen per cent. of the outlay required. On the five years' average, which includes both good and bad years, the increase amounts to Rupees 63,887, or nineteen per cent. of the total cost. On the fourteen years' average it is Rupees 63,982, or eighteen per cent. on the estimated cost of the work, and Rupees 9,400 less than the probable increase, as shown by Mr. Fraser.

1. Submitted to Government, with reference to their Order, dated 15th May 1867, Public Works Department.

2. The Collector's remarks have the Board's full concurrence, and they have nothing to add to them. They do not, however, quite understand on what principle Mr. Thornhill's calculations are framed. The Nunjah Ayacut is given as 12,056 Cawnies, assessed at Rupees 74,601 = 6½ rupees per Cawny. The assessment on the average cultivation is rather more than 8 rupees per acre, and that on the average waste nearly 5 rupees, yet the Water Cess on 2,881 Cawnies of Punjab is put down at only Rupees 5,762, or 2 rupees per Cawny, and that on 1,983 Cawnies of Inam land Rupees 975, or 8 annas. The Collector is accordingly requested to explain his calculations.

(True Copies and Extract.)

(Signed) R. A. DALYELL,
Secretary.

To the Secretary to Government, Department of Public Works.
,, the Acting Collector of Madras.

Exd. J. Wright.

Submitting report from Collector of Madras on Mr. Fraser's scheme for enlargement and improvement of Chembrambakam tank and its supply channels, and requesting the Collector to explain his calculations.

No. 5,380.

Dated 20th August 1867.
Received

PROCEEDINGS OF THE BOARD OF REVENUE.

No.

1867.

Department.

Revenue Department

N^o 22

Proceedings of the Board of Revenue

dated 20th August 1867

Read the following

N^o 22

From,

G. Thornhill Esq^r,
As Collector of Madras

To, J. R. Cockerell Esq^r,
As Secretary to the Board of Revenue
Madras

Sir,

I have the honor to acknowledge the receipt of the Board's Proceedings of the 17th May last conveying the orders of Government in the Public Works Department dated the 15th idem and calling for a report from me on the scheme submitted by Mr. Fraser regarding the enlargements and further improvement of the Chembrambakam Tank and its various supplying channels.

The

8. The reason of this difference is that the calculations framed in this office are based, for the most part, on the actual existing assessment of the land, whereas Mr. Fraser's calculations are at the uniform rate of 5 rupees per cawny.

9. Taking the lowest returns, the profits on this work, supposing that it can be carried out for the estimated outlay, would be eighteen per cent. ; it is, however, impossible to estimate the profits of a work of this nature and magnitude with any degree of certainty. So many causes may combine either to raise the cost or to diminish the returns, still the margin in this case is ample and, even if the profits be one-half those expected or ten per cent., the works would appear to recommend itself very strongly to the notice of Government.

10. The advantages likely to accrue from the existence of a magnificent reservoir of water, such as the enlarged Chembrambakam tank would be in such a position with respect to the Town of Madras, are not to be estimated by the revenue derivable from it alone.

11. It would be available, as Mr. Fraser points out, to supply Madras with drinking water should the Red Hills lake at any time fail, and it would be available to supply the Junction Canal whenever the latter may be constructed.

12. It is shown by Mr. Fraser that it will derive water from the Palar through the Caveripak and Striperumadur tanks, from the Kortillar and from the Coovum rivers. It will be hardly possible, therefore, if the feeders be properly attended to, that it can ever run dry, and in seasons of drought it will be an almost certain source of supply of drinking water for human beings and cattle over a very large tract of country.

13. I am informed, but I cannot vouch for the accuracy of the statement, that even at Saidapett, a distance of nearly ten miles from the tank, the supply of water in the wells depends greatly on the quantity in store in the Chembrambakam tank.

14. With this project from an Engineering point of view, it is not in my province to deal, the whole features of the work seem to have been most carefully observed by Mr. Fraser. I would, however, point out that, where everything depends on the stability of a bund of such great dimensions both as to height and length, it will be necessary that a thoroughly efficient establishment for the conservancy and maintenance of the work be kept up. It will not be safe to intrust a work of this nature to any but skilled and trustworthy superintendence.

15. If for any reason the Government should not sanction the entire project, I would strongly recommend that the works, suggested by Mr. Fraser, for the improvement of the supply channel, should be carried out as early as practicable; even without extension, the tank is a very fine one, and if the supply channels were in proper order, it ought never to fail, and remission for lands under it ought to be unknown.

16. Mr. Fraser remarks, that the channels are not in good order and that repairs are urgently needed will be seen by a reference to the marginal table, which shows the supply of water the tank received from Fusly 1270 to 1274. An estimate for raising the Korattur anicut has been sent in by the Superintending Engineer, and will be submitted at once for sanction.

Fusly	1270	1271	1272	1273	1274	Monthly supply.
1270	...	...	...	...	...	4
1271	...	...	...	...	...	3
1272	...	...	...	...	...	4
1273	...	...	...	...	...	6
1274	...	...	...	...	...	12

17. It would be...

Early 1970...	Monthly supply.
" 1271 ..	4
" 1272 ..	3
" 1273 ..	4
" 1274 ..	6
	12

17. It would also appear highly desirable that the branch channels from the Bungaru channel, which supply numerous minor tanks, should be fitted with regulating head sluices, and that arrangements should be made to prevent the necessity of constructing dams across the channel to divert the water into the side-channels whether for Government or for Zamindari and Shrotrium lands; nothing is more destructive of irrigation than the construction of these bunds.

18. In short, whether this large project be sanctioned or not, the supply channels for the existing tank should be at once placed in an efficient state.

ENCLOSURE No. 1.

No. 273.

Statement showing the probable increase of Revenue derivable by Government by the enlargement and further improvement of the Chembarambakam tank.

NUNJAH CIRCAE AYACUT		CULTIVATION.			WASTE		FUNGIAH LAND LIKELY TO BE CONVERTED INTO FUNJAH		INAM LAND LIKELY TO BE CULTIVATED.		Deduct second crop charge as at present derived from the amount in column 12.	Balance.	Grand total of columns 7, 9, 11, and 14.	Per centage of annual profit on the total cost of the work.	
Cawnies.	Assessment	Fusly.	Cawnies.	Assessment	Cawnies	Assessment	Cawnies.	Near Cooly or water charge	Cawnies.	Near Cooly or water charge on them.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
12,056	74,601	1270	5,332	40,970	6,724	33,631									
		1271	5,379	43,784	6,477	30,817									
		1272	5,954	46,545	6,102	28,056									
		1273	6,755	46,964	5,301	27,637									
		1274	8,268	59,049	3,788	15,552									
			31,888	2,37,312	28,392	1,35,693									
		Average 1275 ...	6,378	47,462	5,678	27,139	2,881	5,762	1,988	975	37,300	4,289	33,011	66,887	19
		Fourteen years' average, from Fuslies 1262 to 1275.	6,841	49,906	5,215	24,695	2,881	5,762	1,988	975	37,300	6,027	31,273	62,705	18
			6,547	50,456	5,509	24,145	2,881	5,762	1,988	975	37,300	4,200	33,100	63,982	18

(Signed) G. THORNHILL,
Acting Collector.

SYDAPET,
22nd July 1867.

2. The additions and improvements contained in Mr Fraser's scheme are as follows: 1st Raising the Tank bund by 15 feet above its present height 2nd To do away with the existing numerous Calingulaks and to leave one only, 700 feet long 3rd To make certain alterations in the existing sluices and to add to their number 4^{thly} To clear and widen the various supplying channels and to build Head Sluices to the branches from the main channels, which supply water to the minor Tanks lying parallel to the Bungaru Channel and lastly to make a road on the top of the bund when it has been raised to its proposed height.

3. Mr Fraser appears to have given the subject every consideration and to have established conclusively the possibility of constructing a reservoir of the proposed capacity and of collecting a sufficient proportion of the rain fall to keep it fully supplied with water.

It

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4. It is obvious that almost the entire area of land included between the Coovum and the Adyar which lies to the Eastward of Chembambakam, would be under command of the water from the Tank and the 28 villages named by Mr Fraser will of course be open to its influence in addition to the 58 villages now watered from it.

5. Mr Fraser calculates the probable increase of Revenue to Government from all 86 villages at Rs 73042 or Rs 20 per Cent of the estimated total cost of the work. His calculations are based on the last 14 Years average cultivation and agree with the returns received in this Office so far as the area under cultivation is concerned, but, as regards assessment, I find he has taken 5 Rs, as the average Muzah assessment per Cawney, and has calculated the increase at that rate upon the whole available waste

waste both wet and dry including Inam lands under both heads.

6. I now beg to submit a Statement showing 1st the actual cultivation of Facli 1275, 2^d the average cultivation of the last 5 years, 3^d the average cultivation of the last 14 years with the increase in all the 3 cases calculated on the existing assessments of the land.

7. It will be seen from the Statement that the increase over the actual cultivation of Facli 1275, rather a good year, for wet crops is Rs 62,705 or 18 per cent of the outlay required. On the 5 years average which includes both good & bad years the increase amounts to Rs 66,887 or 19 per cent of the total cost. On the 14 years average it is Rs 63,982 or 18 per cent on the estimated cost of the work and Rs 4,400 less than the probable increase as shown by Mr Fraser.

8. The reason of this difference is

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is that the calculations framed in this Office are based, for the most part on the actual existing assessment of the land, whereas Mr. Fraser's calculations are at the uniform rate of 5 Rs. per Cawnie.

9. Taking the lowest returns, the profits on this work, supposing that it can be carried out for the estimated outlay, would be 18 per cent, it is however impossible to estimate the profits of a work of this nature and magnitude with any degree of certainty. So many causes may combine either to raise the cost or to diminish the returns, still the margin in this case is ample and, even if the profits be one half those expected or 10 per cent. the work would appear to recommend itself very strongly to the notice of Government.

10. The advantages likely to accrue from the existence of a magnificent Reservoir of water, such as the enlarged Chembrambakam

Frank

Tank would be in such a position with respect to the Town of Madras are not to be estimated by the Revenue derivable from it alone.

11. It would be available as Mr. Fraser points out to supply the Membras with drinking water should the Red Hills lake at any time fail, and it would be available to supply the junction canal whenever the latter may be constructed.

12. It is shown by Mr. Fraser that it will derive water from the Palair through the Gaveripalk and Stripumadur Tanks from the Kortillar and from the Coorn Rivers. It will be hardly possible therefore if the feeders be properly attended to, that it can ever run dry and in seasons of drought it will be an almost certain source of supply of drinking water for human beings and cattle over a very large tract of country.

13. I am informed, but I cannot

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cannot vouch for the accuracy of the statement, that even at Porolapet, a distance of nearly ten miles from the tank, the supply of water ^{in the wells} depends greatly on the quantity in store in the Chembambakam Tank.

14. With this project from an engineering point of view it is not my province to deal, the whole features of the work seem to have been most carefully observed by Mr. Fraser. I would however point out that where everything depends on the stability of a bund of such great dimensions both as to height and length, it will be necessary that a thoroughly efficient establishment for the conservancy and maintenance of the work be kept up. It will not be safe to entrust a work of this nature to any but skilled & trustworthy superintendence.

15. If for any reason the Government

=ment. should not sanction the entire project, I would strongly recommend that the works suggested by Mr. Fraser for the improvement of the supply channel should be carried out as early as practicable; even without extension the Tank is a very fine one & if the supply channels were in proper order it ought never to fail and remission for lands under it ought to be unknown.

16. Mr. Fraser remarks that the channels are not in good order & that repairs are urgently needed will be seen by a reference to the marginal table which shows the supply of water the tank received from Fasli 1270 to 1274. An estimate for raising the Horathur ancient has been sent in by the Superintending Engineer & will be submitted at once for sanction.

17. It would also appear highly desirable that the branch channels from the Pajgarin channel, which supply numerous minor Tanks should be fitted

Fasli	1270	1271	1272	1273	1274
	—4	—3	—4	—6	—12

with regulating head sluices and that arrangements should be made to prevent the necessity of constructing dams across the channel, to divert the water into the side channels whether for Government or for Zemindary and Mrotrigam lands: nothing is more destructive of irrigation channels than the continued construction of these bunds.

18. In short, whether this large project be sanctioned or not the supply channels for the existing Tank should be at once placed in an efficient state.

I have &c &c

Madras Collectors Office
Seydpett.
22nd July 1867

Signed / G. Thornhill
Acting Collector.

Submitted to Government with reference to their order dated 15th May 1867 P.W.D.

The Collectors' remarks have the Board's full concurrence, and they have nothing to add to them. They do not however quite understand on what principle Mr. Thornhill's calculations are framed. The Bumpk

Assessment is given as 12056 lawns assessed
at Rupees 74601. = 6 1/6 Rupees per lawn.

The assessment on the average cultivation is
rather more than 8 Rupees per acre - and
that on the average waste nearly 5 Rupees, yet
the water fees on 2881 lawns of Poona
is put down at only Rupees 5762 or 2 Rupees
per lawn, and that on 1988 lawns of Deccan
land Rupees 975 or 0 annas.
The collector is accordingly requested to explain
his calculations.

/ True Copy and Extract /

M. A. M.
Secretary

To
The Secretary to Government
Public Works Department.
The Enclosure with 5/10/10.

Ed L.

MEMORANDUM.

REQUESTED for reference the under-mentioned papers :—

Plan showing the Sections of the Bund of the
Chumbhambantam Tank to feet Project.
Copy of Mr Francis's Report of April 1867 H. 14 referred
to in S.O. No 2797. H. 22 of 1867.

OFFICE OF THE CHIEF ENGINEER
FOR IRRIGATION,

6-6-1874

Dr. H. W. Harris
Head Clerk.

*Proceedings of the
Board of Revenue*

*Water 20
Sept. 20
Refract
No. 215
1867
One: one
from Revenue
No. 215
1867*

*Submitting report
from C. G. Harris on the
State of the bunds in the
Chumbhambantam Tank
and regarding the
to explain his calculations.*

2797-11/28/67

2797-11/28/67

2797

Proceedings of the Madras Government.
Under date the 11th Sept. 1867

From. W. Fraser Esq. C.E.
Executive Engineer
submitting his report on the project for
improving the Chembrumbari Tank
Proceedings of the Board of

Read the following,
(H.E. dated 17th April 1867
N^o 14

Revenue - (H.E. dated 20th August 1867.)
+ for the improvement of the
on 11th 9-8-67

W. Fraser
J. N.
gp
W. N.

The Chembrumbari Tank, situated about 17 miles South West of Madras, is one of the finest irrigation works of the Carnatic, being formed by an embankment 7,100 yards in length connecting high ground on one side with a rocky spur on the other, and creating thereby a reservoir covering when full an area of nearly seven square miles and commanding for irrigation the lands of 86 Villages capable of wet cultivation to the extent of 14,570 acres.

Within the Agency -	acres
Outside the Agency -	11,378
	3,192
	<u>14,570</u>

2. The tank is provided with ample waste water outlets in six Cakungalas, aggregating 643 1/2 feet in length, and is furnished with 11 irrigating sluices. It is however incapable of containing in its present state sufficient water for the irrigation of much more than half its Tanjain Ayacut, and in consequence the revenue derived from it has averaged, at the low rate of assessment now charged, only Rupees 21,725 during the past 14 years, instead of Rs. 63,842 which it would have yielded had it been possible to store in it sufficient water. This defect seems to have induced Col. Lawford in 1857/8 to recommend its

its enlargement, but no details of his proposal can be found on record, and the scheme now submitted by Mr. Fraser appears to have been suggested by the necessity of providing the means of supplying from some artificial source or another water to the high level junction Canal, which he has for some years past been projecting, to connect Cochrane's Canal on the north with the Sadras Canal on the south of the Presidency.

3. The Thembumbakam Tank is well situated for this purpose, being on such a level as to have full command of the whole of Madras, and by its

its proposed enlargement the means of keeping the Junction Canal full, will be readily obtained, and if that enlargement be carried out to the extent recommended by Mr. Fraser, there will be a large surplus of water for employment in the extension of irrigation under the Tank.

after the requirements of irrigation to the whole available land under the Tank are fully supplied ^{by its enlargement} there will probably be a sufficient surplus to keep the Junction Canal full if, instead of being made a tidal Canal, it be carried out as a high level fresh water Canal ~~with a view to the carrying of goods and passengers.~~

4. The scheme therefore comes before Govt. as a very beneficial and remunerative undertaking. It consists of.

Raising the bund sufficiently to enable the tank to retain 5 yards additional depth of water	Rs. 2,44,286.
Constructing a new Calingulah 700 feet in length and removing the present 6 Calingulahs	13,889
Alteration of present sluices and construction of 2 additional sluices	8,517
Raising portion of Trunk Road No. 1 at the west end of Tank	15,768
Compensation for lands	58,851
Contingencies and Sundries	14,124
	<u>3,55,435</u>

5. For this expenditure of Rs. 3,55,435, which includes a large sum for the payment of compensation for lands to be submerged, Mr. Fraser calculates upon increasing the capacity of the Tank from 55,605,462 Cubic Yards, which it now holds when full to the crest of the Calingulah, to 196,873,925 Cubic Yards. Thus 141 million Cubic Yards of water would be stored in addition to the quantity now retained, and estimating the value of water so stored on the usually accepted data of 9000 Cubic Yards being sufficient for the irrigation of a cawry of rice land, he shows that the proposed outlay ought to yield a return of Rs. 78,330 - at the low charge as water rate

R

of Rs. 5 per canny or Rs. 3.12.6 per acre. This may very fairly be taken as the real value of the additional water to be stored, and Mr. Fraser shows that nearly that amount will be obtained by the complete irrigation for two crops of the total wet lands under the 58 villages contained in the Ayacut of the Bank and under the 28 villages outside of that Ayacut, but possessing land so situated as to be easily irrigated from the Tank.

6. The collector, however, taking some exception to the rate of 5 Rs. per canny assumed by Mr. Fraser as the rate

6
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to be paid for water, shows, in accordance with the actual results of irrigation which at present exists under the Tank, that the probable increase of revenue which will be derived in consequence of the storage of a large additional quantity of water will be 12,705 Rs. as compared with the revenue collected in the year 1865/6, (which was rather a good year) or Rs. 66,887 as contrasted with the average collections of the last 5 years, or Rs. 13,982 on the average of the past 14 years.

7. These estimates by the Revenue Officers are sufficient to confirm Mr. Fraser's calculations of

Of the financial results
to be expected from
the enlargement of the
tank, and the Government
have little doubt that
the work will be remunerative.
2. The Govt. have no
reason to believe that
the means of fully sup-
plying the tank will
be wanting. It is de-
scribed as so situated
as necessarily to receive
the surplus drainage of
a tract of country of it-
self sufficiently extensive
to yield a full supply
of water in all ordinary
years, and the tank is
now not only connected
with the Fortillar, but
has lately been brought
under the influence of the
Palar Aicut by means
of the Kumburnkal Chan-
nel. The Dam across

the Fortillar to divert
water into the Bungairo
Channel which flows towards
Theimbumbakurn, has
lately been renewed and
strengthened, - the head of
the channel has been im-
proved - and operations
are in progress for re-
moving obstructions in
it. The supply of the
Tank from this source
will therefore be improved
and increased, and by
the contemplated raising
of the Korakoor Aicut, it
will be greatly perfected.
On the other hand the sup-
ply from the Palar will
year by year be in the
same manner augment-
ed in consequence of the
improvement of the Chan-
nels taking off from
the

the Arcut across that river, and is practically capable of any requisite expansion.

9. Viewed then from all points, the project is one which, in the opinion of Govt., it is very desirable to carry out as speedily as possible, and they accordingly resolve to submit Mr Fraser's project for the sanction of the Govt. of India, and, in anticipation of its approval, to direct the survey of an appropriation in the outgoing Budget to admit of the commencement of the work next year.



To

- The S. Engr. of the 4th Div. ^{the eight copies each of the Report & Estimate}
 - " Board of Revenue
 - " Revenue Dept.
 - " Mr. Fraser Esq. ^{with the copy of the Report & Estimate}
 - " Comdr.
 - " Acct^y Genl.
- Dec 13/96

244@246

Pub. Works Dept.

Pro: of Govt for Sept^r
No. 2797

Pro: of the Madras Govt
D^d 11th September 1867

Further Pro: 15th 9th 37

C.N. 4258/67

Passing orders on
Mr. Fraser's project
for the enlargement of the
Chembambakum Tank
in the Madras District

244@246

24 Sept 67. C.N.

24 Sept 67

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2798

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

Sir,

I am directed to
forward herewith a pro-
ject prepared by Mr. Fraser,
Executive Engineer, for
the enlargement of the
Chembambakum Tank
which is situated about
17 miles S. West of Madras.
This Tank is admittedly
one of the finest in the
Madras Presidency, being
formed by an embankment
7100 yards in length connect-
ing high ground on one
side

N.
J.P.

1297

side with a rocky spur on the other, and being well situated to receive a good supply of water in all ordinary years. As however, in its present condition, it does not hold sufficient water for much more than half the area of the land which is suitably situated for irrigation by it and included in its Ninjah Syacut, the expediency of its enlargement has long engaged attention, but no definite proposals can be traced till notice was attracted to the scheme as a means of affording a supply of water to Madras. ^{On another source however, being selected for that supply,} Mr. Fraser was instructed

86.
of the Chembambakam Tank enlargement
the investigation, as an irrigation project, on his completing the scheme known as the Viadras Water supply project for bringing water into Viadras from the Red Hill Tank.

Mr. Fraser's scheme embraces the following works.

Raising the bund sufficiently to enable the tank to retain 5 yards additional depth of water.	2,44,286
Constructing a new Calingulah 700 feet in length and removing the present 6 Calingulahs.	13,889
Alteration of present sluices and construction of 2 additional sluices.	8,517
Raising portion of Trunk Road No. 1 at the west end of Tank.	13,768
Compensation for lands.	58,857
Contingencies & sundries.	14,124
	<u>3,55,435</u>

With this outlay it is proposed to increase the capacity of the Tank to 196 million C. Gards, or to 141 million C. Gards the excess of the quantity which is now stored when the Tank is full to the crest of the Calingaiah; and, estimating the value of water so stored on the generally accepted rate of 9000 C. Gards being sufficient for the irrigation of a Cawney, or 1.32 acre/ of rice land, Mr. Fraser shows that the proposed outlay ought to yield a return of 78,330 Rs., or nearly that sum at the low water rate of Rs. 5 per Cawney, or Rs. 3-12-6 per acre, if the total wet lands under the 58 Villages comprized in the Ayscut of the Tank and under the 28 Villages outside of that Ayscut, but

Containing

containing land capable of being watered from the same source, be completely irrigated for two crops.

While acquiescing in the correctness of the particulars given by Mr. Fraser of the area of land under cultivation, the Collector takes some exception to the uniform rate of Rs. 3-12-6 per acre assumed by that Officer as the rate to be paid for water - Mr. Fraser estimates the returns as follows.

Ayscut Land.

First crop on 4257 Caw: or 5629 acres	} Rs. 2,285	
at Rs. 5 7/8 C. or Rs. 3-12-6 per acre.		
Second crop on 8604 Caw: or 11,378 acres	} 25,812	
at Rs. 3 7/8 C. or Rs. 2-4-4 per acre.		
		27,097

Land outside the Ayscut.

First crop on 2414 Caw: or 3192 acres	} 12,070	
at Rs. 5 7/8 C. or Rs. 3-12-6 per acre.		
Second crop on 4615 Caw: or 6102 acres	} 13,845	
at Rs. 3 7/8 C. or Rs. 2-4-4 per acre.		
		25,915
		73,012 =
		20 7/8 C.
		on Calingaiah

The Collector, basing his calculations on the actual results of the irrigation which affords lands under the Tank, shows that the probable increase will be,

Rs 62,705 or 18% on the proposed outlay as compared with the Revenue collected in 1855/56.

66,887 or 19% on Rs as contrasted with the average collections of the last five years.

63,982 or 18% on Rs on the average of the past 14 years.

These various estimates of the returns likely to be derived do not materially affect the remunerative aspect of the proposed work, as the lowest will give a percentage on the outlay sufficient to make the project highly reproductive.

The Tank is so situated as to receive a large

pro.

proportion of the surplus rainfall of a considerable tract of country, and, lying between the two rivers Adyar & Coittilwar much waste water passes into it from numerous tanks which are supplied from those rivers. It is also directly connected with a channel taking off from an Anicut across the Coittilwar near Kasaveram, and on the other hand it is directly in communication with the Palar by means of the Anicut across that river near Arcot through the Vinnobur Kal channel, which, being enlarged & improved, will year by year afford a more full & certain supply. Measures are in progress for improving and perfecting the means of supply on the side of the Coittilwar by clearing and enlarging the Vinnobur Channel and

adding

adding to the height of the
Korator Dam, And there is
no reason to doubt that any
quantity of water that the
Chrambrambakun Tank
may be rendered capable of
storing will be available.

I am accordingly
to request that the project
designed by Mr. Fraser, may
meet with the favorable
consideration of the Govern-
ment of India and that
sanction may be accorded
to it.

[Signature]

Fort St George
11th Sept 1867

Recd 13/9/67 with copy of
the report and the Order thereon
and the detailed Estimate
Twenty three plans recd 24/9/67
7th Sept 1867 India on 23rd Sept 1867

Pub: Works 1867 Depart.
Pri: of Govt for September
No 2798
To
The Secretary to the
Govt of India
D^d 11th September 1867

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3-7-91-91
2-12-05-1

Pub. Works 1867 Depart.

Pro: of Govt. for September

No 2798

To The Secretary to the
Govt. of India
11th September 1867

Forwarding to the Govt
of India the project submitted
by Mr. Fraser for the im-
provement of the Chembarambakkam
Tank in the Madras District,
and requesting sanction to the
estimate of Rs. 355,435 for the
work.

No 2798