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Revenue DEPARTMENT

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Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
24th June 1874.*

Read the following papers:—

No. 520. From Captain JOHN PENNYCUICK, R.E., District Engineer, North Arcot, to Lieutenant-Colonel J. MULLENS, R.E., Chief Engineer for Irrigation, dated Vellore, 29 September 1873, No. 2,094.

I HAVE the honour to forward a revised estimate, amounting to Rupees 17,900, with abstract, comparative statement, and sections, for re-opening the supply-channel from the Seear River to the Seesamungalum Tank, in the Wandewash Taluq.

- 1 Detailed Estimate.
- 1 Abstract do.
- 1 Comparative Statement.
- 4 Plans.

2. The original estimate amounted to Rupees 9,900, which was afterwards increased to Rupees 10,375 by an addition to the amount to be paid as compensation for land, and the latter sum was sanctioned in G. O., No. 313, of 21st February 1872.

3. When the work came to be carried out it was found that there were some errors in the levels on which the estimate was based, and that the work to be done was much greater than that allowed for.

4. The error appears to have been first detected by Mr. Supervisor Stephens early in this year, and on my first visit to Arnee in April last, the Range Officer, who had in the meantime checked the levels himself, brought it to my notice. I went over the ground with Lieutenant Bovan and asked him to prepare a revised estimate.

5. The revised estimate reached me in June, but it was so much higher than I expected that I did not care to forward it until I had been over the ground again, which I did towards the end of June, and found that some of the cross sections had been taken on an erroneous principle, and that all the levels would have to be taken over again.

6. The revised estimate prepared in accordance with the instructions that I then gave reached me a few days ago, and is now forwarded.

7. That there was some error in the original levels was evident from the first, but there was great difficulty in ascertaining its extent, or how it had arisen, owing to the fact that excavation had been begun over nearly the whole length of the channel, so that the original ground was either cut away, or more or less covered with spoil.

8. Only two permanent bench-marks were kept, and the fact that there was something wrong was sufficiently proved by the fact that the difference between the bench-marks by the original levels was — 0.94, while by those taken later it was $\times 1.82$.

9. It appeared to me probable that the cross sections were likely to be accurate in themselves, that is to say that the relative levels of the points in each cross section were not likely to be materially wrong, inasmuch as an error in a cross section where the ground was tolerably uniform would not be likely to pass unnoticed when the sections were being plotted, and that such errors as existed were likely to be in the longitudinal section.

10. With a view of ascertaining as nearly as possible the actual circumstances of the original ground, the following instructions were given:—

"PARAGRAPH 7.—It is presumed that the points at which the cross sections were taken are known, if not the distances must be carefully measured from the head of the channel, the bench-mark above mentioned being taken as the standard for the levels only.

"8. In order to compare as nearly as possible the levels now to be taken with the original ones, a point should be taken on each side of the channel at each cross section (as near to the centre as the excavation will allow), and these points compared with those of the corresponding points, not with that of the centre of the channel, on the original section. The mean of the difference for these two points will then be taken as the difference for the whole of that section. It is not necessary that the two points should be at equal distances from the centre of the channel, only that both should be as near it as possible, and that the distances should be some multiple of 5, that being the distance between Major Hasted's reading.

"9. For example, in cross section No. 5, suppose the points taken are 30 feet to the left of the centre line, and 35 feet to the right, and that the levels are found to be 28.62 and 29.81 respectively; those of the two corresponding points of the original section being 25.90 and 26.95. The difference will be 2.72 and 2.86; the mean of these, or 2.79, may be taken as the error for the whole section; the level of the centre will be $2.79 + 23.70 = 26.49$, and so on for the other readings.

"10. The points to be read at each cross section should be carefully selected so as to ensure that the levels taken are those of the natural ground and not of accidental heaps of earth. All the points should be selected and marked by pegs before any levels are taken, and, in order to insure accuracy, the pegs should be driven up to the head in the ground, and the levelling staff rested on them. A second peg standing out of the ground may be driven at each point to indicate the spot.

"11. The levels should be taken independently by two people with different instruments, and they should not be allowed to compare their field books, but forward them directly after the completion of each day's work to the Range Officer. Any discrepancy exceeding 10 foot should be taken as indicating an error requiring correction.

"12. The cross sections should be plotted according to the revised levels, and, under each section, should be noted the difference from the original levels; the section of the channel should also be put in."

11. The bench-mark nearest the river was to be taken as the starting point, the datum line being taken at 27.92 below this point as in the original levels. (The sill of the head sluice as estimated was to be 17.09 above the datum, and this is the level at which it has actually been built.)

12. Lieutenant Bevan reports that the instructions given above were fully carried out, and the levels taken by two Overseers and checked by himself.

13. They have now been taken by Mr. Stephens, by two Overseers, and by Lieutenant Bevan himself. They were also checked by another Overseer, but Lieutenant Bevan states that this was done in so perfunctory a manner that he does not attach any importance thereto. There is no material difference between any of the observations.

14. The levels as now given cannot of course be considered as exact, as it is impossible to find exactly the points at which the original cross sections were taken, but they are not likely to be wrong to any great extent, and at all events they are as accurate as we can get them now.

15. An examination of the sections will show that, according to the original levels, the second bench-mark was 94 below the one nearest the river, but it now appears to be 1.82 above it, showing an error of 2.74 feet between these two points.

16. This error appears to be nearly constant throughout the sections, except at cross sections 3, 4, 5, 7, 9, 18 and 19.

17. It seems probable, therefore, that there was an error in one of the earlier readings of the original line of levels, which has been continued throughout.

18. The discrepancies in Sections 4, 9, 18 and 19 may be accounted for by a slight error in the position assumed for the centre line, but I find it difficult to account for the peculiar discrepancies in sections 3 and 7, except on the ground of other mistakes in the original levels, as the ground here has but a slight slope either in longitudinal or cross sections.

19. On this point, however, I do not think we can get any further certainty, and I believe the levels now taken give the truth as nearly as it is now possible to ascertain it.

20. I enclose a copy of the original longitudinal and cross sections. In comparing the longitudinal sections it must be noticed that the revised section is taken on the centre line of the channel, which the original one is not.*

* Also that cross section No. 1 on the revised levels corresponds to No. 2 on the original.

21. The original and revised levels above datum of the natural ground on the centre line of the channel at the different cross sections are marked on the longitudinal section for comparison.

22. The original estimates were prepared by Major Hasted, and most of the calculations appear to have been made by himself, but there is nothing to show by whom the levels were taken.

23. With a view of lessening the cuttings as much as possible, the bottom width of the channel has been reduced from 10 to 8 feet.

24. You will see that not only are the quantities much increased, but provision has had to be made for increased rates for hard "morumboo," gravel and rock.

25. This is in great part due to increased depth of cutting, but with the original depths some increase would have been required on this account, as the original estimate provided only for ordinary earthwork, whereas in the line a good deal of rock and gravel are met with.

26. I have been very carefully over the ground, and am of opinion that the rates allowed are not at all too high.

27. The alterations in the channel account for Rupees 6,425 out of the Rupees 7,525, by which the estimate is increased.

28. Provision is made for a (so-called) syphon sluice for carrying the water of Poppambaddy spring channel, which crosses the new channel close to the river bank. This is a manifest necessity, and it is not clear why it was omitted in the original estimate. The cost of this addition is Rupees 300.

29. The two aqueducts allowed in the original estimate cannot, from their position, command the whole of the land under the Moyampoondy tank, and a third has been added at a cost of Rupees 330; provision has also been made for a bridge and aqueduct combined, costing Rupees 450, to afford means of crossing the channel to the village of Moyampoondy. This bridge is unquestionably

wanted, as there is no other means
off the village from the ground betw

30. Some slight alterations in the
aqueducts originally allowed, to me

31. An increase of revenue, a Major Hasted, and in G. O., No. 1, accepted as within the mark, and wise than very moderate; indeed, I than any one, believes it will be cor

32. This sum would be only Rupees 17,900, but as Rupees 5,850 which would be entirely wasted if bad economy not to finish it; it be stopped.

No. 521. From the same Officer

I HAVE the honour to forward

- 3 Plans.
1 Section.
1 Sketch.
1 Detailed Estimate.
1 Abstract do.
1 Comparative Statement.
2 other old estimates received with No. 1
dated 26th January 1874, from the C.
Engineer for Irrigation.

instead of Rupees 17,900 as forw
September last.

3. Of this increase Rupees 7' masonry works; a further increase to the item of compensation for labour to be awarded on this account was submitted. A slight increase blasting rock, it having been found previously allowed.

4. The spans of the aqueduct surface width of the channel, there w

5. I should mention that the letter above referred to were merely with reference to the increased dept.

No. 522. *Note by the Che*

With his letter No. 2,094 of the North Arcot, transmitted a revised re-opening the supply channel from tanks in the Wandewash Taluq. This No. 2,374, of the 1st October 1870, tl

crossing the channel, which entirely cuts it and the river.

been made in the designs of the two
e alteration in the levels.

ning to Rupees 1,187, was anticipated by of 1st October 1870, this estimate was e is no reason to suppose that it is other- want Bevan, who knows the locality better rably exceeded.

at 6½ per cent. on the present estimate of
it had been spent before the end of last year,
the channels were not carried out, it would be
not therefore ordered the excavation to

ed Vellore, 19th February 1874, No. 3,440.

with the revised plans and estimates for the re-opening of the Secsamungalum channel, the designs of the masonry works having been altered as directed in your memorandum No. 742-H, of 2nd October last.

2. The total estimate as now forwarded amounts to Rupees 19,440, and with my letter No. 2,094 of 25th

due to the alterations in the designs of
pees 620 has been caused by an addition
the decree of the District Court fixing the
g been received since the former estimate
also been made to the rate allowed for
the work cannot be done for the amount

...ing been made equal to the greatest
...no economy in making them less.

of these works sent up with my former original sanctioned plans slightly modified by the cutting.

gineer for Irrigation.

September 1873, the District Engineer, ate, amounting to Rupees 17,900, for Seear to the Seesamungalum and other ject was originally sanctioned in G. O., timate being Rupees 9,900, and to this

Rupees 475 were added on account of
1st February 1872, No. 313.

2. In forwarding this revised item of increase was on earthworks. On estimate, and cubic yards 92,250 in the levels, which difference would

Paragraph 23 of No. 2,094.

remarked, which should not have b
 affects materially the quantity of w
 excavation is but small. In the nea
 depth of excavation originally intende
 been principally in such material. T
 the cubic yard, the quantities at each r
 out the work quantities slightly in exc
 of the further excavation, to the exte
 13,409 cubic yards have cost 3 Annas a
 range from 4 Annas to 1 $\frac{1}{4}$ Rupees. (C
 Rupees 6,425 are due to these earthwo:

3. The District Engineer reports

No. 2,094, paragraph 22.

by himself, but that there was nothing

* No 742-2 D., 23rd Oct. 1873.
† „ 85, 17th Nov. „

that he could not call to mind by what
but that it was his impression that this
pared before he took charge of the Range

4. Captain Pennycuick has desc

No. 2,094, paragraphs 8 to 20.

nal levels were very materially incorre-
case, comparatively little time and to
thoroughly in the first instance would
the end, and probably much money be
Major Hasted's experience should have
into the value of the data on which his
that most District Offices contain ma-
because the plans have not been proper-
quently the locality to which they refer is
been called to the subject, and circular
names of those who take and check leve-
and level books to be duly recorded, with
use of permanent bench-marks than was
explained. It must be remarked, howe-

compensation, and sanctioned in G. O.,

it was explained that the principal 73,237 were allowed in the original estimate, the difference being due to errors still greater had not the bottom of the channel been reduced from 10 feet, a change, it may be without due authority, as it will save the saving in quantity of hard soil was met with at the increased depth appears to have original rates were 2 Annas and 1 Anna being very nearly equal, and in carrying out have been executed at these rates, while 19,000 cubic yards found necessary, 1000 yard while the rates for the remainder the difference between the two estimates.

the original estimates were prepared by Major Hasted, and that most of the calculations appeared to have been made by whom the levels were taken.

reference* was accordingly made to his latter officer, who had been transferred to the Kistna, and who replied that the levels had been taken or checked, work had been done and an estimate prepared that he had only revised the estimate. And fully the measures taken to obtain correct levels, and they were such as to leave no room for doubt that the origi-

As has too often been found to be the case, taken in doing such work well and have saved a very great deal of trouble in the past, and I am of opinion that an officer of this rank is much more particular in examining the work than is based. It has been noticed that many surveys and levels which are useless, are completed, dated, and signed, and are absolutely undiscoverable. Attention has been drawn to this, and instructions have been issued requiring the date to be noted on the plans, and the survey to be checked. The necessity for a much more extended examination than formerly customary has been frequently pointed out, and that the importance of working only

*Proceedings of the Madras Government, Public Works Department,
24th June 1874.*

on checked levels was pointed out very many years ago, and there is really no valid excuse for neglecting to take this precaution.

5. The plans of the masonry works belonging to this project were found to require modification, and they were returned* for this purpose to the District Engineer. The estimate as finally revised† amounts to Rupees 19,440, and sanction is thus made up—

* No. 742 H., 24th October 1873.

† District Engineer's No. 3,440, 19th February 1874.

the difference of Rupees 9,065

	RS.
1. Earthworks	6,575
2. Land compensation	620
3. Head sluice	200
4. Syphon sluice (extra work)	480
5. Aqueduct	130
6. Do. No. 2 (extra work)	410
7. Do. No. 3	40
8. Do. No. 4 (extra work)	610
	9,065

a variation in the rates for removing rock has increased the cost of the channel cutting by 150 Rupees. The increase on the 2nd item for land compensation is

No. 3,440, paragraph 3.

due to the amount having been determined at the sum now provided by the District Courts. Items 4, 6, and 7 are for additional masonry works, the necessity for which is explained in paragraphs 2 and 29 of the District Engineer's No. 2,094, and the other items are the result of a revision of the designs of the masonry works to adapt them to the positions they are to occupy. Some of the designs even now are not as good as they might be; the thickness of the wings of the aqueducts being too small, and very great care will be necessary in filling in and consolidating the earthworks around them in order to secure equal pressures on the two sides with equal depths of earth; if this be done they will stand. The instructions given in paragraph 4 of this office memorandum No. 742-H, to mark on the plans the proper level of the aqueduct floors have not been fully attended to. In each case the level of the bed of the irrigation channel should have been shown on the cross section of the main channel and the corresponding level, as also that of the bed of the latter, should have been shown on the plans; only by so doing can mistakes be rendered improbable.

6. When the project was first submitted the returns were estimated at from 12 to 14 per cent.; the increased cost of the channel will reduce these to 6 or 7 per cent. It will be desirable that all that may be necessary should be done to secure the extension of irrigation anticipated, so that some return for the large outlay may be obtained.

OOTACAMUND, (Signed) J. IN MULLINS, Lieut.-Colonel, R.E.,
27th May 1874. Chief Engineer for Irrigation.

No. 523. ORDER THEREON, 24th June 1874, No. 1,700.

IRRIGATION, No. 43.

THE revised estimate, amounting to Rupees 19,440, for the Seesamungalum channel is, the Government observe,

*Proceedings of the Madras Government,
24th June 1874.*

very nearly double that sanctioned in October while accounting for this large difference the estimate was based on altogether inaccurate of the channel alone has cost Rupees necessary.

2. The Government cannot rightly sanction or not if such entirely incorrect submitted; and they concur with the Chief Engineer that much of the responsibility for fraud with Major Hasted, who appears not clearly necessary, seeing that the original whom the levels had been taken, or what Had the levels in the first instance been suitable off-take for the head of the channel considerable part of the expense now incurred

3. The attention of the District Engineer to the masonry works contained in paragraph 5 of the Note of the Chief Engineer for Irrigation, and he will take care that these works are so constructed as to be perfectly stable and efficient.

4. With these remarks the revised estimate is sanctioned, and the probable date of the completion of the work, of which more than half was expected to be finished by the end of the last official year, should be reported to the Collector in order that arrangements may be made for the early irrigation of the additional lands which are to be supplied.

(True copy.)

Lieut.-Colonel, R.E.,

Secretary to Government.

To the Chief Engineer for Irrigation.
District Engineer, North Arcot.
To Major J. O. Hasted, R.E.
To the Officiating Controller of Public Works Accounts.
Revenue Department

Exd. S. T. Austin.
Spare Copies will follow

C No 2214.
Revenue Dept.
Govt. of 1874 Madras.
PUBLIC WORKS.

To
THE CHIEF ENGINEER FOR IRRIGATION,
do. do. do.

Dated June 24th.

Recd. July 6th Encl.

G. O., 24th June 1874, No. 1,700

JUNE

Nos. 520-523

Jan

Do

To of Revenue 13 July 74

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6/7

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Sesamungalam Channel.—The revised
estimate for the repair of the channel in
the North Arcot District, sanctioned with
remarks.

No 69
Communicated to the
Board of Revenue
7 July 74. *C. V. L.*