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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No.	15-04	Press
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Dated	14.6.	1872.

Not to be folded or roughly handled

No. 296. Read the following letter from the Acting Superintending Engineer, 7th Division, to the Chief Engineer and Secretary to Government, Public Works Department, dated Coimbatore, 20th April 1872, No. 14 :—

WITH reference to paragraph 6 of G. O., No. 2,439, dated 10th October 1870,

- | | |
|---|--|
| 3 Estimates of three dams amounting to Rupees 7,40,060, Rupees 5,73,920, and Rupees 5,05,960. | passing orders on Mr. McIvor's report of work done by him on the embankment of the proposed reservoir on the Mail-koondah Road, known by the name of "Lake St. Lawrence," and the observations of the Chief Engineer for Irrigation on that report, as ordered, I have the honour to submit, as per enclosed list, the estimates, sections, surveys, and information called for, to enable the |
| 1 Details of calculations. | |
| 1 List of plans (17 in number, by rail). | |
| 1 Report of Captain Morant, R. E., No. 42, of 4th March 1872. | |
| 1 Copy of a letter, No. 55, dated 31st March 1871, from Captain Morant, to the Chief Engineer for Irrigation. | |
| 1 Copy of a letter No. 73, of 7th September 1871, from Mr. McIvor, with enclosures. | |
| 5 Photographs of the site per book post. | |

Chief Engineer for Irrigation to submit the project to Government, which I am under the impression the G. O. above quoted directs he and not I should do. These papers have been prepared by Captain Morant, R. E., the Executive Engineer of the Neilgherry Range, the great care required in their preparation and their necessary voluminousness will, I trust, sufficiently account for the delay that has taken place in their submission. Since you are as thoroughly acquainted as I am with the whole question of the silting experiments under notice, the fallaciousness of the original estimate, and the causes of its failure, etc., etc., etc., I refrain from making any further remark on the subject, except that should Government desire that the silting process again be tried under proper professional guidance, I beg respectfully to recommend a new site for the experiment, namely, that of the embankment of the far larger and more beautiful lake projected by me in the vicinity of Ootacamund, known as "Lake Victoria," the embankment of which will not exceed more than 130 or 150 feet in height, while, from the greater superficial area and average depth of its basin, its capacity greatly exceeds that of Lake St. Lawrence, and will, therefore, be of more use for storage of surplus water for irrigation purposes.

From Captain J. L. L. MORANT, R.E., Executive Engineer, Neilgherry Range, to the Superintending Engineer, 7th Division, dated Ootacamund, 14th March 1872, No. 42.

WITH reference to your endorsement on G. O., Public Works Department, No. 2,439, I have the honour to submit plans and estimates relating to the construction of a bund by the silting process across the Poorthy river.

2. The following documents refer to the subject :—

- No. 1. Three Estimates of Dams.
- " 2. One Details of Calculations
- " 3. Copy of a letter No. 55.
- " 4. Do. letter " 73.
- " 5. List of Plans.

G. O., No. 1,393, of the 8th May 1867, Public Works Department. Colonel Walker's letter on Mr. McIvor's proposals alluded to in paragraph 4 of Secretary of State's despatch printed with G. O., No. 3,787, of the 5th December 1867.

G. O., No. 3,787, of the 5th Dec. 1867, P. W. D.
 „ „ 1,872, of 13th June 1868, P. W. D.
 „ „ 2,271, of 16th July „
 „ „ 2,093, of 28th June 1869.
 „ „ 2,183, of 6th July „
 „ „ 3,800, of 1st Dec. „
 „ „ 171, of 14th Jan. 1870.
 „ „ 777, of 12th March „
 „ „ 1,183, of 4th May „
 „ „ 1,350, of 28th „ „
 „ „ 2,439, of 10th Oct. „
 „ „ 111, of 14th Jan. 1871.
 „ „ 278, of 30th Jan. „
 „ „ 680, of 8th March „
 „ „ 766, of 14th „ „
 „ „ 1,699, of 23rd June 1871, and letter
 No. 55, of the 31st March 1871, from
 Executive Engineer, Neilgherry
 Range, to the Chief Engineer for
 Irrigation (copy attached).

3. In the latter part of paragraph 3 of G. O., No. 2,439, of the 10th October 1870, it is stated that "should rock be found at a high level the connection of the two valleys by a cutting would be economically impracticable."

This has unfortunately turned out to be the case as the experimental cut alluded to in paragraph 4 of the same G. O. has reached rock at a depth of 45 feet, a report upon which is contained in my letter No. 55 of the 31st March 1871, to the address of the Chief Engineer for Irrigation (copy attached).

The only manner, therefore, in which this difficulty can be attempted to be overcome is by raising the embankment to such a height (within practicable limits) that the rock cutting may be reduced to a minimum. Now, from a very careful inspection of the ground, I am of opinion that it will be found to be very difficult, if not impossible, to obtain earth by the silting process for an embankment higher than 187 feet above datum line. This, I think, will be clear from the following consideration: the enormous excavations which have on all sides been made to form the two embankments which have been washed away amount only to 143,248 cubic yards, whereas this proposed bund of 187 feet high, will contain 1,430,647 cubic yards, or nearly ten times the former. Can it be hoped that earth for a bund larger than this is obtainable any where at all near the spot at any reasonable cost.

4. In framing the estimates the first point which we have to determine is the rate at which the silting of the bund can be effected.

We have three separate data from which this can be obtained:—

1st.—We can compare the contents of Bund No. 2, which was washed away in June 1870, with its stated cost, or

2ndly.—We can set the cost of the two dams, which were successively erected, together with the contents of the escape excavation against the whole expenditure

upon earthwork up to the present moment, or, lastly, we can take the rate of silting out the escapement alone.

5. With regard to the first, Mr. McIvor, in paragraph 2 of his letter No. 144 of the 23rd July 1870, printed with G. O., No. 2,439, of the 10th October 1870, states that the second embankment contained 322,322 cubic yards. Major Mullins, at the close of paragraph 12 of his Note printed with the same G. O., hints at the possibility of these figures being inaccurate. My calculations, which have been made with great care and accuracy from the detailed contoured survey of the bund site, give only 131,478 cubic yards. I will endeavour to show how this difference arises. In Mr. McIvor's letter he states this dam to have been "raised to 81 feet on the back or lower portion, and to 57 feet at the front or upper portion, giving an average height of 69 feet. The width of the bund up and down the river being 475 feet at the base and 383 feet at the top. The length of the embankment across the river-bed averaged 170 feet at the base and 418 feet at the top."

*Looking, first, at the average height of the bund, I find Mr. McIvor, in paragraph 4 of his letter, states that the deep bed of the river averages 11 feet under summer water level, and the summer water level he places 10½ feet below the lower culvert sill. Major Mullins, in paragraph 7 of his Note, seems to consider it probable that this is erroneous, and refers to it in the following terms:—

"My measurements of the heights are somewhat different to those given by Mr. McIvor, unless he has taken the deep bed of the river (which he puts 21½ feet below the sill of the lower part of the culvert) as his datum. There may be pools of this or of even of greater depth, but I am disposed to think that the average level of the bed at the bund site is not many feet below the bottom of the lower culvert."

Now, from the two cross sections and one longitudinal section taken at the bund site, it will be seen that the floor of the lower culvert is at its tail only

* 13.08 feet above datum.

2.08 feet* above the rocky bed of the river. There is one pool in this rocky

bed close to the tail of culvert, but its area is insignificantly small, and its depth where deepest is only 8 feet below the floor of lower culvert. I will, however,

assume that this pool is a large one, and

† 5.00 feet above datum.

will take its greatest depth as 8.08 feet†

below sill of lower culvert. The north and south cross section, taken quite close to the centre line of the bund, shows the river-bed there to be exactly on the level of the lower culvert, and the other cross section, taken 170 feet to the west of the first, makes the river-bed there only 8.08 feet below the floor of lower culvert, there being no pools near either of these latter sections below this level. We have therefore these facts: the deepest portion of the bed of the river above and below centre line of bund is 8.08 feet below floor of lower culvert. At centre line of bund the floor of lower culvert and river-bed are of the same level. We thus obtain as an average the deep bed of the river to be 4.04 feet below lower culvert sill. But we have seen, Mr. McIvor states, that the bed of river averages 21½ feet below the sill of lower culvert. We may thus with fair accuracy put down the average height of the two parts of the embankment at 66.96 (or, say, 67 feet) and 42.96 (or, say, 43 feet) respectively, instead of 81 and 57 feet as Mr. McIvor makes them.

It is not so easy to ascertain the average width of the bund up and down the river owing to the very irregular manner in which the two sides of the dam were lined out, and the ledges by which it has in parts been raised. The length of the culvert, which is nearly at the very base of the embankment, is, according to Mr. McIvor's statement, 400 feet long. Yet he makes the average width of the dam, i. e., midway between its crest and toe, 429 feet. How is this possible?

Lastly, we require the length of the embankment across the river-bed.

Mr. McIvor states that the river-bed averages 170 feet at base. The cross section and contoured plan give the river-bed at base 50 feet (this not being an exactly perpendicular measurement), and 38 feet respectively, and the extreme width of river-bed at outer toe of dam and on a level with the floor of lower culvert (i. e., 8.04 feet above the deep pool there) is only 100 feet. The average of these three is therefore only 63 feet, but 50 feet as an average would be nearer the mark. Similarly, I make the river-bed at top of the two embankments (higher and lower) average 322 and 258 feet respectively, which gives a mean of 290 feet for the length at top. The middle length will be thus about 176 feet.

I have in this way, I trust, clearly shown how erroneous Mr. McIvor's measurements are. The content of the dam will in this clearly somewhat rough manner come to under 140,000 cubic yards.

6. The dam's content can, however, be viewed from another point. I have ascertained, in a necessarily rough manner, and allowing for irregularities as much as possible, the contents of all the silting pits to be only 143,248 cubic yards, which I am sure gives their outside contents. Mr. McIvor, however, in his paragraph 11 states the whole of the earthwork to have amounted to 393,462 cubic yards. I do not bring this forward as in itself conclusive, but merely indirectly to support (if support be deemed necessary) the measurements obtained of the dam from the contoured survey.

7. We may, therefore, fairly assume dam No. 2 to have contained 131,478 cubic yards, and Mr. McIvor, in paragraph 3 states this dam to have cost Rupees 7,585. Hence we obtain a rate of $17\frac{1}{4}$ cubic yards per rupee.

8. Now, with regard to the second proposed method of striking the rate, we have seen above that the second dam contained 131,478 cubic yards. Of the contents of the first dam, which went in June 1869, it is impossible to obtain an accurate measurement. But Mr. McIvor states it, in his paragraph 10, to have contained 71,140 cubic yards. From my letter to the Chief Engineer the quantity of earth silted out for the escapement when the work was stopped, amounted to 8,674 cubic yards (*vide* my letter to the Chief Engineer). * These three quantities added together make 211,292 cubic yards. In accompaniment to Mr. McIvor's letter, No. 73 of 7th September 1871, to my address, he states the entire expenditure on earthwork, including escapement, to be Rupees 10,634. We hence obtain a rate of 20 yards per rupee.

9. Lastly, from my letter to the Chief Engineer before quoted, the rate of silting but the escapement is ascertained to be only $7\frac{1}{4}$ yards per rupee.

10. Here I would beg to observe parenthetically that, in the silting of the escapement there was nothing, so far as I am aware, to enhance the cost. The earth seemed of ordinary hardness. Moreover, no expense had to be incurred in taking the silted earth and depositing it in any particular place. The saddle for

the escapement was merely cut through, and the earth washed down into the valley below where it was left to take care of itself. In the dams, however, which Mr. McIvor raised, he had not only to silt out the earth from the hill, but to carry it to the dam and spread it and dispose of it regularly there. I cannot explain why the rate in the latter case is cheaper than in the former.

11. Taking the average of the above three rates, which gives pretty fairly the probable working rate in different kinds of soil, and under various circumstances, we obtain a working rate of 15 cubic yards per rupee. This is the lowest rate which, in my opinion, can be entered in the estimate from the data before us.

12. Before leaving the subject of the rate it is necessary to explain a point connected with the stated cost of the earthwork.

In paragraph 3 of Mr. McIvor's letter, he states the actual cost of the earthwork amounts to Rupees 7,585, namely, Rupees 3,240 expended in bringing the silting streams to the site of the dam and maintaining them in repair, and Rupees 4,345 the cost of excavating the soil and depositing it on the embankment; and again, in paragraph 13, he states, "leaving out the cost of the silting streams, which in reality should be charged only against the whole of the work when completed, and not against a portion, gives 90 cubic yards per rupee." Major Mullins also in paragraph 2 of G. O., No. 680, of the 8th March 1871, states that "the former rate (7.86 cubic yards per rupee) includes probably the cost of bringing the silting streams to the work, and this would not have to be repeated."

I beg to be allowed to observe, on this point, that the cost of bringing the silting streams to the work and of maintaining them in repair has hitherto come to a very large proportion (something like 50 per cent.) of the whole expenditure on earthwork, notwithstanding that the operations have been some years in progress and a bund of a large size was raised. Is there any guarantee that these charges will in future be reduced? And, if so, by how much? Unless there be it does not seem to me in an estimate of this kind, where, by a fictitious prospect of cheapness, the Government might be induced to embark in an ultimately expensive project, that the cost of the silting streams and of keeping them up should be excluded; and I may add here that, if the work be resumed, the streams will have to be considerably repaired, as they have necessarily become injured by hill cattle and floods.

Moreover, in the estimate for all the embankments (high and low) I have entered one rate for the earthwork, the rate obtained from the comparatively low dam which was washed away. But as the embankment rises fresh streams will have to be brought to the site, and the silt will have to be conveyed for a necessarily longer distance, and the plane of deposition becoming flatter the rate will probably increase with the height of the dam.

13. Three estimates have been prepared: one for a bund with the water line 130 feet above datum, another for a bund with the water line 148 feet above datum, and a third for a bund with the water line 166 feet above datum, with all the requisite subsidiary works in each case.

Each bund is proposed to be raised 21 feet above its own water line, with a breadth at top of 30 feet, an outer slope of 3 to 1, and an inner of 2 to 1.

The escapement level for each bund will be at high water line, and in view of the remarks contained in paragraph 5 of the late Colonel Anderson's Memorandum,

printed with G. O., No. 1,872, of 13th June 1868, it is proposed to make the permanent escape channel 60 feet wide.

14. No. 1 Bund (or lowest) contains 622,510 cubic yards of earth, will cost with all requisite subsidiary works Rupees 7,40,060, and impounds 3,712,835,306 gallons of water.

No. 2 Bund contains 921,902 cubic yards, will cost Rupees 5,73,920, and impounds 5,398,095,993 gallons.

No. 3 Bund contains 1,296,984 cubic yards, will cost Rupees 5,05,960, and impounds 7,847,171,493 gallons.

15. In framing the estimate, I have added one-twelfth to the contents of each bund to allow for settlement as well as for inequalities in the ground which the contours may not be able to show, and for slight inaccuracies in the deposition of the earth which may occur while the work is in progress. From what has occurred in the settling of the bund at Marlimund, I think this you will allow to be a very moderate addition.

16. To give effect to the instructions contained in paragraph 7 of G. O., No. 2,439, of the 10th October 1870, Public Works Department, a culvert under each bund, with inlet tower, foot-bridge of approach, valves, etc., has been entered in the estimate. These will be similar to those carried out so successively by Colonel Fife, R.E., in the Sholapore Tank, Bombay Presidency, and which are thus described by him: "The channels themselves call for no particular remark, but the arrangements for admitting water into them from the lake have been a source of much anxious consideration, and I took the opportunity of ascertaining Sir Arthur Cotton's opinion upon the question. The common plan of using an iron pipe with a valve, which is practised in almost all town water-supply works in England, is both an economical and a safe method when the quantity of water to be liberated is moderate and the depth not very great, and this plan has been adopted for the small four mouth's canals. But for the perennial canal, which starts at a point 41.73 feet below the surface of the lake, I have followed Sir Arthur Cotton's advice, which was to construct an inlet tower with a number of small openings at different levels, and carry from its base through the dam a massive masonry culvert or tunnel much larger than is actually required for the free passage of the full supply of water. To make the regulation of the water doubly secure, I requested Mr. Campbell to provide a separate chamber attached to the inlet tower for the regulation of valves at the tunnel entrance. By means of these valves we shall be able to regulate the flow in such a manner as always to keep a good body of water in the inlet tower for the water falling from above to fall upon, and we shall thus prevent injury to the masonry of the inlet tower, which would be subjected to a most tremendous action if the water, about 70 cubic feet per second, were permitted to fall the full height of the tower." I may add that the upper culvert sill is 109.92 feet below the 130 feet water line, and the head of water will be greater than in Colonel Fife's project.

The whole of Mr. McIvor's culvert will have to be taken down and rebuilt, as it has been condemned by Colonel Orr in his memorandum printed with G. O., No. 3,800, of the 1st December 1869, and is manifestly utterly unsafe. The sides of both upper and lower culverts, having bulged inwards, being shored up with wooden frames.

17. The turbing of the outer and inner slopes of each dam, and the cost of the first year's temporary escape, described in paragraph 9 of Major Mullins' last memorandum, have not been entered in the estimate, but can be met out of contingencies.

18. I have endeavoured to make plain, in paragraph 3, that an embankment higher than 187 feet above datum line is an impossibility at any reasonable cost, owing to the difficulty of obtaining earth by silting for its manufacture.

Estimate No. 87 also gives us Rupees 5,05,960 as the cost of this dam, including the expenditure needed to cut out the escape through the saddle named in the latter part of paragraph 3 of G. O., No. 2,439, of the 10th of October 1870.

It is now necessary to show that no other place for the escape is available. Major Mullins, in paragraph 11 of his Memorandum, printed with G. O., No. 2,439, of the 10th October 1870, states that "he is not aware that any other suitable site is available."

19. Two other methods of providing for the surplus water have, however, been proposed; one to form a masonry drop on the saddle close to the bungalow. This saddle is at least 200 feet above the bed of the river where the surplus water will fall and the ravine is very steep. The escape (60 feet wide) formed in steps of brick and mortar with cut-stone edges will cost at least 75,000 Rupees.

In my opinion, however, the position of this saddle in such very close proximity to the bund is very unsuited for the escapement of such a large stream as the Poorthy river. The escape water would fall down into the stream not far from the outer toe of the dam, and would certainly place the embankment itself in jeopardy.

Another proposal is to lead the surplus waters from a point at one extremity of the embankment along the right or left bank of the river, in a level channel 60 or 100 feet wide, to some point a quarter or half a mile distant from the dam.

This plan cannot, in my opinion, be expected to cost less than the cutting through the saddle. It would also, I conceive, be difficult to obtain in this way a safe water-tight escape. For a channel 60 feet wide a cutting 100 feet wide would have to be made into the hill side and the channel cut down into that. Can it be hoped to effect this without meeting with large quantities of rock?

20. Five photographs of the site are enclosed, which, I trust, speak for themselves. They were taken by Mr. Boesinger of this place. The photograph of the tail of lower culvert shows a large heap of silt, which blocks up about one-third or half of the aperture. A list of plans, etc., sent also accompanies this.

From Lieutenant J. L. L. MORANT, R.E., Executive Engineer, to the Chief Engineer for Irrigation, Madras, dated 31st March 1871, No. 55.

In continuation of my No. 42 of the 4th instant, as the Superintending Engineer is on circuit (to avoid delay), I have the honour to submit to you direct a plan and sections of the site of the proposed permanent waste weir at the Lake St. Lawrence bund, showing the progress made by Mr. McIvor in silting out the escape up to the 15th instant, as directed in paragraph 2 of G. O., No. 680, of the 8th instant, and G. O., No. 766, of the 14th instant.

2. Comparing the details of expenditure, as furnished by Mr. McIvor, with the quantity of work done, it appears that on the 15th instant, 8,673½ yards of the escape had been silted out at a

*Proceedings of the Madras Government, Public Works Department,
18th June 1872.*

rate of 7.3 yards per rupee, including all charges, or at the rate of 16.15 yards per rupee if the expenditure on silting alone be considered. My measurements are up to the 15th instant. Mr. McIvor's expenditure up to 30th. I have, therefore, taken one-half of his March's expenditure, making his total thus—

	RS.	A.	P.
On escapement	...	...	...
Superintendent and Maistries	535	7	3
New supply of water	520	1	9
Tools	93	12	10
	41	4	0
Total	1,190	9	10

3. I have examined carefully the site of the excavation, and am of opinion that the cut has now reached the solid rock, which is a portion of the backbone of the adjoining hills. This rock appears in a large solid sheet (48 feet wide) at one part, and crops out at several other parts of the cut. The whole of the bottom of the cut looks as if rock had either been actually met with, or was not very far off, and, to confirm this appearance, I find the longitudinal section of the cut has remained exactly the same up to date as it did on the 23rd ultimo, when I last reported on it, or, in other words, between the 23rd February and the 15th of March. No progress has been made in deepening the cut. Attempts have been made to turn the rock by silting out to the right and left on each side of the cut, but not only has the rock still appeared, but it seems to slope upwards on both sides from the saddle in a parallel direction to the surfaces of the adjoining hills.

I may also add that in almost if not in all the excavations (by silting) which have been made in the neighbourhood of the bund site, rock has been met with at depths not greater than 45 feet below the ground surface. It is, therefore, unlikely that a cut of about 100 feet can be made without meeting with rock.

The above considerations appear to lead to the conclusion that the proposed site for the permanent escape is impracticable, that is to say that it cannot be made use of for the purpose intended at any reasonable cost. The cutting through of a mass of rock 60 feet deep, and some 500 feet in length cannot but be very costly. If therefore the present site of the proposed permanent escape be pronounced impracticable, it is likely the dam cannot be raised at its present site; for there does not appear to be any other practicable point where a permanent escape can be placed.

Whichever way the above points be decided, for the present it would seem advisable that all further expenditure on the work should cease until I am able to put into your hands all the surveys and the information required from which to arrive at definite conclusions, regarding cost, etc. I cannot hope to do this before three months from this date, and perhaps it may take longer.

From W. G. McIVOR, Esq., Superintendent of the Government Cinchona Plantations, to the Executive Engineer, Neilgherry Range, dated Ootacamund, 7th September 1871, No. 73.

REFERRING to your letter No. 86, dated 17th May 1871, I have again been called upon by the Controller of Public Works Accounts for a completion certificate, which I am unable to fill in as I have no one competent to take the measurements of the works performed at the Poorthy Bund.

2. I believe that your Surveyor has now completed his work, and shall feel obliged by your being so good as to fill in the quantities of work performed according to your survey. Annexed is a memorandum of the cost of the work done.

(True Copy.)

12th March 1872.

(Signed) J. L. L. MORANT, Captain, R.E.,
Executive Engineer, Neilgherry Range.

*Proceedings of the Madras Government, Public Works Department,
18th June 1872.*

Memorandum of cost of work done at Poorthy Bund.

	RS.	A.	P.
Cubic yards of embankment including cost of escapements at	...	...	...
— cubic yards per rupee	10,634	0	0
20,317 cubic feet of masonry for culvert at Rupees 109-9-0 per	...	...	...
100 cubic feet	22,260	0	0
Cubic feet of masonry for bungalow at ————— per 100 cubic	...	...	...
feet ————— of bungalow fittings at —————	...	...	...
square ————— of bungalow roofing at —————	1,722	0	0
Apparatus for value of culvert	406	0	0
Cubic yards of new escapement at ————— cubic yards per rupee...	452	13	0
Total	35,474	13	0

(True Copy.)

(Signed) J. L. L. MORANT, Captain, R.E.,
Executive Engineer, Neilgherry Range.

List of new Plans relating to the Poorthy River Dam project.

1. Survey of water-spread of Lake St. Lawrence.
2. Cross Sections connected with above Survey.
3. Survey of Escape Valley.
4. Longitudinal Section of Escape Valley.
5. Cross Sections of Escape Valley.
6. North and South Section (Mr. Arbuthnot's).
7. Do. do. (Mr. Hyde's).
8. Contoured Survey of site of lake dams.
9. Longitudinal section along bed of Poorthy River.
10. Contoured Survey showing the portions of the dam which were washed away in June 1870, which are still left.

OOTACAMUND,
12th March 1872.

(Signed) J. L. L. MORANT, Captain, R.E.,
Executive Engineer.

List of old Plans relating to the Poorthy River Dam project.

1. Survey of water-spread of Lake St. Lawrence.
2. Cross Sections connected with above Survey.
3. Longitudinal Sections connected with above Survey in three parts.
4. Survey of bund site with permanent Escape Valley.
5. Sections on above Survey.
6. Survey of progress in experimental silting of permanent escape.
7. Sections of above.

OOTACAMUND,
12th March 1872.

(Signed) J. L. L. MORANT, Captain, R.E.,
Executive Engineer.

No. 297.

ORDER THEREON, 18th June 1872, No. 1,504.

CIVIL WORKS, No. 24.

With these papers are submitted estimates for carrying out the Lake St. Lawrence Reservoir on the Neil-

*Proceedings of the Madras Government, Public Works Department,
18th June 1872.*

gherry Hills by constructing three alternative dams of the following heights and cost, and impounding the undermentioned quantities of water, namely:—

	Height.	Estimated cost.	Cubic capacity.
NOTE.—The water level is 21 feet lower.	151 feet.	Rs. 7,40,060	22,001,987 yards.
	169 "	" 5,73,920	31,988,717 "
	187 "	" 5,05,960	46,501,757 "

2. The apparent anomaly of decrease in cost, according as the height is increased, is accounted for by the presence of solid rock at 45 feet below the surface of the only saddle by which it is possible to discharge the surplus water of monsoons, and 187 feet is decided to be the maximum height to which the silting process (by which the earthwork is to be carried out) can be effectually and economically adopted. Otherwise, by increase of earthwork in the dam and decrease of rock cutting in the escape weir, the capacity and cost of the reservoir might have been brought into more fitting relation to each other, than is the case with even the most favourable of the alternative projects under review. For a capital outlay of Rupees 5,06,000 represents an annual cost (at 5 per cent.) of Rupees 25,300, which secures 46½ millions of cubic yards of water or 93 millions at two supplies per annum, say 3,000 cubic yards per rupee, allowing for evaporation, but not for cost of maintenance of the work. Anyhow, the scheme is so hampered by its disadvantages as to the waste weir site, that it may be as well to investigate the other or Victoria Lake project, mentioned in Lieutenant-Colonel Farewell's letter, and which has certain recommendations in the larger capacity of its basin and its accessibility, though not perhaps as to its supply. But it will be necessary, first, to ascertain whether that project admits of an advantageous site for the construction of a waste weir, and whether Mr. McIvor will be satisfied with the quantity of water available on both sides of the valley for silting, on both which points Lieutenant-Colonel Farewell will be so good as to report after conference with him.

3 Captain Morant's calculations prove that Mr. McIvor greatly over-estimated the amount of silting performed by him, and consequently under-estimated its cost, which is now ascertained to have been at the rate of from 17½ to 20 cubic yards to the rupee for work on the dam, and only 7½ yards to the rupee for silting out the escape weir. From these a mean rate of 15 cubic yards to the rupee has been adopted by Captain Morant for earthwork of all kinds. No doubt as a dam rises, and the plane of deposition becomes flatter, the cost of silting must increase under most if not all circumstances; hence restriction of the height of highest projected dam to 187 feet.

4. The method adopted for discharge of water for irrigation, namely, a water tower with numerous small openings at different levels, communicating at its base with a massive tunnel through the dam, is no doubt the safest and best that can be devised and neither of the expedients for superseding the waste weir originally proposed are of a nature to commend themselves for adoption. They would come too near the dam itself, and greatly endanger it.

5. The Government are disappointed to find that the cost of silting originally guessed at 400 cubic yards to the Rupee, then at 100 cubic yards, and again at 50 cubic yards, has eventually had to be averaged as high as 15 cubic yards. But they are willing to hope that with the aid of the professional officers in laying out

*Proceedings of the Madras Government
18th June 18*

Works Department,

and measuring the works, and with his m. silting, Mr. McIvor will succeed in effecting. There is no difference of opinion amongst all th already performed, as to the wondrous solidity and of which the dam was composed.

1 solely to the details of the siderable saving on this item. 2 who have witnessed the work istency of the silted material

6. The Victoria Lake project having up, in the first instance, several years go, Lieutenant-Colonel Farewell will report whether, if the project be resumed, the papers connected with it are likely to be disposed of in time for entry of the work in the Budget of 1873-74.

(True Extract.)

Colonel, R.E.,

Secretary to Government.

To the Acting Superintending Engineer, 7th Division.

Exd. S. T. Augustin.

Contents of 3 Dams, respectively 151, 169 and 187 ft. above Datum supposed to be constructed by filling process across the Poorthy River. The contents are obtained by taking the Area of each contour level with Planimeter, and thence mean between every two of these consecutive Areas. The Contents are at every 3 ft.

21 ft. above 130 ft. Contour. i.e. 151 ft. above Datum.				21 ft. above 160 ft. Contour. i.e. 169 ft. above Datum.				21 ft. above 166 ft. Contour. i.e. 187 ft. above Datum.			
Area Sq. Yds.		Contents Cu. Yds.		Area Sq. Yds.		Contents Cu. Yds.		Area Sq. Yds.		Contents Cu. Yds.	
1 st 2.414	Averaging	1.82	3.641	1 st 2.092	Averaging	1.42	2.811	1 st 2.092	Averaging	1.42	2.811
2 nd 3.668		2.13	4.193	2 nd 4.310		2.13	4.310	2 nd 4.310		2.13	4.310
3 rd 4.718		3.14	5.247	3 rd 5.506		3.14	5.506	3 rd 5.506		3.14	5.506
4 th 5.776		4.15	6.273	4 th 6.032		4.15	6.032	4 th 6.032		4.15	6.032
5 th 6.770		5.16	7.245	5 th 7.996		5.16	7.996	5 th 7.996		5.16	7.996
6 th 7.720		6.17	8.177	6 th 9.144		6.17	9.144	6 th 9.144		6.17	9.144
7 th 8.634		7.18	9.093	7 th 10.272.2		7.18	10.272.2	7 th 10.272.2		7.18	10.272.2
8 th 9.532		8.19	9.999	8 th 11.202		8.19	11.202	8 th 11.202		8.19	11.202
9 th 10.466		9.20	10.709	9 th 12.270		9.20	12.270	9 th 12.270		9.20	12.270
10 th 11.372		10.21	11.392	10 th 13.240		10.21	13.240	10 th 13.240		10.21	13.240
11 th 12.450		11.22	12.061	11 th 14.056		11.22	14.056	11 th 14.056		11.22	14.056
12 th 13.012		12.23	12.701	12 th 15.012		12.23	15.012	12 th 15.012		12.23	15.012
13 th 13.556		13.24	13.254	13 th 15.720		13.24	15.720	13 th 15.720		13.24	15.720
14 th 14.114		14.25	13.835	14 th 16.510		14.25	16.510	14 th 16.510		14.25	16.510
15 th 14.100		15.26	14.447	15 th 17.342		15.26	17.342	15 th 17.342		15.26	17.342
16 th 15.070		16.27	15.029	16 th 17.954		16.27	17.954	16 th 17.954		16.27	17.954
17 th 15.464		17.28	15.542.2	17 th 18.674		17.28	18.674	17 th 18.674		17.28	18.674
18 th 15.914		18.29	16.008	18 th 19.136		18.29	19.136	18 th 19.136		18.29	19.136
19 th 16.202		19.30	16.336	19 th 19.570		19.30	19.570	19 th 19.570		19.30	19.570
20 th 16.470		20.31	16.579	20 th 20.250		20.31	20.250	20 th 20.250		20.31	20.250
21 st 16.680		21.32	16.702	21 st 20.710		21.32	20.710	21 st 20.710		21.32	20.710
22 nd 16.976		22.33	16.910	22 nd 21.124		22.33	21.124	22 nd 21.124		22.33	21.124
23 rd 16.950		23.34	16.985	23 rd 21.600		23.34	21.600	23 rd 21.600		23.34	21.600
24 th 17.020		24.35	17.070	24 th 22.046		24.35	22.046	24 th 22.046		24.35	22.046
25 th 17.160		25.36	17.194	25 th 22.194		25.36	22.194	25 th 22.194		25.36	22.194
26 th 17.220		26.37	17.210	26 th 22.406		26.37	22.406	26 th 22.406		26.37	22.406
27 th 17.104		27.38	17.165	27 th 22.660		27.38	22.660	27 th 22.660		27.38	22.660
28 th 17.226		28.39	17.113	28 th 22.702		28.39	22.702	28 th 22.702		28.39	22.702
29 th 17.000		29.40	16.899	29 th 22.776		29.40	22.776	29 th 22.776		29.40	22.776
30 th 16.790		30.41	16.750	30 th 22.636		30.41	22.636	30 th 22.636		30.41	22.636
31 st 16.702		31.42	16.545	31 st 22.590		31.42	22.590	31 st 22.590		31.42	22.590
32 nd 16.380		32.43	16.206	32 nd 22.510		32.43	22.510	32 nd 22.510		32.43	22.510
33 rd 16.124		33.44	16.095	33 rd 22.360		33.44	22.360	33 rd 22.360		33.44	22.360
34 th 16.380		34.45	16.206	34 th 22.510		34.45	22.510	34 th 22.510		34.45	22.510
35 th 16.124		35.46	16.095	35 th 22.360		35.46	22.360	35 th 22.360		35.46	22.360
36 th 16.006		36.47	15.704	36 th 22.150		36.47	22.150	36 th 22.150		36.47	22.150
37 th 15.562		37.48	15.875	37 th 21.18		37.48	21.18	37 th 21.18		37.48	21.18
38 th 15.108		38.49	14.491	38 th 21.18		38.49	21.18	38 th 21.18		38.49	21.18
39 th 14.794		39.50	14.365	39 th 21.18		39.50	21.18	39 th 21.18		39.50	21.18
40 th 14.336		40.51	14.134	40 th 21.18		40.51	21.18	40 th 21.18		40.51	21.18
41 st 13.932		41.52	13.682	41 st 21.18		41.52	21.18	41 st 21.18		41.52	21.18
42 nd 13.428		42.53	13.165	42 nd 21.18		42.53	21.18	42 nd 21.18		42.53	21.18
43 rd 12.902		43.54	12.515	43 rd 21.18		43.54	21.18	43 rd 21.18		43.54	21.18
44 th 12.120		44.55	11.802	44 th 21.18		44.55	21.18	44 th 21.18		44.55	21.18
45 th 11.476		45.56	10.107	45 th 21.18		45.56	21.18	45 th 21.18		45.56	21.18
46 th 10.032		46.57	8.417	46 th 21.18		46.57	21.18	46 th 21.18		46.57	21.18
47 th 8.220		47.58	6.727	47 th 21.18		47.58	21.18	47 th 21.18		47.58	21.18
48 th 6.220		48.59	5.037	48 th 21.18		48.59	21.18	48 th 21.18		48.59	21.18
49 th 4.220		49.60	3.347	49 th 21.18		49.60	21.18	49 th 21.18		49.60	21.18
50 th 2.220		50.61	1.657	50 th 21.18		50.61	21.18	50 th 21.18		50.61	21.18
51 st 0.220		51.62	0.000	51 st 21.18		51.62	21.18	51 st 21.18		51.62	21.18
52 nd 0.000		52.63	0.000	52 nd 21.18		52.63	21.18	52 nd 21.18		52.63	21.18
53 rd 0.000		53.64	0.000	53 rd 21.18		53.64	21.18	53 rd 21.18		53.64	21.18
54 th 0.000		54.65	0.000	54 th 21.18		54.65	21.18	54 th 21.18		54.65	21.18
55 th 0.000		55.66	0.000	55 th 21.18		55.66	21.18	55 th 21.18		55.66	21.18
56 th 0.000		56.67	0.000	56 th 21.18		56.67	21.18	56 th 21.18		56.67	21.18
57 th 0.000		57.68	0.000	57 th 21.18		57.68	21.18	57 th 21.18		57.68	21.18
58 th 0.000		58.69	0.000	58 th 21.18		58.69	21.18	58 th 21.18		58.69	21.18
59 th 0.000		59.70	0.000	59 th 21.18		59.70	21.18	59 th 21.18		59.70	21.18
60 th 0.000		60.71	0.000	60 th 21.18		60.71	21.18	60 th 21.18		60.71	21.18
61 st 0.000		61.72	0.000	61 st 21.18		61.72	21.18	61 st 21.18		61.72	21.18
62 nd 0.000		62.73	0.000	62 nd 21.18		62.73	21.18	62 nd 21.18		62.73	21.18
63 rd 0.000		63.74	0.000	63 rd 21.18		63.74	21.18	63 rd 21.18		63.74	21.18
64 th 0.000		64.75	0.000	64 th 21.18		64.75	21.18	64 th 21.18		64.75	21.18
65 th 0.000		65.76	0.000	65 th 21.18		65.76	21.18	65 th 21.18		65.76	21.18
66 th 0.000		66.77	0.000	66 th 21.18		66.77	21.18	66 th 21.18		66.77	21.18
67 th 0.000		67.78	0.000	67 th 21.18		67.78	21.18	67 th 21.18		67.78	21.18
68 th 0.000		68.79	0.000	68 th 21.18		68.79	21.18	68 th 21.18		68.79	21.18
69 th 0.000		69.80</									

7

*Capt. R.
Executive Engineer*

*Calculations to obtain Approximate Contents of
all the Melting Pits and other Reservoirs.*

Contents of the Drum destroyed by the falling process
by Mr W.G. McDevor, which was washed away in June 1870.

[illegible]

S. C. King Pat. on the Shedd.		
	Yrs.	Yds. Yds.
(a)	9 3/4	1 1/2
(b)	6 1/2	5 3/4
(c)	20	16 5
(d)	15	4 1/2
(e)	16	3 3/4
(f)	14	2 3/4
(g)	30	30 5
(h)	30	16 1/2
(i)	11	1 1/2
(j)	30	33 6 1/2
(k)	16 1/2	14 1/2
(m)	31	7 5 1/2
(n)	16 1/2	4 3/4
Total		6. Yds. 22.094 1/2

P. B. Spade & Son, Inc.		
	Yrs.	Yds.
(a)	5 1/2	10 1/2
(b)	21	10 2 1/2
(c)	16 1/2	10 1/2
(d)	20	2 1/2
Total		6. Yds. 41.08 1/2

Contents of all the Selling 97 1/2
 Selling Below the North 14 230 7 96
 D: D: South 22 098
 D: D: 94 1/2 Bangalore 7 128 1/2
 Total Amount of 97 1/2 14 230 7 96.

[illegible]

Amount of Receipts
 Compounding Charges 15-882 1/2 C. 1/2
 Total = 47- 125 1/2
 Total Contents of Receipts 71-85 3/4 C. 1/2

Contents of Draw Light after the Broadening		Inches Water	
102	318 L. Gals.	112	216 L. Gals.
203	326	216	210
304	656	304	212
405	628	405	216
506	616	506	206
607	676	607	180
708	774	708	358
809	1036	809	974
910	1204	910	1000
1011	1096	1011	1030
1112	1092	1112	1028
1213	1108	1213	906
1314	1108	1314	904
1415	908	1415	854
1516	846	1516	900
1617	768	1617	920
1718	508	1718	920
18	476	18	672
Total 14,302 L. Gals.		19	308
		Total 12,436 L. Gals.	
		Total 26,738 L. Gals.	

*:— Cubic Yards of new chimney—127,000
{ Add for portion below lowest
level of roof is a lower Datum)
shown Depth—23 mads. Length
4.04' x 63' x 4 1/2' 5.6 Yds 4.470

Total contents of Damfir 6 Yds 13.478
which was washed away

Contents of Tank up to 100 ft. Conto

Section	Depth	Volume	Weight	Notes
1	0-10	100	100	
2	10-20	200	200	
3	20-30	300	300	
4	30-40	400	400	
5	40-50	500	500	
6	50-60	600	600	
7	60-70	700	700	
8	70-80	800	800	
9	80-90	900	900	
10	90-100	1000	1000	
Total 1000				

Sum of Tank up to 100 ft. Conto = 1000

(a) Sum of Tank up to 100 ft. Conto = 1000

(b) Sum of Tank up to 100 ft. Conto = 1000

(c) Sum of Tank up to 100 ft. Conto = 1000

(d) Sum of Tank up to 100 ft. Conto = 1000

(e) Sum of Tank up to 100 ft. Conto = 1000

(f) Sum of Tank up to 100 ft. Conto = 1000

(g) Sum of Tank up to 100 ft. Conto = 1000

(h) Sum of Tank up to 100 ft. Conto = 1000

(i) Sum of Tank up to 100 ft. Conto = 1000

(j) Sum of Tank up to 100 ft. Conto = 1000

(k) Sum of Tank up to 100 ft. Conto = 1000

(l) Sum of Tank up to 100 ft. Conto = 1000

Contents of Cutting for permanent escape for Dam No. 1 at 15 ft. ft

Section	Depth	Volume	Weight	Notes
1	0-10	100	100	
2	10-20	200	200	
3	20-30	300	300	
4	30-40	400	400	
5	40-50	500	500	
6	50-60	600	600	
7	60-70	700	700	
8	70-80	800	800	
9	80-90	900	900	
10	90-100	1000	1000	
Total 1000				

Sum of Tank up to 100 ft. Conto = 1000

(a) Sum of Tank up to 100 ft. Conto = 1000

(b) Sum of Tank up to 100 ft. Conto = 1000

(c) Sum of Tank up to 100 ft. Conto = 1000

(d) Sum of Tank up to 100 ft. Conto = 1000

(e) Sum of Tank up to 100 ft. Conto = 1000

(f) Sum of Tank up to 100 ft. Conto = 1000

(g) Sum of Tank up to 100 ft. Conto = 1000

(h) Sum of Tank up to 100 ft. Conto = 1000

(i) Sum of Tank up to 100 ft. Conto = 1000

(j) Sum of Tank up to 100 ft. Conto = 1000

(k) Sum of Tank up to 100 ft. Conto = 1000

(l) Sum of Tank up to 100 ft. Conto = 1000

(m) Sum of Tank up to 100 ft. Conto = 1000

(n) Sum of Tank up to 100 ft. Conto = 1000

(o) Sum of Tank up to 100 ft. Conto = 1000

(p) Sum of Tank up to 100 ft. Conto = 1000

(q) Sum of Tank up to 100 ft. Conto = 1000

(r) Sum of Tank up to 100 ft. Conto = 1000

(s) Sum of Tank up to 100 ft. Conto = 1000

(t) Sum of Tank up to 100 ft. Conto = 1000

(u) Sum of Tank up to 100 ft. Conto = 1000

In a letter from the Sup.
Ingenier 7^e Division to the
Secretary to Government
P.W. Department 12^e 14 of 20
April 1872.

PM 2045/72

Proc. 18^e June 12^e L. B. 1876

Details of cultivation for
waterspread contents of
Dams &c. —

H. O. No 2439 of 10th October 1870
H. O. No 111 of 14th January 1871



6356
18/3/74

Executive Engineer's Office
Cotacambur 14th March 1872

21

No. 22

From

Captain J. L. L. Morant R.E.
Executive Engineer
Mylheery Range

To

Lieut Colonel W. T. Farwell
Superintending Engineer
1st Division

Sir

With reference to your endorsement
on G. O. P. W. D. No. 2439 I have the honor to
submit Plans and Estimates relating to the
construction of a Bund by the silting process
across the Poorthy River.

The following documents refer to
the subject:

- G. O. No. 1393 of the 8th May 1867 P. W. D.
- Colonel Walker's letter on No. 1122
proposals alluded to in para 4 of Secretary
of state's Despatch printed with G. O. No. 3787
of the 5th December 1867.
- G. O. No. 3787 of the 5th December 1867 P. W. D.
- G. O. No. 1842 of 13th June 1868 P. W. D.
- G. O. No. 2271 of 16th July 1868
- G. O. No. 2093 of 28th June 1869
- G. O. No. 2183 of 6th July 1869
- G. O. No. 3800 of 1st December 1869
- G. O. No. 171 of 14th January 1870
- G. O. No. 471 of 12th March 1870
- G. O. No. 1183 of 4th May 1870
- G. O. No. 1350 of 28th May 1870
- G. O. No. 2439 of 10th October 1870
- G. O. No. 111 of 14th January 1871

No. 1. 3 Estimates of Dams
No. 2. 1 Details of Calculations
No. 3. Copy of a letter No. 55
No. 4. - do - letter No. 73
No. 5. List of Plans.

L. O. No 278 of 30th January 1871
L. O. No 680 of 8th March 1871
L. O. No 766 of 14th March 1871
L. O. No 1699 of 23rd June 1871 and
Letter No 55 of the 31st March 1871
from Executive Engineer Neilgherry Range
to the Chief Engineer for Irrigation
(Copy attached).

3 In the latter part of para. 3 of L. O.
No 2439 of the 10th October 1870 it is stated that
"Should rock be found at a high level
the connection of the two valleys by a
cutting would be economically impracticable."

This has unfortunately turned out to be the case
as the experimental cut alluded to in para. 4 of
the same L. O. has reached rock at a depth
of 45 feet, a report upon which is contained
in my letter No 55 of the 31st March 1871
to the address of the Chief Engineer for
Irrigation (Copy attached).

The only manner therefore in which this diffi-
culty can be attempted to overcome is by
raising the embankment to such a height,
(within practicable limits) that the rock
cutting may be reduced to a minimum. Now
from a very careful inspection of the ground
I am of opinion that it will be found to be
very difficult if not impossible to obtain earth
by the silting process for an embankment
higher than 187 feet above datum line. This
I think will be clear from the following
consideration: the enormous excavations which
have on all sides been made to form the
two embankments which have been washed
away amount only to 1,43,248 Cubic yards, whereas
this proposed Bund of 187 feet high will contain
1,430,647 Cubic yards or nearly 10 times the former.
Can it be hoped that earth for a Bund larger
than this is obtainable anywhere at all near the
spot at any reasonable cost?

1 In framing the estimate the 1st point which
we have to determine is the rate at which the silting
of the Bund can be effected.

We have 3 separate data from which this
can be obtained.

1st We can compare the contents of Bund
No 2 which was washed away in June 1870 with
its stated cost.

or 2^{ndly} We can set the cost of the two Dams
which were successively erected together with the
contents of the escape excavation against the whole
expenditure upon earth work up to the present moment
or, lastly, we can take the rate of silting out
the escapement alone.

5 With regard to the 1st Mr. M^r Suor in
para. 2 of his letter No 164 of the 23rd July 1870
printed with L. O. No 2439 of the 10th October 1870
states that the 2nd embankment contained 322,322
Cubic yards. Major Mullins at the close of
para. 12 of his note printed with the same L. O.
hints at the possibility of these figures being
inaccurate. My calculations which have been made
with great care and accuracy from the detailed
contoured survey of the Bund site give only 1,31,478
Cubic yards. I will endeavour to show how
this difference arises. In Mr. M^r Suor's letter
he states this Dam to have been raised to 81 feet
"on the back or lower portion and to 54 feet
"at the front or upper portion giving an
"average height of 69 feet. The width of the
"Bund up and down the river being 475 feet
"at the base and 383 feet at the top. The
"length of the embankment across the river
"bed averaged 170 feet at the base and
"418 feet at the top."

Looking first at the average height of the Bund
I find Mr. M^r Suor in para. 4 of his letter states
that the deep bed of the river averages 11 feet under
summer water level and the summer water level
he places 10½ feet below the lower Culvert sill.
Major Mullins in para. 7 of his note seems to
consider it probable that this is erroneous and
refers to it in the following terms.

"My

My measurements of the heights are somewhat different to those given by Mr. Mc Ivor unless he has taken the deep bed of the river (which he puts 21 1/2 feet below the sill of the lower part of the Culvert) as his datum. There may be pools of this or of even greater depth, but I am disposed to think that the average level of the bed at the Bund site is not many feet below the bottom of the lower Culvert.

Now from the 2 cross sections and one longitudinal section taken at the Bund site it will be seen that the floor of the lower Culvert is at its tail only 2.68 feet above the rocky bed of the river. There is one pool in this rocky bed close to the tail of Culvert, but its area is insignificantly small and its depth which deepest is only 8 feet below the floor of lower Culvert. I will however assume that this pool is a large one and will take its greatest depth as 8.98 feet below sill of lower Culvert. The north and south cross sections taken quite close to the centre line of the Bund show the river bed there to be exactly on the level of the lower Culvert and the other cross section taken 170 feet to the west of the 1st makes the river bed there only 8.08 feet below the floor of lower Culvert. There being no pools near either of these latter sections below this level. We have therefore these facts, the deepest portion of the bed of the river above and below centre line of Bund is 8.08 feet below floor of lower Culvert. At centre line of Bund the floor of lower Culvert and river bed are of the same level. We thus obtain as an average lower Culvert sill to be 4.04 feet below States that the bed of river averages 21 1/2 feet below the sill of lower Culvert. We may thus with fair accuracy put down the average height of the two parts of the embankment at 66.96 (or say 67 feet) and 42.96 (or say 43 feet) respectively instead

13.08 feet above Datum
8.00 feet above Datum



instead of 81 and 57 feet as Mr. Mc Ivor makes them.

It is not so easy to ascertain the average width of the Bund up and down the river owing to the very irregular manner in which the two sides of the Dam were lined out and the ledges by which it has in parts been raised. The length of the Culvert which is nearly at the very base of the embankment is according to Mr. Mc Ivor's statement 400 feet long. Yet he makes the average width of the Dam, i.e. midway between its crest and the 42.9 feet. How is this possible?

Clearly we require the length of the embankment across the river bed.

Mr. Mc Ivor states that the river bed averaged 740 feet at base. The cross section and Contoured plan given the river bed at base 50 (this not being an exactly perpendicular measurement) and 38 feet respectively and the extreme width of river bed at outer toe of Dam and on a level with the floor of lower Culvert (i.e. 8.04 feet above the deep pool there) is only 100 feet. The average of these 3 is therefore only 63 feet. But 50 feet as an average should be nearer the mark. Similarly I make the river bed at top of the 2 embankments (higher & lower) average 322 and 258 feet respectively, which gives a mean of 290 feet for the length at top. The middle length will be thus about 176 feet.

I have in this way I trust clearly shown how erroneous Mr. Mc Ivor's measurements are. The Content of the Dam will in this clearly somewhat rough manner, come to under 140000 Cubic Yards.

6 The Dam's content can however be viewed from another point. I have ascertained in a necessarily rough manner and allowing for irregularities as much as possible the contents of all the sitting pits to be only 143248 Cubic Yards which I am sure gives their outside contents.

contents. Mr. Mc Ivor however in his para 11 states the whole of the earth work to have amounted to 39,3462 Cubic yards. I do not bring this forward as in itself Conclusive but merely indirectly to support (if support be deemed necessary) the measurements obtained of the Dam from the Contoured Survey.

7. We may therefore fairly assume Dam No. 2 to have contained 131478 Cubic yards and Mr. Mc Ivor in para 3 states this Dam to have cost Rupees 7585. Hence we obtain a rate of 17 $\frac{1}{3}$ Cubic yards per rupee.

8. Now with regard to the 2^d proposed method of striking the rate. We have seen above that the 2^d Dam contained 131478 Cubic yards. Of the contents of the 1st Dam which went in June 1869 it is impossible to obtain an accurate measurement. But Mr. Mc Ivor states it in his para 10 to have contained 71140 Cubic yards. From my letter to the Chief Engineer the quantity of earth silted out for the escapement when the work was stopped, amounted to 8674 Cubic yards (vide my letter to the Chief Engineer). These three quantities added together make 211292 Cubic yards. In accompaniment to Mr. Mc Ivor's letter No. 73 of 7th September 1871 to my address he states the entire expenditure on earth work including escapement to be Rupees 10634. We hence obtain a rate of 20 yards per rupee.

9. Lastly from my letter to the Chief Engineer before quoted the rate of silting out the escapement is ascertained to be only 7 $\frac{1}{3}$ yards per rupee.

10. Here I would beg to observe parenthetically that in the silting of the escapement there was nothing so far as I am aware to enhance the cost. The earth seemed of ordinary hardness. Moreover no expense had been incurred

incurred in taking the silted earth and depositing it in any particular place. The saddle for the escapement was merely cut through of the earth washed down into the valley below where it was left to take care of itself. In the Dams however which Mr. Mc Ivor raised he had not only to silt out the earth from the hill, but to carry it to the Dam and spread it and dispose of it regularly there. I cannot explain why the rate in the latter case is cheaper than in the former.

11. Taking the average of the above 3 rates which give pretty fairly the probable working rate in different kinds of soil & under various circumstances, we obtain a working rate of 15 Cubic yards per Rupee. This is the lowest rate which in my opinion can be entered in the Estimate from the Data before us.

12. Before leaving the subject of the rate it is necessary to explain a point connected with the stated cost of the earth work.

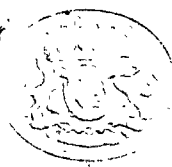
In para 3 of Mr. Mc Ivor's letter he states the actual cost of the earth work amounts to Rupees 7585, namely Rupees 3240 expended in bringing the silting streams to the site of the Dam, and maintaining them in repair, and Rupees 4345 the cost of excavating the soil, and depositing it on the embankment; and again in para 13 he states "leaving out the cost of the silting streams which in reality should be charged only against the whole of the work when completed and not against a portion, gives 90 Cubic yards per Rupee." Major Mullins also in para 2 of G.O. No 680 of the 8th March 1871 states that "the former rate (7.86 Cubic yards per rupee) includes probably the cost of bringing the silting streams to the work and this would not have to be repeated."

I beg to be allowed to observe on this point that

that the Cost of bringing the silting streams to the work of maintaining them in repair has hitherto come to a very large proportion (something like 50 percent) of the whole expenditure on earth work, notwithstanding that the operations have been some years in progress and a Bund of a large size was raised. As there any guarantee that these charges will in future be reduced? and if so by how much? Unless there be it does not seem to me an estimate of this kind when by a fictitious prospect of cheapness the Government might be induced to embark in an ultimately expensive project that the Cost of the silting streams and of keeping them up should be excluded, and I may add here that if the work be resumed the streams will have to be considerably repaired, as they have necessarily become injured by Hill Cattle and floods.

Moreover in the Estimate for all the embankments (high and low) I have entered one rate for the earth work, the rate obtained from the comparatively low Dam which was washed away. But as the embankment rises fresh streams will have to be brought to the site and the silt will have to be conveyed for a necessarily longer distance and the plane of deposition becoming flatter the rate will probably increase with the height of the Dam.

13 Three Estimates have been prepared one for a Bund with the water line 130 feet above datum, another for a Bund with the water line 148 feet above datum, and a third for a Bund with the water line 166 feet above datum with all the requisite subsidiary works in



in each case.

Each Bund is proposed to be raised 21 feet above its own water line with a breadth at top of 30 feet an outer slope of 3 to 1 and an inner of 2 to 1.

The escapement level for each Bund will be at high water line and in view of the remarks contained in para 5 of the late Colonel Andreason's Memo printed with G.O. No 1872 of 13th June 1868 it is proposed to make the permanent escape Channel 60 feet wide.

14 No 1 Bund (lowest) Contains 622510 Cubic yards of earth, with Cost with all requisite subsidiary works Rupees 7,40,060, and impounds 3712,835,306 gallons of water.

No 2 Bund Contains 924902 Cubic yards, with Cost Rupees 5,73,920, and impounds 5398095,993 gallons.

No 3 Bund Contains 1295984 Cubic yards, with Cost Rupees 505960, and impounds 7847174,93 gallons.

15 In framing the Estimate I have added 12th to the Contents of each Bund to allow for settlement as well as for inequalities in the ground which the Contours may not be able to show, and for slight inaccuracies in the deposition of the earth which may occur while the work is in progress. From what has occurred in the settling of the Bunds at Marlimund, I think this you will allow to be a very moderate addition.

16 To give effect to the instructions contained in para 7 of G.O. No 2439 of the 10th October 1870 P.W. S. a culvert under each Bund with inlet tower, foot bridge of approach, valves &c. has been entered in the Estimate. These will be similar to those carried out so successfully by Colonel Fife R.E. in the Sholapore Tank (Bombay Presidency) and which are thus described by him

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The channels themselves call for no particular
remark, but the arrangements for admitting
water into them from the lake have been a
source of much anxious consideration and
I took the opportunity of ascertaining
Sir Arthur Cotton's opinion upon the
question. The common plan of using
an iron pipe with a valve which is
practised in almost all town water supply
works in England is both an economical
and a safe method when the quantity of
water to be liberated is moderate and the
depth not very great and this plan has been
adopted for the small four months canals.
But for the perennial Canal which starts at
a point 11.72 feet below the surface of the
lake I have followed Sir Arthur Cotton's
advice which was to construct an inlet tower
with a number of small openings at different
levels, and carry from its base through the
Dam a massive masonry culvert or
tunnel much larger than is actually required
for the free passage of the full supply of
water. To make the regulation of the water
doubly secure I requested Mr. Campbell to
provide a separate chamber attached to the
inlet tower for the regulation of valves at
the tunnel entrance. By means of these
valves we shall be able to regulate the flow
in such a manner as always to keep a good
body of water in the inlet tower for the water
falling from above to fall upon, and we
shall thus prevent injury to the masonry
of the inlet tower which would be subjected
to a most tremendous action if the water
about 40 cubic feet per second were permitted
to fall the full height of the tower. I may add
that the upper Culvert sill is 109.92 feet below the

130 feet water line, and the head of water will be greater
than in Colonel Telford's project.

The whole of Mr. Mc Lure's Culvert will
have to be taken down and rebuilt as it has
been condemned by Colonel Orr in his Memo
printed with G. O. No 3800 of the 1st December
1869 and is manifestly utterly unsafe. The
sides of both upper and lower Culverts having
bulged inwards being shored up with wooden
frames.

The turping of the outer and inner slopes
of each Dam and the cost of the 1st years
temporary escape described in para 9 of
Major Mullins' last Memorandum have not
been entered in the Estimate, but can be met
out of Contingencies.

18 I have endeavoured to make plain
in para 3 that an embankment higher than
18' above Datum Line is an impossibility
at any reasonable cost owing to the difficulty
of obtaining earth by sifting for its manufacture.

Estimate No 87 also gives no the 505,60
as the cost of this Dam including the expenditure
needed to cut out the escape through the saddle
named in the latter part of para 3 of G. O. No
2439 of the 10th of October 1870.

It is now necessary to show that no
other place for the escape is available. Major
Mullins in para 11 of his Memo printed with
G. O. No 2439 of the 10th October 1870 states that
"he is not aware that any other suitable site
is available."

19 Two other methods of providing for the
surplus water have, however, been proposed -
one to form a Masonry Drop on the saddle
below the Bungalow. This saddle is at least
200 feet above the bed of the river where the
surplus water will fall and the ravine is very
steep

Step. The escape (60 feet wide) formed in steps of Brick and mortar with cut stone edges will cost at least 75000 Rupees.

In my opinion however the position of this saddle in such very close proximity to the Bund is very unsuitable for the escape. The escape water would fall down into the stream not far from the outer toe of the Dam and would certainly place the embankment itself in jeopardy.

Another proposal is to lead the surplus waters from a point at one or left bank of the river in a level channel 60 or 100 feet wide to some point 2 or 3 mile distant from the Dam.

This plan cannot in my opinion be expected to cost less than the cutting through the saddle. It would also conceivably be difficult to obtain in this way a safe water tight escape. For a channel 60 feet wide would have to be made into the hill side and the channel cut down into that. Can it be hoped to effect this without meeting with large quantities of rock?

Five photographs of the site are enclosed which I trust speak for themselves. They were taken by Mr. Boesinger of this place. The photograph of the tail of lower culvert shows a large heap of silt which blocks up about $\frac{3}{4}$ or $\frac{1}{2}$ of the aperture. A list of Plans &c. sent also accompanies this.

I have the honor to be,
Sir,
Your Most Obedt. Servant.

J. M. M. M.
Executive Engineer. Captain. R.E.

6356
18/4/74

No 55

To

Captain J. G. Ryves R.E.
Chief Engineer for Irrigation
Madras.

Sir

In continuation of my No 42 of the 15th Inst. as the Superintending Engineer is on circuit (to avoid delay), I have the honor to submit to you direct a Plan and Sections of the site of the proposed permanent Waste Weir at the Lake, Saint Lawrence Bund, shewing the progress made by Mr. M. J. J. in sitting out the escape up to the 15th Inst. as directed in para. 2 of G. O. No 600 of the 8th Inst. and G. O. No 766 of the 15th Inst.

2. Comparing the details of expenditure as furnished by Mr. M. J. J. with the quantity of work done, it appears that on the 15th Inst. 8673 1/2 yards of the escape had been sited out at a rate of 7.3 yards per Rupee including all charges or at the rate of 16.15 yards per Rupee, if the expenditure on sitting alone be considered. My measurements are up to the 15th Inst. Mr. M. J. J.'s expenditure up to 30th. I have therefore taken one half of his March's expenditure making his total thus

On escapement—Rs 535-7-3
Supt. and Maistries—520-1-9
New supply of Water—93-12-10
Tools—18-4-0
Total Rupees 1190-9-10

3. I have examined carefully the site of the excavation, and am of opinion that the cut has now reached the solid rock which is a portion of the back bone of the adjoining hills. This rock appears in a large solid sheet (48 feet wide) at one part and crops out at several other parts of the cut. The whole of the bottom of the cut looks as if rock had either been actually met with, or was not very far off; and to confirm this appearance, I find the Longitudinal Section of the cut has remained exactly the same up to date as it did on the 23rd ultimo, when I last reported on it, or in other words between the 23rd February and the 15th of March no progress has been made in deepening the cut. Attempts have been made to turn the rock by sitting out to the right and left on the side of the cut, but not only has the rock still

still appeared, but it seems to slope upwards on both sides from the saddle in a parallel direction to the surfaces of the adjoining hills.

I may also add that in almost if not in all the excavations (by sitting) which have been made in the neighbourhood of the Bund site, Rock has been met with at depths not greater than 45 Feet below the ground surface. It is therefore unlikely that a cut of about 100 Feet can be made without meeting with Rock.

The above considerations appear to lead to the conclusion that the proposed site for the permanent escape, is impracticable, that is to say that it cannot be made use of for the purpose intended at any reasonable cost. The cutting through of a mass of Rock 60 Feet deep, and some 500 Feet in length cannot but be very costly. If therefore the present site of the proposed permanent escape be pronounced impracticable, it is likely the Dam cannot be raised at its present site, for there does not appear to be any other practicable point where a permanent escape can be placed.

Whichever way the above points be decided, for the present, it would seem advisable, that all further expenditure on the Work should cease, until I am able to put into your hands all the surveys and the information required, from which to arrive at definite conclusions, regarding cost &c. I cannot hope to do this before 3 Months from this date, and perhaps it may take longer.

31st March
1871

I have &c
D. J. L. Morant Lieut. R. E.
Executive Engineer
(True Copy)

12th March 1872

J. L. Morant Capt. R. E.
Exec. Eng. R. E.

In a letter from the
Sigs Engineer's Division
to the Chief Engineer and
Secretary to Govt. P.W.D.
No. 14 dated 20th April/72.

Mr 2045/72

Copy of
Captain Morant's letter
No 55 dated 31st March
1871 to the Chief Engineer
for Engineer's Division
submitting Plan and
Estimate of P.W.D.
revenue Bund.



6356
18/4/72
No 73

Ootacamund 18th April 1872
37
From The Superintendent of the Government
Chinchona Plantations Ootacamund
To, The Executive Engineer
Melgherry Range
Ootacamund

Sir,
Referring to your letter No 86, dated 17th
May 1871. I have again been called upon by the
Comptroller of P. W. Accounts for a completion cer-
tificate, which I am unable to fill in, as I have
have no one competent to take the measurements
of the Works performed at the Poothy Bund.

I believe that your Surveyor has now
completed his work, and shall feel obliged by
your being so good as to fill in the Quantities
of work performed according to your survey.
Annexed is a Memo. of the cost of the work
done.

I have pp.

(Signed) W. G. Mc Ivor
Super. Govt. Chinchona
Plantations

(True Copy)

J. E. Morant Capt. R.E.
Exec. Eng. N. N.

12th March 1872

6350
14/4/46

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29

Memo of cost of Work done at Porthy Bund.

Cubic Yards of Embankment including cost of	
Escapements @ Cubic Yards per Rupee	10,634-0-0
20,317 Cubic Feet of Masonry for Culvert	
@ Rs 109-9-0 per 100 Cubic Feet	22,260-0-0
Cubic Feet of Masonry for Bungalow	
@ per 100 Cubic Feet	
of Bungalow fittings	1,722-0-0
@ Square of Bungalow roofing	
@ Apparatus for value of Culvert	406-0-0
Cubic Yards of new escapement	
@ Cubic Yards per Rupee	452-18-0
	<u>Rs 35,474-13-0</u>

True Copy
J. de Morant Capt. M.R.
Execd by Mr. N.

In a letter from the
Sup^r Engineer's Division
to the Chief Engineer and
Secretary to Government
No 14 dated 20th April 1872

Mr 2045/72

Copy of a letter No 73 dated
7th December 1871 from the
Supt of the Government
Chinichona Plantations
to the Executive Eng^r in
Nilgerry about work
performed at Poothy
Bund.

1356/1872
List of New Plans relating to
The Poothy River Dam Project.

1. Survey of Water spread of Lake St Lawrence.
2. Cross Sections connected with above Survey.
3. Survey of Escape Valley.
4. Longitudinal Section of Escape Valley.
5. Cross Sections of Escape Valley.
6. North and South Section (Mr. Arbutnot's)
7. North and South Section (Mr. Hydes)
8. Contoured Survey of site of Lake Dams.
9. Longitudinal Section along Bed of Poothy River.
10. Contoured Survey shewing the portions of the Dam
which was washed away in June 1870, which are
still left.

Executive Engineer's Office
Nilgerry Range
Ootacamund 12th March 1872

J. A. Morant.

Capt. R. L.
Executive Engineer

17
43
17
72

List of Old Plans relating to
The Poorthy River Dam Project.

1. Survey of Water spread of Lake St. Lawrence.
2. Cross Sections connected with above Survey
3. Longitudinal Sections connected with above Survey
in three parts.
4. Survey of Brund Site with permanent Escape Valley
5. Sections on above Survey
6. Survey of Progress in Experimental Siltting of
permanent Escape
7. Sections of above

Executive Engineer's Office

Nulgherry Range

Ootacamund 12th March 1872

J. Morant.

Capt. R. E.
Executive Engineer

In a letter from the
Supr Engineer's Division
to the Secretary to Govt
P.W. Department No. 14
dated 20th April 1872.

Mr 2045/72

List of New Plans
relating to the Portney
River Dam Project.

In a letter from the
 Supy Engineer, 7th Divⁿ
 the Chief Engineer and
 Secretary to Govt. P.W.D.
 No 14 of 20th April 1872.

Mr 2045/72
 Pres-13 June 1872 Ld. Secy.

Captain Morant's letter
 No 42 dated 14th March 1872
 submitting Plans and
 Estimates relating to
 the construction of a
 Barrage by the salt
 process across the
 Parvathy River.

14
 47
 Supy Engineer's Office,
 7th Division
 Coimbatore. 20th April 1872

From Colonel W. Farewell Secy
 As Supy Engineer, 7th Divⁿ

To
 The Chief Engineer
 and Secretary to Government,
 P.W.D. Madras

Enclosures

- 3 Estimates of 3 dams
 amounting to
 Rs. 740,000, Rs. 573,900,
 & Rs. 505,900.
- 1 Details of Calculations
- 1 Set of Plans (17 in number
 by Rail)
- 1 Report of Capt. Morant R.E.
 dated 14th March 1872
- 1 Copy of letter No 55
 of 3rd March 1872 from
 Capt. Morant to the
 Chief Eng^r for signature
- 1 Copy of letter No 39 of
 1st Feb 1872 from Mr.
 Morant with enclosures
- 5 Photographs of the
 site per Capt. Morant.

Sir,
 With reference to para 6 of
 GO No 2439 dated 10th October 1870,
 passing orders on Mr. Morant's
 report of work done by him
 on the embankment of the
 proposed Reservoir on the
 Mail Road, Kaveri
 by the name of Lake Lawrence
 and the observations of the
 Chief Engineer for Irrigation on
 that report as ordered, have
 the honor to submit as per
 enclosed

Recd
 31-5-72
 The Chief Eng^r
 P.W.D. Madras

enclosed list the Estimates, Sections,
Surveys and information called
for, to enable the Chief Engineer
for Irrigation to submit the
project to Government, which
I am under the impression
the GO above quoted directs he
and not I should do. These
papers have been prepared by
Captain Morant R.E., the Executive
Engineer of the Bridgeway Range,
the great care required in their
preparation and their necessary
voluminousness will, I trust,
sufficiently account for the
delay that has taken place
in their submission. Since you
are as thoroughly acquainted
as I am with the whole question
of the silting experiments under
notice, the fallaciousness of the
original Estimate, and the causes

of its failure ~~has been~~ I refrain
from making any further
remark on the subject, except
that should Government desire
that the silting process again
be tried under proper pro-
fessional guidance, I beg
respectfully to recommend
a ~~new site~~ for the experiment,
viz that of the Embankment
of the far larger and more
beautiful lake projected
by me in the vicinity of
Ootakanui known as
"Lake Victoria," the Embankment
of which will not exceed more
than 130 or 150 feet in height,
while from the greater super-
ficial area and average
depth of its basin its capacity
greatly exceeds that of Lake

Lake St. Lawrence, and will
therefore be of more use for
storage of surplus water for
irrigation purposes. —

Have the honor to be,
Sir,
Your most obedt Servant

Wm. Smith, Esq.
Adj. Capt. Engineer, 7th Inf.

Oct 29/6

Oct. 1872. Recd. by
Pro-Sp. for Genl.
Stewart, Oct. 20/45
The duty of the
Genl. W. Engineer
is to be to be
dated Oct. 20/45
Respectfully
Oct 14
Incl. 28 etc
Submits. Submits
during the of the
General's Genl. with
reference to the
of the Genl. 1872
with the report of the
of the Genl. 1872
of the Genl. 1872
of the Genl. 1872

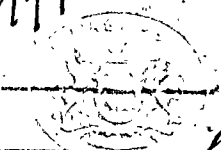
Three Estimates
of
Dams across the
Poorthy River

6356
1872/73

General No. 2 of 1872/73.

\$3

Estimate No. 85. of 1871/72.



Nilgherry Range. Coimbatore District.

Work. Probable cost of constructing a Dam 151 Feet above Datum with all Subsidiary Works.

Water 151 Feet above Datum.

Quantities	Particulars	Rate		Amount		Total.	
		Rs.	As.	Rs.	As.	Rs.	As.
622,310	Contents of Dam.						
17,135	Add Cutting for Escapes						
639,645							
26,762	Deduct portion of Dam of 1870,						
612,877	which is left.						
51,073	Add 1/2 for Settlement year						
663,950	C. Yds. Contents of Dam @ 15 Yards	1		44,263	5	4	
725	Running Feet. Culvert under Dam						
	@ 40 Rupees per foot.	40		29,000			
146	Running Feet. Inlet-Tower.	20		2,920			
285	Do. Wooden Foot.						
	Bridge with Iron supports &						
	Railings &c. complete.	10		2,850			
142,275	Cubic Yds. Earth-cutting for Escape	2		18,609	6		
202,392	Do. Rock Do. Do.	3		60,716			
						704,218	11 4

Executive Engineer's Office
Nilgherry Range
Coimbatore 12th March 1872

Sup^r & Sundries 35,241 4 8
Total Estimate Rupees 740,060.

J. A. M. M. M. Capt. R. E.
Executive Engineer.

None of this can be filled out as the fall of the Escape Valley is not great.

6356
1872/73
No. 1 of 1872/73

55

Neilgherry Range. Coimbatore District.
 Work. Probable cost of Constructing a Dam 109 Feet above
 Datum with all Subsidiary Works.

[illegible]

Executive Engineer's Office
Kailgherry Range
Colacamund 12th March 1872

Sup ^t & Sundries	27,331	9	9
Total Estimated Rupees.	573,920	-	-

McClellant. *Capt. R. B.*
Executive Engineer

(1) - 6. 53. The rate for Culvert under Dams increases with height of Dam because the Culvert already built (the materials of which, will be available) will be less in proportion to length of larger Culverts.

(2) - 1. 71. The rates for Inlet, Tower and Foot Bridge per running foot increase with height of Dam, as their Foundations &c. will have to be wider and deeper.

Ms. A.9.2. v.17 p.202. b.8r
N^o. 1. oblong 17 x 28. 7. 1/2 inch

Work. Probable Cost of Constructing a Dam 187 Feet above Datum with all Subsidiary Works.

[illegible]

Executive Engineer's Office
Nulgherry Range
Patalamund 12th March 1872

Sup ^t & Sundries	26,099	14	7
Total Estimated Rupees.	505,960	-	-

gentleman.

The rate for Culvert under Dams increases with height of Dam, because the Culvert already built the materials of which will be available) will be less in proportion to length of larger Culverts.

The rates for Inlet, Tower and Test Bridge per running foot, increases with height of Dam, as their Foundations ^{you} will have to be wider and deeper.

In a letter from the
Supr Engineer's Division
to the Chief Engineer
and Secretary to Govt
P.W. Department No. 14
dated 20th April/72.

MR 2045/72

Pro 18th June/72 in B. No. 296

Three Estimates of
of Dams across the
Poorthy River —

61/6
Public Works Department
No. 1504
Proceedings of the Madras Government
Read the following

From

The Super Engineer
4th Div. } (H. E. No. 14 of 20 April
1872)

ff
A.A.
With these papers
are submitted estimates
for carrying out the
Lake Saint Lawrence
Reservoir on the
Heilgherry Hills by con-
structing three alter-
native dams of the
following heights, and
cost, and impounding
the undermentioned
quantities of water viz.
Height

Note. The water level is 21 feet lower	Height	Estimated cost	Cubic Capacity
	151 ft	Rs 7,40,060	22,001,987 cu ft
	169	55,73,920	31,988,717
	187	50,05,960	46,501,757

2. The apparent anomaly of decrease in cost according as the height is increased, is accounted for by the presence of solid rock at 45 feet below the surface of the only saddle by which it is possible to discharge the surplus water of monsoons. and 187 feet is decided to be the maximum height to which the silting process (by which the earthwork is to be carried out), can be effectually and economically adopted. Otherwise, by increase of

63 17
earthwork in the Dam and decrease of rock cutting in the escape Weir, the capacity and cost of the Reservoir might have been brought into more fitting relation to each other, than is the case with even the most favorable of the alternative projects under review. For a capital outlay of Rs 5,06,000 represents an annual cost (at 5 per cent) of Rs 25,300 which secures $46\frac{1}{2}$ millions of cubic yards of water, or 93 millions at two supplies per annum, say 3,000 cubic yards per Rupee

allowing for evaporation
but not for cost of
maintenance of the work.
Any how the scheme
is so hampered by its
disadvantages as to the
waste weir site, that
it may be as well to
investigate the other or
Victoria Lake Project
mentioned in Lieutenant
Colonel Farewell's letter
and which has certain
recommendations in the
larger capacity of its
basin and its accessibility
though not perhaps as
to its supply. But it
will be necessary first
to ascertain whether that
project admits of an
advantageous site for the
construction

after conference
with him -

I would wish
him to
A. A.

65 /
construction of a waste
weir, and whether
Mr. McIvor will be
satisfied with the quan-
-tity of water available
on both sides of the
valley for silting - on
both which points
Lieut. Col. Farewell
will be so good as to
report.

It was all along
understood by the
Public Works Officer
in communication with
him that Mr. McIvor
was not competent to
make accurate calculations
of the work which he
undertook to perform
and Captain Morison's
calculations prove

2. We have
that ~~he~~ greatly overesti-
mated the amount of
silling performed by
him, and consequently
underestimated its
cost, which is now
ascertained to have
been at the rate of
from $17\frac{1}{3}$ to 20 cubic
yards to the Rupee for
work on the dam, and
only $7\frac{1}{3}$ yards to the
Rupee for silling out
the escape weir. From
these a mean rate of
 15 cubic yards to the
Rupee has been adopted
by Captain Invariant
for earthwork of all
kinds. No doubt, as a
dam rises and the
plane of deposition

19
becomes flatter, the cost
of silling must increase
under most if not
all circumstances;
hence restriction of the
height of highest pro-
jected dam to 187 feet.
The method adopted
for discharge of water
for irrigation, viz a
water tower with
numerous small li-
openings at different
levels, communicating
at its base with a
massive tunnel
through the dam, is
no doubt the safest
and best that can
be devised - and
neither of the expedi-
ents for superseding
the waste weir originally

proposed, are of a nature
to commend themselves
for adoption. They would
come too near the
dam itself, and greatly
endanger it.

The Government
are disappointed to find
that the cost of silting
originally guessed at
400 cubic yards to the
Papee, then at 100 cubic
yards, and again at 50
cubic yards, has even-
tually had to be
averaged as high as
150 cubic yards. But they
are willing to hope that
with the aid of the pro-
fessional officers in
laying out and measuring
the works, and with
his

20
his mind devoted solely
to the details of the silting,
Mr. Mc Ivor will succeed
in effecting a considerable
saving on this item.
There is no difference
of opinion amongst
all those who have
witnessed the work
already performed,
as to the wondrous soli-
dity and consistency
of the silted material
of which the dam was
composed.

The Victoria Lake
Project having been
taken up, in the
first instance, se-
veral years ago, Lieut.
Col. Farewell will
report whether the

5/10/25
if the project
be taken up

Public Works 1872 Dept

N^o 1504

Proceedings of the
Madras Government

Dated 18th June 1872. —

Cave

N^o 296 + 297.

R.C. 25/11/72
R.C. 8/11/72 R. 282
1st Mar/72 R. 72