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(2) Date of repair _____

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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. 2042

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Read the following papers:—

No. 672. From the Superintending Engineer, 7th Division, to the Secretary to Government, Department Public Works, dated Coimbatore, 8th June 1866, No. 37.

Hoping to avail myself of the services of at least one of the Assistant Engineers, lately appointed and placed at my disposal, on projects connected with the irrigation of the Coimbatore District, I have the honor to request that you will be so good as to cause the transmission to my Office of all surveys, plans, and observations connected with the subject, which may have been prepared by Mr. William Fraser, C. E., while employed on special duty in that District.

No. 673. Memorandum on the proposed large Reservoirs on and about the Neilgherry Hills by W. FRASER, Esq., C. E., dated 11th June 1866.

1. In the Proceedings of the Madras Government, No. 597, dated the 20th February 1866, I am directed—

I. To inform the Government in what state of progress the investigations which were entrusted to me, for ascertaining the means of storing water in the valleys of the Bhowany, the Moyaur, and the Noyel* were left when my examination of those rivers was suspended.

II. To submit, at once, all plans and documents connected with these investigations that may be in my possession.

2. In replying to this order, I shall endeavour to give a brief account of what was done up to the time the investigation was suspended, and what I would recommend should now be done, if the Government are disposed to renew the enquiry.

3. In April 1855, when I came to India, I was directed to make myself familiar with the Madras system of irrigation, especially as practised in the District of Tanjore. At that time the Government were in the habit of making large remissions annually to the Merassidars for losses arising from deficient crops from deficiency of water.

I saw that this necessity arose from the system of depending altogether on the natural flow of the rivers for supplying the irrigation channels; and having no reservoir to fall back upon. It was not only when the monsoon was scanty that this deficiency occurred; it was almost equally bad when the usual quantity of rain fell, but in a short space of time, producing an unusually high flood, which filled the channels to overflowing, but which rapidly went down again, the water passing to the sea unused. This rapid discharge of the floods has often occurred; and there can be no doubt but that as clearing and cultivation extend in the upper regions of the rivers it will, from another cause, become their normal condition.*

4. I was aware that the natural remedy for this evil was the formation of reservoirs; and an inspection of the Indian Atlas led me to believe that, on the upper portions of the Cavery and of its tributaries, there were many places where

* Note.—In Major Sankey's Report and the papers connected with it, this is treated as a newly discovered fact. It has long been known as an established fact in England, and on the Continent. When I was employed under the "Irish Arterial Drainage Commission" it was frequently a cause of litigation between Mill owners and Towns. The Millars discovered that the clearing and draining of the lands upon the rivers above the sites of their mills, produced overwhelming floods during the rains, and an insufficient quantity of water during the rest of the year. They appealed to the law for compensation, and were sometimes successful.

reservoirs of great capacity could be constructed at small expense, as the required embankments would be short.

5. I submitted my opinions on this subject to Government, and recommended that the upper regions of these rivers should be examined. Up to this time I was not aware that Colonel Arthur Cotton, R. E., and one or two other parties had, many years previously, urged the construction of similar reservoirs; but, notwithstanding all that had been written on the subject, no actual investigation or survey had ever been made.

6. The Government quite agreed with the views I put forward, but they declined to undertake any investigation, and I was directed to proceed to Tanjore to become personally acquainted with the irrigation works of that Province.

A few months afterwards, a project which had been frequently brought up within the previous twenty or thirty years, was again urged on the consideration of Government, viz., the restoration of the Nerisapuram system. This related ancient is across the Cavery, at the point marked A on the accompanying sheet of the Atlas, and its restoration would bring under cultivation an immense tract of land in the Districts of Salem and Coimbatore; but, after much consideration, Government were obliged to reject the proposition, as, because the reconstruction of the ancient would probably have rendered still more uncertain the cultivation in Tanjore and the adjacent Districts.

7. I took advantage of this circumstance to again bring before Government the advantage of constructing large reservoirs in the hill country; for I believed that if a few such reservoirs were on the tributaries which enter the Cavery below the site of the ancient, they would render the cultivation of the lower Districts so secure that there might be no hesitation about the execution of so useful and profitable a work as the restoration of that ancient would be.

The Government were then convinced of the importance of, at all events, getting some accurate information as to what could be done, and in August 1855, I was appointed to make the investigation.

8. I reached the Bhowany on the 4th of November 1855, and immediately proceeded with the examination of that river and its tributaries.

In August 1856 I sent up a preliminary report on thirty-two sites on the Bhowany, Moyaur, and Manar rivers; and one site at Yennamangalam on the Kurchi stream, which flows into the Cavery about ten miles north of Baowany. Those sites are marked upon the accompanying map (sheet 61 of the Atlas), they were fully described in the report, and sketch sections were given of the best sites for the embankments.

This report was the result of a careful examination of about 500 miles of river course, and three or four times as many square miles of country, nearly the whole of which was a wild, uninhabited, and unhealthy jungle.

At the same time I recommended that certain sites, which seemed to be particularly favorable, should be surveyed in more or less detail, according as their advantages became apparent during the survey.

After some delay the Government sanctioned this proposition, and in 1856-57 five sites were surveyed, two on the Moyaur marked A* and B;* one (No. 31) on

* Note.—These were subsequently considered as one.

the Manal Kava; one in Arungadu valley near Coonoor; and one at Palavar on the Bhowany numbered 7. No. 33, on the Kurchi stream was also surveyed, but in a general way.

The first five sites were all surveyed in detail but No. 31, and that at Palavar were carefully contoured as they were the most favorable.

9. Of No. 31 detailed plans, estimate, and report were sent up to Government in September 1857. The plans of those in the Moyaur and Arungadu valleys were never completed, as the Surveyor who had them in hands was withdrawn before he could finish his work.

The field work of the Palavar site was completed towards the close of 1857, the rough plans, and the details of the designs were then completed; but at this stage of their progress the two Assistants I had were withdrawn to the Executive Department, and as I was soon after appointed District Engineer of Coimbatore, I had no means of getting fair copies, estimates, &c., prepared, as Government declined to allow me to employ a Draughtsman for the purpose. This was the period when all works which were not absolutely and immediately necessary were stopped.

10. These plans of the Palavar basin are still with me, and as soon as those of No. 31, which are now in hands, are sent up, they will be finished and the estimates, &c., submitted to Government.

11. The plans, estimates, &c., of No. 31, which were submitted in September 1857, were forwarded by Government to Colonel Arthur Cotton, R. E., and to Colonel Lawford, R. E., then Superintending Engineer, for their opinion. They were subsequently returned to me to consider some objections raised by Colonel Cotton; after some discussion I re-submitted them; but they were finally returned to me with an intimation that under present circumstances it was not necessary to send up any designs for large works.

The plans have since remained with me, but I have only the original draft of the report and estimate. These have to be revised and copied, and some of the calculations re-made. They are now in hands, and so soon as they are in a satisfactory state I will submit the whole project to Government.

12. GENERAL REMARKS. *The Bhowany.*—I would refer to the accompanying map in explanation of these remarks.

From the junction of the Bhowany with the Cavery, to the junction of the Moyaur, there is no favorable site for a large reservoir. The country is generally flat, and nothing better than the usual long-banded, wide-spread, and shallow tanks could be constructed in that reach.

13. A short distance below the confluence of the Bhowany and Moyaur (about one mile) a bund might be thrown across the valley at a place where a rocky ridge, which approaches the river on the south side, is surmounted by a small pagoda not far from the village of Causipalliam. This would not be a favorable site so far as length of embankment is concerned, and there is also the objection that a large reservoir would swamp a considerable area of cultivated land on both rivers, two or three unmade public roads, and some villages; but it is so favorably situated, at the confluence of these two rivers which drain the whole of the Neilgherries and

a large part of the Mysore plateau, that if, in an engineering point of view, it turned out to be a good site, I would not allow those objections to prevail against it.

The catchment basin above this point is about 1,600 square miles, or 4,053 millions of square yards, and taking into account that by far the greater part of this area is upon the Neilgherries, a constant supply to a reservoir here would be certain. It would also have the advantage of catching any surplus water that might pass the other basins, supposing that a series of them were constructed on the rivers higher up. If a reservoir capable of holding 1,000 millions of cubic yards were constructed at this site, it would require about five inches in depth off the whole catchment basin to fill it, or about one-seventeenth of the average rain-fall upon Dodabetta. Such a reservoir could probably be filled twice in a year. I would recommend an examination of this site.

14. Between the junction of the Moyaur and No. 7 at Palavur there is no favorable site for a large reservoir, although there are several good sites for small ones.

This part of the Bhowany requires no further examination.

15. The site No. 7 at Palavur has already been alluded to in paragraphs 9 and 10, but, pending the submission of the plans and estimates, a short statement regarding the character of the natural basin may be interesting.

I propose to place the surplus weir 155 feet above the bed of the river at the site of the dam. At this height the area is nearly 20 millions of square yards, or about $6\frac{1}{2}$ square miles, or about 4,200 acres.

The circumference at the same height is about 45 miles.

The capacity up to the same level is 507½ millions of cubic yards.

The width of the valley to be embanked across is, at the level of the surplus weir, 837 yards, and, at that of the top of the bund, (10 feet higher,) 852 yards.

Nearly the whole of the site is a wild, and almost uninhabited jungle.

The catchment basin is 304 square miles, or about 942 millions of square yards. Nearly the whole of it is exposed to the south-west monsoon, and must therefore receive probably not less than 120 inches of rain in the year.

16. Above Palavur, on the Bhowany, there are two good sites for comparatively small reservoirs at the villages of Sheramungundy and Sherakudavu. And on the Sirruvani there are three or four favorable sites; one, especially, No. 5, near the village of Hugly, is singularly favorable; a ridge about 50 or 60 feet high runs across the valley on the west side of the river, and a nearly similar ridge approaches it on the opposite side, leaving only a narrow gorge for the river to pass through.

But all these sites above No. 7 would require no further consideration, until observations had shown that the proposed reservoir at Palavur was not sufficient to store the whole of the surplus water.

17. *The Moyaur river.*—I examined carefully the whole of the Moyaur from its source, under Makurty peak, to its junction with the Bhowany, and I am of opinion that it does not present even one very favorable site for the construction of a large reservoir, such as that at Palavur.

There are several places where comparatively small basins could be formed, especially on the plateau of the Neilgherries, where though the basins would be small, they would be favorable as regards cost of storage.

18. Near Gajelhatty, at the point marked A², Captain (now Colonel) Ludlow recommended, many years ago, that a reservoir should be formed by embanking across the Moyaur. I have been informed that his report on the subject has been printed, but I could never get a copy of it; I saw, however, the original plan from which he made all his calculations.

It consisted of a section in the line of the proposed bund, and one contour line at the level of the proposed calingulah, partly surveyed and partly sketched.

Very early, in the course of my enquiry, I examined this site, and ran some lines of fly levels through it, but it turned out so far short of what I had expected that I passed on in the expectation of finding something much better.

I had no opportunity of renewing my examination, or I would have done so, for although, from my cursory examination at that time, I formed an unfavorable opinion of the site, I subsequently, from the perusal of many of his early reports, saw that Captain Ludlow was not likely to have put forward any thing that had not much to recommend it.

At the same time, I believe, he saw the site from only one side of the river, and that the Surveyor who prepared the plan did his work very carelessly, and thus misled him.*

The next site on the Moyaur is where the one alluded to in paragraph 9 was surveyed. It is a good site, but I can say little about it as the surveys were never plotted. The place was so unhealthy that we remained out surveying nearly all day, intending to plot the work in a healthier climate; but, as before stated, the Surveyor who had the principal part of the work in hands was not allowed to remain to plot it.

I would consider this site unnecessary if that at Gajelhatty were approved of.

19. Between this point and that marked 30, there is no good site for a large reservoir.†

20. Site No. 30 is a good one and should, I think, be further examined.

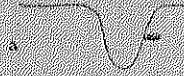
The following extract from my first Report in August 1856, will explain the nature of this site:—

“As before stated, the river becomes sluggish near the Sawyer’s village. Here “it takes a sweep towards the west, to get round a large spur thrown out from “Chellavaroyenbetta. The spur runs nearly due west, and ends abruptly at the “river.

* Note.—This Gajelhatty is a most dangerous place, on account of jungle fever. Few Europeans have ever gone there without being attacked, and no stranger should be allowed to go there without ample warning.

The fever is of a most virulent description, and difficult to be got rid of.

† Note.—At the point marked B², known as the *Dorshokundy Pass*, the Moyaur valley which, up to this, is wide undulating, and teeming with tributaries on both sides, suddenly narrows, and we then enter the lower end of what is called the “*Moyaur ditch*,” which extends from this place up nearly to Tippiakadu. It is evident, from the configuration of this valley that the Dorshokundy Pass is the termination of an ancient estuary. There are many places along the sides of the valley, where the ancient sea margins can be traced distinctly. The “*Moyaur ditch*,” which commences here, is a very singular instance of the action of a river in deepening its bed. It ranges, in depth, from 100 feet near the upper end to about

800 feet at the lower. Its cross sectional shape is that of a  with a level bit at the bottom, about 120 feet in width through which the river flows. The sides are very steep and are practically impassable. In approaching the ditch it is not seen until one comes close to its edge, as the land is at the same level on both sides.

"On the opposite side the land rises rapidly from the water, and then slopes upwards to the top of a conical hill called Pwanga-ghery-goody, or Pwanga-mally, about half a mile from the river, and about 500 feet above the level of the valley.

"The line of this spur seems to be the best one for an embankment.

"The reservoir would consist of the valley of the main river, that of the Shree-Maddurah river, (a considerable stream which flows from the west,) and that of the stream that enters near the Sawyer's village.

"The catchment basin is $113\frac{1}{2}$ square miles, or 351,377,000 square yards, off which we might safely calculate on storing 500 millions of cubic yards, and I consider that if filled twice in the year this quantity might be stored by a bund 90 feet in height and not exceeding 400 yards in length.

"From Chellavaroyanbetta other spurs run down to the river on the north side of the one alluded to above; and as they are all met by the high ground on the opposite side of the river, it may be that one of them would answer better for the bund than the one described. The forest here is so close, that nothing but levels can decide this question, but I am of opinion that No. 30 is the best site this locality affords."

21. Upon the Neilgherries the Moyaur is called the Bakkary river, sometimes the Makurty river.

In this reach there are seven sites from No. 23 to No. 29 inclusive, where reservoirs, sufficiently large for their respective catchment basins, could be formed. Of these seven sites I prefer those numbered 25 and 28.

22. The former though small is a singularly favorable site, as the bund would be very short, and the basin flat and extensive. It is the flat reach which is crossed by the bridle-path from Ootacamund to Makurty peak, and it has all the appearance of being the bed of a former lake.

The two streams whose catchment basins are marked L. and M. on the map, can be turned into No. 25, as they lie at a much higher level.

The catchment basin of No. 25 is $25\frac{1}{2}$ square miles, or nearly 70 millions of square yards. The rain-fall at this place is probably over 100 inches per annum, so that we might calculate on being able to conserve 120 millions of cubic yards. To accomplish this a very small bund would be required.

23. At No. 28 the catchment basin is 42 square miles, or about 130 millions of square yards, off which could probably be stored 200 millions of cubic yards.

If it be considered advisable to have reservoirs upon the Neilgherries, I would recommend the further examination of these two sites.

24. Besides Nos. 25, 28, and 31 already described, the following sites would, I think, be found favorable for small reservoirs upon the hills.

I. At the head of the Bhowany, near a place known as the "Long Valley," on the road from Ootacamund to Sissupare.

I have only ridden over this site, and can therefore give but a general opinion that I consider it would be found a favorable one.

II. The stream which rises on the west side of Dodabetta, and flows through Love Dale, that which flows by the west side of Bishop's Downs, and the streams

which flow from the neighbourhood of Manjanad, Mel Cowah, &c., all unite in an extensive flat which lies above the point marked No. 10. I do not know what changes may have taken place in this locality during the last ten years, but at that time very little cultivated land would have been interfered with by the formation of a reservoir there, as the site was then almost entirely grass-land, but the road from Ootacamund to Sissupare should have been diverted, and the bridle-path which then led from Ooty to Melur altered.

The place selected for the bund was a narrow rocky gorge of a V shape, with very steep sides, at the lower end of the flat alluded to above: and it would be difficult to find a site more favorable for an embankment.

The catchment basin at No. 10 is fifteen square miles, or 46,464,000 square yards.

The rain-fall is probably about 90 inches per annum, and assuming that we stored 54 inches off the whole area, it would yield about 70 millions of cubic yards.

On my inspection I was of opinion that a bund 70 to 80 feet in height would accomplish this.

25. A small basin, No. 22, was surveyed at Arungadu, but I presume that in that locality vested interests have so increased since I was there, that I need not further allude to it.

26. I examined all the streams on the south-east side of the hills, and although I met with many sites for small basins I would not recommend any of them for further examination.

27. On the north side there are two streams which I did not examine; the Mausri river, whose catchment basin is marked T, and the stream east of it marked O.

The result of enquiries I made about them was that, on the latter, no good site was likely to be found, but that the Mausri river was likely to afford one or more good ones. I think that this stream should be looked at.

28. For the sake of clearness I will now recapitulate what I have recommended:—

I. An examination of the site at A', below the confluence of the Bhowany and Moyaur.

II. An examination of the site A' near Gajelhatti.

III. Do. do. A' at Mangadu.

IV. Do. do. No. 30 near the Sawyer's village.

V. Do. do. No. 28.

VI. Do. do. No. 25.

VII. Do. do. in the "Long Valley."

At the head of the Bhowany, near the Sissupare road—

VIII. An examination of the site No. 10 on the Manar river.

IX. Do. do. of the Mausri river.

X. In addition to the above I would suggest the examination of the site at A' on the Bakkary or Moyaur river.

This is at a place called Kok-mally, where the river tumbles from the plateau of the Neilgherries to the plains.

On the only occasion on which I was able to visit this place, a thick fog prevented my seeing much, but I believe the site is a favorable one.

29. In conclusion, I beg to state that I have been able to put together the whole of the original draft of my first Report, which was sent up in August 1856. In it all the sites numbered on the map, and the rivers, are described, and sketch sections in the lines of the proposed bunds are given. Should the Government desire to have this report, as a record, I will have it copied and sent in, as I suppose the original could hardly be found now.

Should the Government decide on having any of the sites in the jungles surveyed, I shall be happy to afford information regarding the proper routes, places for halting, &c., which might be useful should the party be a stranger to jungle life.

I append a table of the areas of the several catchment basins, and a copy of the registry of rain-fall upon Dodabetta from the year 1847 to 1855 inclusive.

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

Table of Catchment Basins—See the accompanying Plan.

BHOWANY.

Letter on Map.	Description.	No. of sites.	Square miles.	Square yards.	Square miles.	Square yards.
A.	Catchment basin of site ...	1	...	...	91.6	283,740,160
B.	Do. do. of site at Hugly	5	57.6	178,421,760		
C.	Do. do. of the Hugly stream ...	...	9.4			
	Catchment basin of site ...	6	67.0	207,539,200	67.0	207,539,200
D.	Do. do. of the Vengar river, &c. ...	...	...	...	145.4	
	Catchment basin of site at Palayur ...	7	...	...	304.0	941,670,400
	<i>The Kondah river.</i>					
E.	Catchment basin of site ...	10	15.0	46,464,000		
F.		...	11.0			
	Do. do. of ...	13	26.0	80,537,600		
G.	Do. do. of Attaboli stream ...	...	28.0			
	Do. do. of ...	14	54.0	167,270,400		
H.	Remainder of the catchment of Manar river ...	...	60.0			
	Catchment basin of the Manar river ...	...	114.0	353,126,400	114.0	
I.		...	...	...	24.5	
	Do. do. of site at Tondoy	17	...	...	442.5	
J.	Do. do. of the Neerulay river, &c. ...	...	...	...	70.5	
	Do. do. of site at Oosherkulley ...	20	...	...	513.0	
K.		...	...	...	389.0	
	Do. do. of the Bhowany at the junction of the Moyaur ...	...	...	...	902.0	2,794,035,200
L.	Do. do. of site ...	23	6.0			
M.		...	9.5			
	Do. do. of site ...	24	15.5	48,012,800		
N.	Do. do. of site ...	25	10.0			
	Do. do. of No. 25, if Nos. 23 and 24 be conveyed to it ...	25	25.5	78,988,800		
O.		...	16.5			

Proceedings of the Madras Government, Public Works Department
28th June 1866.

Table of Catchment Basins—(Concluded)

Letter on Map.	Description.	No. of sites.	Square miles.	Square yards.	Square miles.	Square yards.
P.	Catchment basin of site ...	28	42.0	130,099,200		
	Do. do. of site ...	30	113.50	351,577,600		
Q.	Includes part of Mysore ...	...	132.75			
R.	Catchment basin of site at Nairgoonamundu ...	31	18.0	55,756,800		
S.	Remainder of the catchment basin of the Seegoor river ...	...	77.0			
	Catchment basin of site ...	32	341.25	1,057,056,000		
T.	...	...	82.50			
U.	...	...	57.25			
V.	...	...	129.0			
	Do. do. of site at Gajelhatti ...	...	610.00	1,889,536,000		
W.	...	...	87.0			
	Do. do. of the Moyaur ...	...	697.0	...	697.0	2,159,027,200
	Do. do. of the Bhowany and Moyaur at their junction ...	...	...	...	1,599.0	4,953,062,400
X.	...	...	...	...	849.0	
Y.	Do. do. of part of the Andoor river ...	...	...	...	224	
	Total catchment basin of the Bhowany ...	...	...	...	2,470	7,651,072,000

11th June 1866.

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

Proceedings of the Madras Government, Public Works Department
28th June 1866.

Registry of Rain on Doodabetia, Nellocheries, from 1847 to 1855 inclusive.

Months.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	Total.	Average of months.
January ...	Inches. 1.79	Inches. 1.77	Inches. 1.77	Inches. 4.9	Inches. .08	Inches. 1.51	Inches. 5.14	Inches. .35	Inches. 4.05	Inches. 15.21	1.69
February ...	Inches. 7.43	Inches. ...	Inches. ...	Inches. 2.63	Inches. ...	Inches. ...	Inches. 74	Inches. ...	Inches. 3.16	Inches. 13.96	1.55
March ...	Inches. 3.62	Inches. 5.5	Inches. 2.15	Inches. .69	Inches. .49	Inches. 2.17	Inches. 9.88	Inches. 57	Inches. 3.73	Inches. 23.85	2.65
April ...	Inches. 19.18	Inches. 2.09	Inches. 7.72	Inches. 5.50	Inches. 1.75	Inches. 3.39	Inches. 4.89	Inches. 2.91	Inches. 4.58	Inches. 52.66	5.85
May ...	Inches. 4.86	Inches. 6.10	Inches. 6.05	Inches. 6.45	Inches. 8.23	Inches. 18.61	Inches. 6.78	Inches. 4.94	Inches. 1.70	Inches. 61.02	7.11
June ...	Inches. 4.55	Inches. 5.66	Inches. 8.45	Inches. 6.60	Inches. 5.15	Inches. 7.71	Inches. 7.32	Inches. 4.53	Inches. 7.63	Inches. 57.60	6.40
July ...	Inches. 7.41	Inches. 13.06	Inches. 10.59	Inches. 9.84	Inches. 20.11	Inches. 13.00	Inches. 8.86	Inches. 10.29	Inches. 5.52	Inches. 98.68	10.96
August ...	Inches. 9.32	Inches. 8.63	Inches. 9.51	Inches. 19.58	Inches. 10.40	Inches. 30.16	Inches. 21.15	Inches. 19.02	Inches. 9.90	Inches. 120.67	13.40
September...	Inches. 7.52	Inches. 14.05	Inches. 12.26	Inches. 9.09	Inches. 5.36	Inches. 7.37	Inches. 7.34	Inches. 8.31	Inches. 11.99	Inches. 83.29	9.25
October ...	Inches. 12.49	Inches. 4.36	Inches. 15.37	Inches. 12.56	Inches. 13.13	Inches. 9.44	Inches. 9.74	Inches. 25.48	Inches. 13.77	Inches. 116.94	12.92
November ...	Inches. 11.85	Inches. 8.48	Inches. 6.50	Inches. 10.06	Inches. 68.33	Inches. 4.33	Inches. 3.37	Inches. 11.68	Inches. 1.60	Inches. 76.25	8.47
December ...	Inches. 12.38	Inches. 2.59	Inches. 1.87	Inches. 4.91	Inches. 2.58	Inches. 19.52	Inches. ...	Inches. 1.98	Inches. 13.22	Inches. 52.95	5.88
Yearly Total ...	Inches. 102.83	Inches. 65.99	Inches. 82.24	Inches. 88.40	Inches. 85.66	Inches. 94.21	Inches. 85.21	Inches. 90.09	Inches. 80	Inches. 775.48	86.13

11th June 1866.

* Not observed, but calculated from the average of other years.

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

Proceedings of the Madras Government, Public Works Department
28th June 1866.

No. 674.

ORDER THEREON, 28th June 1866, No. 2,043.

CIVIL WORKS, No. 165.

1. In the Proceedings of Government, No. 537, under date the 26th February 1866, Mr. W. Fraser, Executive Engineer, was directed to report in what state or progress he left the investigations which had been entrusted to him for ascertaining the means of storing water in the valleys of the Bhowany, Moyaur, and Noyel rivers, in the Coimbatore District. The Memorandum above recorded, which is Mr. Fraser's reply, will be communicated to the Superintending Engineer of the 7th Division, with a view to his considering the advisability of completing the investigation of one or more of the projects which are noticed therein.

2. Mr. Fraser will be requested to forward at once to Government all the papers, plans, and surveys connected with these projects which are in his possession, for transmission to Lieutenant-Colonel Walker.

(True Extract.)

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

To the Superintending Engineer, 7th Division, with Annex sheet No. 43.
To W. Fraser, Esq., C. E.
To the Revenue Department.

Exd. T. O'Connor.

13

*Memorandum on the
proposed large Reservoirs
on and about the
Nilgerry Hills*
William Fraser, C.E.
11 June 1866

11th June 1866. - 15

Memorandum on the proposed
Large Reservoirs on and about the
Nelgherry Hills. -

1. In the proceedings of the Madras Government No 597 dated the 20th February 1866 I am directed, -

I To inform the Government in what state of progress the investigations which were entrusted to me, for ascertaining the means of storing water in the Valleys of the

* The Noyel } Bhovani, the Mojar, and the Noyel
was not }
included in } were left when my examination of those
my instructions... }

Rivers was suspended -

II To submit, at once, all Plans and documents connected with these investigations that may be in my possession.

2.

In replying to this order I shall endeavour to give a brief account of what was done up to the time the investigation was suspended, and what I would recommend should now be done, if the Government are disposed to resume the enquiry:

3

In April 1855, when I came to India, I was directed to make myself familiar with the Madras system of Irrigation, especially as practised in the District of Tanjore: At that time the Government were in the habit of making large remissions annually to the Merasudars for losses arising from deficient crops from deficiency of water:

I saw that this necessity arose from the system of depending altogether

3 17

on the natural flow of the Rivers for supplying the Irrigation channels; and having no reservoir to fall back upon:

It was not only when the Monsoon was scanty that this deficiency occurred; it was almost equally bad when the usual quantity of rain fell, but in a short space of time; producing an unusually high flood which filled the channels to overflowing, but which rapidly went down again, the water passing to the sea unused: — This rapid discharge of the flood has often occurred; and there can be no doubt but that as clearing and cultivation extend in the upper regions of the Rivers it will, from another cause, become their

Normal condition*

I was aware that the natural remedy for this evil was the formation of Reservoirs; and an inspection of the Indian Atlas led me to believe that on the upper portions of the Ganges and of its tributaries, there were many

* Note: In Major Sankar's Report and the papers connected with it, this is treated as a newly discovered fact.

It has long been known as an established fact in England and on the Continent; when I was employed under the "Irish Artificial Drainage Commission" it was frequently a cause of litigation between Mill owners and Land owners. The Millers discovered that the clearing and draining of the lands upon the Rivers above the sites of their Mills, produced overwhelming floods during the rains, and an insufficient quantity of water during the rest of the year. They appealed to the Law for compensation, and were sometimes successful.

places where Reservoirs of great Capacity could be constructed at small expense; as the requisite embankments would be short.

5. I submitted my opinions on this subject to Government, and recommended that the upper regions of these Rivers should be examined:

Up to this time I was not aware that Colonel Arthur Cotton R.E. and one or two other parties had, many years previously, urged the construction of similar Reservoirs; but, notwithstanding all that had been written on the subject, no actual investigation or survey had ever been made.

6. The Government quite agreed with the views I ~~had~~ put forward, but they declined to undertake any investigation, and I was directed to

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4 19
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6. The Government quite agreed with the views I ~~had~~ put forward, but they declined to undertake any investigation, and I was directed to

found to Tanjore to become personally
acquainted with the irrigation works
of that Province.

A few months afterwards,
a project which had been frequently
brought up within the previous 1850
year, was again raised with considera-
tion of fact; namely, the restoration of
the storied Anaikeat. This ruined
Anaikeat is across the river at the
point marked A.E. in the accompany-
ing sheet of plan. It was; and its restoration
would bring under cultivation an immense
tract of land in the Districts of Salem
and Coimbatore; but, after much con-
sideration, the Government were obliged to reject
the proposition again, because the

52
reconstruction of the Anaikeat would
probably ^{have} rendered still more uncertain
the cultivation in Tanjore and the adjacent
Districts.

I took advantage of this
circumstance to again bring before Govt.
the advantage of constructing large
Reservoirs in the Hill country; for
I believed that if a few such Reservoirs
were on the tributaries which enter the
Cavery below the site of the Anaikeat,
they would render the cultivation of
the lower Districts so secure that
there might be no hesitation about
the execution of so useful and pro-
fitable a work as the restoration
of that Anaikeat would be.

The Govt. were then convinced of the importance of, at all events, getting some accurate information as to what could be done and in August 1855, I was appointed to make the investigation.

8. I reached the Bhovani on the 14th of November 1855 and immediately proceeded with the examination of that River and its tributaries:—

In August 1856 I sent up a preliminary Report on 32 sites on the Bhovani, Mayar, and Maniar Rivers; and one site at Yeniamangalam on the Kurchi stream which flows into the Kavery about 10 miles North of Bhovani: Those sites are marked upon the accompanying map (Sheet 61 of the Atlas), they were

23
fully described in the report, and Sketch Sections were given of the best sites for the Embankments:—

This report was the result of a careful examination of about 500 miles of River Course, and 3 or 4 times as many square miles of Country, nearly the whole of which was a wild, uninhabited and unhealthy Jungle:—

At the same time I recommended that certain sites which seemed to be particularly favourable, should be surveyed in more or less detail according as their advantages became apparent during the Survey:—

After some delay the Government sanctioned this proposition, and in 1856-7 five sites were surveyed, Two on

the Mogar marked ^{*}Raid Bgr. one (No. 31) on the Manali River; one in Arungadu Valley near Coonoor; and one at Palavur on the Bhuvan River. No. 31, on the Kurichi Stream was also surveyed, but in a general way.

The first 5 sites were all surveyed in detail but No. 31, and that at Palavur were carefully contoured as they were the most favourable.

Of No. 31 detailed Plans, estimate and report were sent up to Government in September 1857.

The Plans of those in the Mogar and Arungadu Valleys were never completed, as the Surveyor who had them in hand

* Note - These were subsequently considered as one.

7
was withdrawn before he could finish his work:

The Field work of the Palavoor site, was completed towards the close of 1857; the rough Plans, and the details of the designs were then completed, but at this stage of their progress the two assistants I had were withdrawn to the Executive department, and as I was soon after appointed District Engineer of Coimbatore, I had no means of getting fair copies, Estimates, &c prepared; ^{as} ~~and~~ Government declined to allow me to employ a Draftsman for the purpose: This was the period when all works which were not absolutely and immediately necessary were stopped.

10. These Plans of the
Palavir Basin are still with me;
and as soon as those of No. 51, which are
now in hands, are sent up, they will
be finished, and the Estimates ~~of~~ submit-
ted to Government.

11. The Plans Estimates ~~of~~ of
No. 51 which were submitted in Sept. 1857,
were forwarded by Govt. to Colonel Arthur
Cotton R.E. and to Colonel Lawford R.
E. Then ~~Superintending~~ ^{Superintending} Engineer for their
opinion: They were subsequently re-
turned to me to consider some objections
raised by Colonel Cotton; after some
discussion I resubmitted them; but
they were finally returned to me with
an intimation that under present

circumstances it was not necessary
to send up any designs for large works

The Plans have since remained
with me, but I have only the original
draft of the Report and Estimate:

These have to be revised and copied,
and some of the calculations remade;

They are now in hands and so soon
as they are in a satisfactory state
I will submit the whole project to
Government.

12. General remarks
The Bhovani

I would refer to the accompanying
map in explanation of these remarks.

From the Junction of the Bhovani with
the Bavery, to the Junction of the Major

there is no favourable site for a large Reservoir. — The country is generally flat and nothing better than the usual long-banded, wide-spread, and shallow Tanks, could be constructed in that reach.

13 A short distance below the confluence of the Bhavani and Moyar (about one mile) a Band might be thrown across the valley at a place where a rocky ridge which approaches the River on the south side, is surmounted by a small Pagoda not far from the village of Caripalliam. — This would not be a favourable site so far as length of Embankment is concerned; and,

92 there is also the objection that a large Reservoir ~~would~~ would swamp a considerable area of cultivated land on both Rivers, two or three unmade public roads, and some villages; but it is so favourably situated, at the confluence of these two Rivers which drain the whole of the Nilagiris and a large part of the Mysore Plateau; that if, in an Engineering point of view, it turned out to be a good site; I would not allow those objections to prevail against it.

The Catchment Basin above this point is about 1600 square miles or 4,953 millions of square yards and taking into account that by far the greater

The circumference at the same height is about 45 miles:—

The capacity up to the same level is $50\frac{1}{4}$ millions of cubic yards:—

The width of the Valley to be embanked across, is, at the level of the surplus weir, 837 yards; and, at that of the top of the Bund, (10 feet higher) 852 yards:—

Nearly the whole of the site is a wild, and almost uninhabited jungle:—

The Catchment Basin is $30\frac{1}{4}$ square miles or about 942 millions of square yards:— Nearly the whole of it is exposed to the S. W. monsoon, and must therefore receive probably not less than 120 inches of rain in the year:—

16—

16—

Above Pālavār, on the Bhavāni, there are two good sites for comparatively small Reservoirs at the villages of Thēramungundy and Thērakudam:—

And on the Tiruvāni there are three or four favourable sites; one, especially, N^o 5, near the village of Hughly, is singularly favourable; a ridge about 50 or 60 feet high runs across the Valley on the west side of the River, and a nearly similar ridge approaches it on the opposite side, leaving only a narrow gorge for the River to pass through:—

But all these sites above N^o 7 would require no further consideration, until observations had shown that the proposed Reservoir at Pālavār was not sufficient to store the whole of the surplus

water.

17. I examined carefully the whole of the Moyar from its source, under Makurti Peak, to its junction with the Phorani; and I am of opinion that it does not present even one very favourable site for the construction of a large Reservoir such as that at Palavin.

There are several places where comparatively small Basins could be formed, especially on the Plateau of the Neilgherries, where though the Basins would be small, they would be favourable as regards cost of storage.

18. Near Gajelhatti at the point marked A² Captain (now Colonel) Ludlow recommended, many years ago, that a Reservoir should be formed by

The Moyar
River

35/12
embanking across the Moyar:— I have been informed that his report on the subject has been printed, but I could never get a copy of it; I saw however the original Plan from which he made all his calculations.

It consisted of a section in the line of the proposed Bund and one contour line at the level of the proposed Kalingala; partly surveyed and partly sketched:—

Very early in the course of my enquiry I examined this site and ran some lines of fly levels through it, but it turned out so far short of what I had expected that I passed on in the expectation of finding something much better:—

I had no opportunity of renewing my examination or I would have done so, for although, from my cursory

examination at that time, I formed an unfavourable opinion of the site; I subsequently, from the perusal of many of his early reports, saw that Captain Ludlow was not likely to have put forward any thing that had not much to recommend it:—

At the same time I believe he saw the site from only one side of the River, and that the Surveyor who prepared the Plan did his work very carelessly and thus misled him.*—

*Note.— This Gajelhutty is a most dangerous place on account of jungle fever:— Few Europeans have ever gone there without being attacked, and no stranger should be allowed to go there without ample warning.—

The fever is of a most virulent description and difficult to be got rid of. —

37/13
The most site on the Moyar is where the one alluded to in Para 9 was surveyed. It is a good site but I can say little about it as the surveys were never plotted; The place was so unhealthy that we remained out surveying nearly all day, intending to plot the work in a healthier climate; but, as before stated, the Surveyor who had the principal part of the work in hands was not allowed to remain to plot it:—

I would consider this site unnecessary if that at Gajelhutty were approved of.—

19. Between this point and that marked 30, about 8 miles above Lappahadu, where the Mysore road

~~On the River~~, there is no good site
for a large Reservoir*.

20. Site No 30 is a good one and
should, I think, be further examined:—

The following extract from my first
Report in August 1856, will explain
the nature of this site:—

*Note— at the point marked P. known as the
Dorshakundy Pass, the Moyar Valley which, up
to this, is wide undulating, and teeming with tribes—
narrows on both sides, suddenly narrows and we
then enter the lower end of what is called the
“Moyar ditch” which extends from this place
up nearly to Tippakadu; It is evident from
the conformation of this Valley that the Dorshakundy
Pass is the termination of an ancient Estuary:—
There are many places along the sides of the Valley
where the ancient Sea Margins can be traced
distinctly:— The “Moyar ditch” which commences
here is a very singular instance of the action of a
River in deepening its bed:— It ranges, in depth, from
100 feet near the upper end to about 800 feet at the lower:—
Its cross sectional shape is that of a , with a
level bit at the bottom, about 120 feet in width, through
which the River flows:— The sides are very steep and
are practically impassable:— In approaching the ditch
it is not seen until one comes close to its edge, as the
land is at the same level on both sides:—

21. ^{27/11} As before stated the River becomes

“sluggish near the Nayari Village”:— Here

it takes a sweep toward the West to get round

a large spur thrown out from Chellavarigen:—

~~the spur~~ The spur runs nearly due

west and ends abruptly at the River:—

On the opposite side the land rises rapidly

from the water, and then slopes upwards

to the top of a Conical Hill called

“Panagayal-gody”, or Panaga-mally

about half a mile from the River and

about 500 feet above the level of the Valley:—

The line of this spur seems to be the

best one for an embankment.

The Reservoir would consist of the

valley of the main River, that of the

“Three-Maddurah River” (a considerable

"Stream which flows from the west) and that
"of the stream that enters near the Sawyard
"Village:—

"The Catchment Basin is 110 1/2
"Square Miles or 351,577,600 square yards.
"off which we might safely calculate on
"storing 500 millions of Cubic yards, and
"I consider that if filled twice in the year
"this quantity might be stored by a Band
"90 feet in height and not exceeding 400
"yards in length:—

"From Chellavayyambetta other
"Spurs run down to the River on the north
"side of the one alluded to above; and as
"they are all met by the high ground
"on the opposite side of the River, it may
"be that one of them would answer better for the

134
"Band than the one described; The
"Forest here is so close, that nothing but
"levels can decide this question, but I am
"of opinion that No 30 is the best site
"this locality affords.—

21. Upon the Melagherries the
"Mogor is called the Mukkary River—
"Sometimes the Mukkarty River:—

In this reach there are seven sites
"from No 22 to No 29 inclusive, where
"Reservoirs sufficiently large for their
"respective Catchment Basins, could be
"formed:— Of these seven sites I

prefer those numbered 25 and 28:—

22. The former though small
"is a singularly favourable site, as the
"Band would be very short, and the Basin

flat and extensive:— It is the flat reach which is crossed by the Bridle path from Otakamund to Makurty Peak, and it has all the appearance of being the bed of a former Lake:—

The two streams whose Catchment Basins are marked **I** and **II** on the map, can be turned into **N^o 25** as they lie at a much higher level:—

The Catchment Basin of **N^o 25** is, $25\frac{1}{2}$ Square miles or nearly 79 millions of Square yards:— The Rain fall at this place is probably over 100 inches per annum, so that we might calculate on being able to conserve 120 millions of cubic yards:— To accomplish this a very small bund would be required:—

23. At **N^o 28** the Catchment Basin is 42 Square miles, or about 130 millions of Square yards, off which could probably be stored 200 millions of cubic yards:—

If it be considered advisable to have Reservoirs upon the Nilagheries I would recommend the further examination of these two sites:—

24. Besides **N^{os} 25, 28 and 31** already described, the following sites would, I think, be found favourable for small Reservoirs upon the Hills.

I. At the Head of the Phovani near a place known as the "Long Valley" on the Road from Otakamund to Tossupare:— I have only ridden over this site, and

can therefore give but a general opinion that I consider it would be found a favourable one. —

II The stream which rises on the west side of Dodabetta, and flows through Love Dale; that which flows by the west side of Bishop's Domes; and the streams which flow from the neighbourhood of Mājanād, mēl Cowāh &c. all unite in an extensive flat which lies above the point marked N^o 10: — I do not know what changes may have taken place in this locality during the last 10 years, but at that time very little cultivated land would have been interfered with by the formation of a Reservoir there as the site was then almost entirely grass land,

but the road from Otakamand to Liscuparu should have been diverted, and the bridge path which then led from ooty to Madhavallur.

The place selected for the Pond was a narrow rocky gorge of a V shape with very steep sides, at the lower end of the flat alluded to above; and it would be difficult to find a site more favourable for an embankment. —

The Catchment Basin at N^o 10 is 15 square miles or 46,464,000 square yards; —

The dam fall is probably about 90 inches per annum, and assuming that we stored 5 1/2 inches off the whole area, it would yield about 70 millions of cubic yards: —

On my inspection I was of opinion that

a Bund 40 to 80 feet in height would accomplish this:—

25— A small Basin N^o 22 was surveyed at Arungādu, but I presume that in that locality, vested interests have so increased since I was there, that I need not further allude to it.—

26— I examined all the streams on the S. E. side of the Hills and although I met with many sites for small Basins I would not recommend any of them for further examination.—

27— On the North side there are two streams which I did not examine; the Mausi River whose Catchment Basin is marked T; and the stream east of it marked O:—

1847
The result of enquiries I made about them was, that, on the latter, no good site was likely to be found; but that the Mausi River was likely to afford one or more good ones.— I think that this stream should be looked at.—

28— For the sake of clearness I will now recapitulate what I have recommended.—

- I An examination of the site at A' below the confluence of the Phovani and Moyar—
- II - Do - of the site A² near Gajelhatti.—
- III - Do - of the site A³ at Māngādu.—
- IV - Do - of the site N^o 30 near the Sawyers Village
- V - Do of the site — N^o 28
- VI - Do Do — N^o 25
- VII - Do Do in the "Long Valley"

at the Head of the Phovani, near the Lissapore Road:—

VIII Do Do No 10 on the Manar River—

IX An examination of the Mausi River—

X In addition to the above I would suggest the examination of the site at A⁴ on the Bakery or Mogyar River:—

This is at a place called Rik-mally where the River tumbles from the plateau of the Nilagherries to the plains:—

On the only occasion on which I was able to visit this place, a thick fog prevented my seeing much, but I believe the site is a favourable one. —

29 In conclusion I beg to state that I have been able to put together the whole of the original draft of my First

Report which was sent up in August 1856, in it all the sites numbered on the map, and the Rivers, are described; and sketch sections in the lines of the proposed Bunds are given:— Should the Government desire to have this Report as a record I will have it copied and sent in, as I suppose the original could hardly be found now:—

Should the Government decide on having any of the sites in the Jungles surveyed, I shall be happy to afford information regarding the proper routes, places for halting, &c which might be useful should the party be a stranger to Jungle life. —

I append a Table of the areas of the several Catchment Basins; and

a copy of the Registry of Rain fall upon
Doda-betta from the year 1847 to 1855

inclusive

William Fraser C.E.

Special Ec. Engineer

Madras waterworks
Office
Church Park
Mount Road
11th June 1866.

Table of Catchment Basins
on the accompanying Plan
to be shown

Letter on map	Description	No. of sites	Length miles	Square yards	Square miles	Square yards
A	Catchment Basin of site	1			91.6	204,140,160
B	Catchment Basin of site at Angly	5	59.6	198,401,960		
C	Catchment Basin of the Angly stream		9.4			
	Catchment Basin of site	6	69.0	209,639,200	69.0	209,639,200
	Catchment Basin of the Venagur River				145.4	
D	Catchment Basin of site at <u>Belavip</u>	9			304.0	941,690,400
E	<u>The Ponda River</u> Catchment Basin of site	10	15.0	46,464,000		

Letter on map	Description	No. of sites	Square miles	Square yards	Square miles	Square yards
F	Catchment Basin of		11.0			
G	Catchment Basin of Allahabad stream	13	26.0	80,584,600		
	Catchment Basin of		28.0			
H	Remainder of the Catchment of Munar River	14	54.0	164,240,400		
	Catchment Basin of the Munar River		60.0			
I	Catchment Basin of site at Gondy	17	114.0	353,126,400	114.0	
J	Catchment Basin of the Choralay River &c.				24.5	
	Catchment Basin of site at Dohimulley	20			44.5	
K	Catchment Basin of the Choralay at the junction of the Alayir				40.5	
L	Catchment Basin of site	23	6.0		513.0	
M			9.5		389.0	
					902.0	2,494,035,200

N	Catchment Basin of site	24	15.5	48,012,800		
	Catchment Basin of site	25	10.0			
	Catchment Basin of No. 25 if no. 24 be employed to it	25	25.5	48,988,800		
O			16.5			
P	Catchment Basin of site	28	42.0	130,099,200		
			41.50			
Q	Catchment Basin of site	30	113.50	351,544,600		
	Includes part of Chyore		132.45			
R	Catchment Basin of site at Kairamanam	31	13.0	55,456,800		
S	Remainder of the Catchment Basin of the Chyore River		44.0			
	Catchment Basin of site	32	341.25	1,054,056,000		
T			82.50			
U			57.25			
V	Catchment Basin of site at Gajekhaty		129.0			
			610.00	1,889,536,000		

Station or map	Description	No. of sites	Square miles	Square yards	Square miles	Square yards
II	Catchment Basin of the Elroy		84.0			
	Catchment Basin of the Chocoma & Elroy at their junction. — — —		694.0		694.0	2,159,024,200
					1594.0	4,952,062,400
					844.0	
					2,035	
	Total Catchment Basin of the Chocoma				2440	4,651,042,000

Wm. H. Miller, Jr. C.E.

11th June 1866

Registry of Rain on Doodahetta Valley heretofore from 1847 to 1855 inclusive.

Months	1847	1848	1849	1850	1851	1852	1853	1854	1855	Total	Average of months
January	1.70	.12	1.77	.49	.08	1.51	5.14	.35	4.05	15.21	1.69
February	7.43	"	"	2.68	"	"	.74	"	3.16	13.96	1.55
March	3.62	.55	2.15	.69	.49	2.17	9.88	.57	3.73	23.85	2.65
April	19.18	2.09	7.72	5.50	1.75	3.39	4.89	2.94	4.58	52.66	5.85
May	4.86	6.40	6.05	6.45	8.23	18.61	6.78	4.94	1.70	64.02	7.11
June	4.55	5.66	8.45	6.60	5.15	7.71	7.32	4.53	7.63	57.60	6.40
July	7.41	13.06	10.59	9.84	20.11	13.00	8.86	10.29	5.52	98.68	10.96
August	9.32	8.63	9.51	19.58	10.40	30.16	21.15	19.02	9.90	120.67	13.40
September	7.52	14.05	12.26	9.09	5.36	7.87	7.34	8.31	11.99	83.29	9.25
October	12.49	4.36	15.37	12.56	13.13	9.44	9.74	25.48	13.77	116.34	12.92
November	11.85	8.48	6.50	10.06	18.38	4.33	3.37	11.68	1.60	76.25	8.47
December	12.28	2.59	1.87	4.91	2.58	13.52	"	1.98	13.22	52.95	5.88
Yearly Total	102.83	65.99	82.24	88.40	85.66	94.21	85.21	90.09	80	775.48	86.18

* Not observed but calculated from the average of other years.

Wm. H. Miller, Jr. C.E.

11th June 1866

No 20 February 1866 at 446-447

Copy in a letter to England
of 25th September No 47 of 1866.

W. Fraser Dept
Proof read for June
No 24/5

From
W. Fraser Esq. C.E.

To
The Secy to Govt. P.W.D.

Of "1" } June 1866
No 13" }

En. one.

Forwarding with
a plan, a Memo. on the
proposed large
Reservoirs on and
about the Nilgherry
Hills

4/3

C. W. Fraser Esq.

No 2043. 28th June 1866

Public Works Department

2043

Proceedings of the Madras Government
under date the 28th June 1866.

Recd the following

From the Superintending Engineer
of the 7th Division.

(A. E. No 3 dated 8th June 1866)

From W. Fraser Esq.
Special Executive Engineer

(A. E. No. dated 11th June 1866)

N.

W. Fraser

In the Proceedings of Govt.
No 597 under date the 20th
February 1866, Mr W. Fraser,
Executive Engineer, was
directed to report in
what state of progress he
left the investigations which
had been entrusted to him
for ascertaining the means
of storing water in the
valleys of the Bhavani,
Moyar, and Noyel rivers
in the Pindar District.
The Memorandum above

Recorded which is No.
Hassers reply will be com-
municated to the Sup-
Engineer of the 7th Division,
with a view to his
considering the advisability
of completing the investi-
gation of one or more
of the projects which are
noticed therein -

Mr. Hader will be
requested to forward at
once to Government all
the papers, plans, and
surveys connected with
these projects which are
in his possession for
transmission to Colonel
Walker

[Signature]

The Sup. Engr. 7th Div.
with Attn. Capt. No. 84
W. H. Hader Engr. 62

19
3

Sept. 29th 1865

Copy in a letter to England
of 25th September 1866.

3-10-01

16-11-32 BTH

P. W. 1866 D. 1866
Pro: of East for East

Ac 2043.

Pro: of the Maorai East

of 28th August

Report by Mr. A. Brown
in relation to the state of progress
in which he left the investigations
for ascertaining the means of
storing water in the valleys of the
Kilomany, Mnyam, and other
rivers connected to the upper
basin of the 7th river.

Ac 2043.