

(1) Number of pages 20
 (2) Date of repair 18. XI. 42
 (3) Initials of the Referencer _____

MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. <u>1025</u>	Press Mis.
<u>267-220</u>	
Dated <u>19-4-</u>	<u>18 65.</u>

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
19th April 1865.*

Read the following letters:—

No. 267. From Captain J. MULLINS, R. E., Consulting Engineer for Irrigation and Canal Company, to Colonel C. A. ORR, R. E., Secretary to Government, Department Public Works, dated Madras, 18th February 1865, No. 208.

SIR,

2 Letters in original.
3 Estimates.
1 Comparative Statement.
1 Plan.

Letter from Agent No. 66, 7th February, with Chief Engineer's No. 1,454, 30th January.

3 Estimates.
1 Comparative Statement.
1 Plan.

1. I have the honor to submit, for the consideration of Government, a revised estimate, Rupees 44,908, and plan for the Kadrabagh aqueduct in the 23rd mile of the main canal.

2. The original estimate for this work was sanctioned in the Order of Government of the 6th May 1864, No. 1,301.

3. The revised estimate has been corrected in this Office to agree with the plan; as received from the Agent, the first part had been re-copied from the original estimate in which the foundations were entered at a depth which it was supposed would suffice. This correction has increased the total of the estimate from Rupees 44,013 to 44,908, and the amount of the supplemental sanction necessary is Rupees 15,191.

4. The causes of increase are:—

Rupees 1,353-6-6.

Rupees 2,052.

Rupees 4,017.

Rupees 7,282-8-0.

1st.—Additional masonry for the most part in the foundations.

2nd.—The centring with centring walls have cost double what was allowed.

3rd.—The additional walls and work shown in yellow on the plan.

4th.—The omission from the original estimate for the aqueduct of the expenditure on culvert No. 13 for which it was substituted, and which expenditure was on work of no use in the revised arrangements. This omission was noticed in paragraph 35 of my letter No. 40, 2nd July.

5th.—Small increases of cost on other items as string-course, coping, and sundries.

5. With regard to the want of provision for sufficient foundations it is difficult to assign good cause, for, when the aqueduct was designed, foundations of much greater depth than was allowed in its estimate had already been put down for the culvert, the place of which the aqueduct was to take, and therefore the nature of the soil must have been well known; but from the 2nd

No. 1,454, 30th January 1865.

was prepared without reference to the circumstances of the site, as ascertained from the work already done there. However, the error has unfortunately extended beyond the estimate, and,

Letter No. 40, 2nd July, paragraph 35.

as already brought to the notice of Government, the foundations of the western pier, and,

as the plan shows, of the abutment also, have been laid at a depth altogether insufficient.

6. In paragraph 4 of his letter above referred to, the Chief Engineer explains the arrangements which have been estimated for with a view to remedy the defects in the foundations, and the plan shows what these arrangements are. As the alternative to rebuilding, I suggested underpinning or piling: the Chief Engineer does not refer to the latter, but the former he considered could not be effected except at too great a risk. It will be seen on looking at the plan that the danger from the action of canal water on the one hand, and of the nullah freshes on the other, had to be guarded against. There was, if I may so say, plenty of room for work having the former object in view, but the water of the nullah could not be kept at a distance, and I am unable to think that the extra thickness of flooring under the first arch, and the small piece of

*Proceedings of the Madras Government, Public Works Department,
19th April 1865.*

similar work close to the pier under the second arch, will suffice to render these foundations secure, for I do not see how they can prevent the water from finding its way from all sides into the surface soil and in that case the resistance, which this soil will be capable of offering to pressure, will be liable to constant variation.

7. I believe that at the present time it would be useless to recommend any other measures, for even should the work have not been already commenced, it would be impracticable to prepare for and execute, within the small space of time available, any works having as their object the transference of the weight of the abutment and pier, and of the superstructure resting upon them, to such a depth below the surface as would ensure the permanent stability of this part of the aqueduct, and it must take its chance; but it is I think much to be regretted that action was not taken sooner, and the proposed additional work estimated for and submitted for sanction in time to allow of a full consideration of the arrangements deemed necessary, for should this aqueduct fail during the irrigation season of 1865-66, it will not be possible to supply the main canal below the 23rd mile, and this is in effect to say that any returns from irrigation would be postponed for at least another year—a very serious consideration, now that the works in the next 50 or 60 miles have made such progress, as to afford a reasonable hope of several thousand acres being irrigated. I hope that the aqueduct may stand uninjured this year, but I consider its condition to be so far from safe, that it would seem necessary in any case to provide for the execution at the earliest possible date of such additions to the foundations as will make it permanently secure. Proper foundations might be laid under the pier, but under the abutment this would be a very difficult arrangement to carry out, and for that part piling would seem to be the only remedy short of rebuilding, and the same course might be adopted for the pier if still deemed preferable to underpinning.

No. 268. From Captain J. MULLINS, R. E., Consulting Engineer for Irrigation and Canal Company, to Colonel C. A. ORR, R. E., Secretary to Government, Department Public Works, dated Madras, 22nd February 1865, No. 214.

SIR,
I have the honor to transmit, for the information of Government, a copy of a letter No. 99 of the 20th instant from the Agent and Manager, Irrigation and Canal Company, from which it will be seen that the Acting Chief Engineer is preparing an estimate for the Kadrabagh aqueduct, which will probably supersede that submitted with my letter as per margin.

No. 238 of the 18th instant.

No. 269. From Captain J. MULLINS, R. E., Consulting Engineer for Irrigation and Canal Company, to Colonel C. A. ORR, R. E., Secretary to Government, Public Works Department, dated Nagatoor, 24th March 1865, No. 230.

SIR,

1. I have the honor, in continuation of my letters as per margin*, to transmit a letter No. 133, of the 13th instant from the Agent and Manager, Irrigation and Canal Company, together with the additional estimate, Rupees 2,010,

* Letter in original, No. 1,169.
* Plan of aqueduct.
* Estimate of do.

* No. 20th of the 18th ultimo.
" 21st of the 22nd ultimo.

therein referred to, and a plan showing the modification of the additional works to the Kadrabagh aqueduct, proposed by the Officiating Chief Engineer, with a view to provide, as far as may be practicable, for the safety of that important work.

2. I inspected the aqueduct the day-before-yesterday, and I am of opinion that the alteration now intended to be made is an improvement upon the simple paving under the arches before proposed.

3. It has been found on proceeding to make the excavation for the dry rubble wall between the east wings, that the presence of water will prevent this part of the work from being executed. The item for this work amounts to Rupees 635, and a small correction in the calculations of the estimate reduces that to Rupees 2,000, for all the works included therein, so that if

*Proceedings of the Madras Government, Public Works Department,
19th April 1865.*

sanction be given for Rupees 1,400, in addition to the amount of the estimate, Rupees 44,908, submitted with the earlier of the two letters above quoted, the amount of the revised estimate will be Rupees 46,308, and of the supplemental sanction required Rupees 16,591.

4. From the Officiating Chief Engineer's report for January, and from his opinion expressed to me at Kurnool, I learn that he considers that unless the works now proposed are found sufficient to make the aqueduct secure, there will be no alternative but to take down the abutment, one pier, and two arches, and probably also the retaining wings, and to rebuild them properly next year. The wings are insufficiently strong to bear the thrust of the banks in rear, and cracks have already appeared; the buttresses may prevent further damage and if so their unsightliness may be overlooked, otherwise these walls will have to be rebuilt. Altogether the aqueduct is very far from being either well designed or well built, and nothing but the importance of getting water below the 23rd mile this year would warrant the expenditure of a considerable additional sum on a work the stability of which is extremely doubtful.

No. 270.

ORDER THEREON, 19th April 1865, No. 1,025.

CIVIL WORKS, No. 52.

1. The work alluded to in the foregoing letters is an aqueduct intended to carry the Irrigation Company's Main Canal across a stream near Kadrabagh, in the 2nd Section of the canal. The estimate for this section, sanctioned by Government on the 24th December 1861,* contained an item of Rupees 11,747 for a culvert of three arches of nine feet span, by which it was proposed to take the canal across the stream in question.

* G. O. No. 2,369.

2. Subsequently it was found that this culvert did not allow sufficient water-way, and an aqueduct was substituted, with three arches of 25 feet span. The estimate for this work, Rupees 29,717, being Rupees 17,970 in excess of the original estimate, was sanctioned by Government on the 6th May 1864.†

† G. O. No. 1,301.

3. With the first of the letters recorded above the Consulting Engineer submitted a revised estimate for this work, amounting to Rupees 44,908; but this, it appeared, required subsequent modification; and Captain Mullins has now forwarded a newly revised estimate amounting to Rupees 46,308, being in excess of the amount already sanctioned by Rupees 16,591. This excess has been partly caused by an omission to include, in the first estimate for the aqueduct, the sum of Rupees 7,282 spent on the culvert, and which expenditure was rendered useless by the change in the design for the work. The rest of the excess is due to the insufficiency of the original estimate, chiefly in the matter of foundations; and on this point the omission to make suitable provision seems unaccountable, as the designer of the aqueduct had before him the experience of the work executed on the original culvert, for which it had been found necessary to construct much deeper foundations than were allowed in the subsequent estimate.

4. When they look to the series of signal blunders of which this work has been the subject, the Government cannot but share the fears expressed by the Consulting Engineer as to its stability; but as it is of great importance that water for irrigation purposes should be conveyed during the current year to the sections of the canal below Kadrabagh, the Governor in Council is unwilling to offer any obstacle to the early completion of the aqueduct, and he therefore sanctions the supplemental estimate now before him, amounting to Rupees 16,591.

(True Extract.)

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

To the Consulting Engineer for Irrigation and Canal Company.
" Manager for do. do.
Exd, T. O'Connor.

Consulting Engineers' Office,
Irrigation & Canal Company,
Madras, 18 February 1865.

Enclosures.
2 Letters in orig.
3 Estimates.
1 Comparative stat.
1 Plan.
7

N^o 200.

From,

Captain J. Mullins R.E.
Cons Eng for I.C.C.

To,

The Secretary to Government,
Department of Pub. Works.

Sir,

1. I have the honor to submit for the
consideration of Government a revised es-
timate Rupees 44,900 and plan for the
Madnabuzh Aqueduct in the 23rd mile of
the Main Canal.

2. The original estimate for this work
was sanctioned in the order of Government
of the 6th May 1864 N^o 1301.

3. The revised estimate has been correct-
ed in this office to agree with the plan; as
received from the Agent the first part had
been recopied from the original estimate in
which the foundations were entered at a
depth which it was supposed would suffice.
This correction has increased the total of
the estimate from Rupees 44,013 to 44,900
and

Letter from Agent N^o 66 July 1864
with Ch. Eng^r N^o 1652-30 Aug
3 Estimates
1 Comparative statement
1 Plan

and the amount of the supplemental sanction necessary is Rupees 15,191.-

4. The causes of increase are:

1st. Additional masonry for the most part in the foundations.

Rs. 13,53-

2nd. The centings with centring walls have cost double what was allowed.

Rs. 2052.

3rd. The additional walls and work shown in yellow on the plan.-

Rs. 4,017.

4th. The omission from the original estimate for the aqueduct of the expenditure on Culvert No. 13 for which it was substituted, and which expenditure was an work of no use in the revised arrangements. This omission was noticed in para. 35 of my letter No. 40. 2nd July.-

Rs. 7,282-0.

Q.M. L. No. 2,438-26
Aug 1/64.-

5th. Small increases of cost on other items as string course, coping and sundries.

Rs. 486-0-6

With regard to the want of provision for sufficient foundations it is difficult to assign good cause, for, when the aqueduct was designed, foundations of much greater strength than was allowed in its estimate had already been put down for the culvert, the place

No. 11,554-30 Aug 1/65.

Letter No. 40-2nd July
para. 35.-

place of which the aqueduct was to take, and therefore the nature of the soil must have been well known, but from the 2nd para. of the Chief Engineer's letter it would appear that the design for the aqueduct was prepared without reference to the circumstances of the site, as ascertained from the work already done there. However the error has unfortunately extended beyond the estimate, and as already brought to the notice of Government, the foundations of the western pier, and, as the plan shows, of the abutment also, have been laid to a depth altogether insufficient. b. In para. 4 of his letter above referred to the Chief Engineer explains the arrangements which have been estimated for with a view to remedy the defects in the foundations, and the plan shows what these arrangements are. As the alternative to rebuilding, I suggested underpinning or piling: the Chief Engineer does not refer to the latter, but the former he considered could not be effected except at too great a risk. - It will be seen on looking at the plan that the danger from the action of canal water

on the one hand and of the nullah fresher on the other, had to be guarded against. There was, if I may say so, plenty of room for work having the former object in view, but the water of the nullah could not be kept at a distance, and I am unable to think that the extra thickness of flooring under the first arch and the small piece of similar work close to the pier under the 2nd arch will suffice to render these foundations secure, for I do not see how they can prevent the water from finding its way from all sides into the surface soil and in that case the resistance, which this soil will be capable of offering to pressure, will be liable to constant variation. —

7 I believe that at the present time it would be useless to recommend any other measures, for even should the work have not been already commenced it would be impracticable to prepare for and execute, within the small space of time available, any works having as their object the transference of the weight of the abutment and pier, and of the superstructure resting upon them, to such a depth below the surface as would ensure

ensure the permanent stability of this part of the aqueduct, and it must take its chance; but it is I think much to be regretted that action was not taken sooner, and the proposed additional work estimated for and submitted for sanction in time to allow of a full consideration of the arrangements deemed necessary, for should this aqueduct fail during the irrigation season of 1865/66, it will not be possible to supply the Main Canal below the 23rd mile, and this is in effect to say that any returns from irrigation would be postponed for at least another year, a very serious consideration now that the works in the next 50 or 60 miles have made such progress, as to afford a reasonable hope of several thousand acres being irrigated. I hope that the aqueduct may stand uninjured this year, but I consider its condition to be so far from safe, that it would seem necessary in any case to provide for the execution at the earliest possible date of such additions to the foundations as will make it permanently secure. Proper foundations might be laid under the pier, but under the abutment this would be a very difficult arrangement to carry out, and for

for that part piling would seem to be the only re-
 medy short of rebuilding, and the same course
 might be adopted for the pier if still deemed
 preferable to underpinning.

Have the honor to be,
 Sir,
 Your most obedient servant,
 Wm. L. Williams Captain, R.E.
 Cons. Eng. for J.C. Company.

Wm. L. Williams

100267
 Madras 1865

Submitted for the con-
 sideration of the Board of Directors
 of the Madras Waterworks & Sewerage
 Committee on 14th 1865
 in the 23rd meeting of the Board
 of Directors

Recd 1865
 24th February 1865

6th May 1865
 24th Aug 1865
 Copy in a letter to the
 J.C. Company of 24th 1865

1865
 24th Feb 1865
 The Secretary to the Board

N: 99 Madras Irrigation & Canal Co.
 Madras 20th February 1865
 To: The Agent & Manager
 M. J. & C. Co.
 The Consulting Engineer
 M. J. & C. Co.
 Sir, Being aware that you propose
 leaving Madras soon, I deem it desirable
 to inform you that since the Plan & Estimate
 was prepared for works at Kadra Bagh -
 (transmitted to you with my letter N: 66 of the
 7th February/65) a further examination has
 induced the Acting Chief Engineer to propose
 some modification of the work which will
 involve addition to the estimate. I fear it
 may be some days before the Plan & Estimate
 reach me, and this work is one of such
 vital importance that I am anxious that
 not a moment should be lost. I shall
 therefore feel obliged by your giving me
 your proposed route, in order that I may
 be able to communicate with you. The
 completion of work to secure this aqueduct
 and also the effective closing of the Breach
 at

forth at Sookasala are so indispensable that
 I would request the favour of your giving
 me your advice to Mr. Gordon and Mr. Dodson
 when on the spot; so that no effort nor
 suggestion may be wanting towards effecting
 these two operations.

I have &c.
 (Signed) F. M. Henslow.
 Agent & Manager
 (True Copy)

Whitham's Captain R. L.
 Consulting Engineer &c.

Copy in a letter to B. 23
 of 31st May 1865

Enclosure in a letter
 N^o 214 from the Hon. Secy. of
 the Govt. and my letter of
 22nd Feb. 1865.

9977351165

From 19th of Feb. 1865 to 18th 265

Consulting Engineer's Office,
 Irrigation and Canal Co.
 Madras 22nd Feb. 1865

N^o 214.

From
 Captain J. Mullins R. L.
 Consulting Engineer &c.

To
 The Secretary to Government,
 Department of Public Works.
 Sir,

I have the honor to transmit for
 the information of Government a copy of
 a letter N^o 99 of the 20th instant from
 the Agent & Manager Irrigation & Canal Co.
 from which it will be seen that the
 Acting Chief Engineer is preparing an
 estimate for the Madrabagh Aqueduct,
 which will probably supersede that
 N^o 208 of the 18th inst. submitted with my letter as per margin.

I have the honor to be
 Sir
 Yours Most Obedt. Servt.
 Whitham's Captain R. L.
 Consulting Engineer &c.

Agatoot 21th March 1865

Enclosure N^o 230.

1. Letter in orig. N^o 1169.
1. Plan of aqueduct.
1. Estimate of cost —

Captain, J. Mullins, P.E.,
 Consulting Engineer, H. Sand, & Co.,
 The Secretary to Government,
 Public Works Department,

1. I have the honor in continuation of my letter as per margin, to transmit a letter P. 133 of the 13th Instant from the Agent and Manager, Irrigation and Canal Company, together with the additional estimate, Rupees 2,010, therein referred to, and a plan showing the modification of the additional works to the Kadebagh Aqueduct, proposed by the Officiating Chief Engineer, with a view to provide, as far as may be practicable, for the safety of that important work.

2. I inspected the Aqueduct the day before yesterday, and I am of opinion that the alterations now intended to be made is an improvement upon the simple paving under the arches before proposed.

3. It has been found on proceeding to make the excavation for the dry rubble wall between the east

Wings

Copy in a letter of 29 Aug
29 Good day of 29 Aug -

[illegible]

To The Engineer of R.R.
Henderson, Tenn.

Adid 22nd }
 Received 20 } February 1865
 \$1000-19th } April 1865
 Cecil

Copy of letter from Hunt-
M^{rs} 99.

Transmit for information
letter for the Dept from

which it will be seen that
the Q^2 Ch. Imp. is comparative

Can estimate for the Household
Dependents - probably 1000

Received of one submitted in the letter
No. 208 of the 18a sheet.

at 5m, depth 186502 yte

№ 268

Wings. That the presence of water will prevent this part of the work from being executed. This item for this work amounts to Rupees 635, and a small correction in the calculations of the Estimate, ^{reduces that} to Rupees 2,000, for all the work included therein, so that if sanction be given for Rupees 14,00, in addition to the amount of the Estimate, Rupees 44,908, submitted with the earlier of the two letters above quoted, the amount of the revised Estimate will be Rupees 46,308, and of the supplemental sanction required Rupees 16,591.

From the officiating Chief Engineer's report for January, and from his opinion expressed to me at Karnool, I learn that he considers that, unless the works now proposed are found sufficient to make the aqueduct secure, there will be no alternative but to take down the abutment, one pier, and 2 arches, and probably also the retaining wings, and to rebuild them properly next year. The wings are insufficiently strong to bear the thrust of the banks in rear, and cracks have already appeared; the buttresses may prevent further damage and if so their unsightliness may be overlooked, otherwise these walls will have to be rebuilt. Altogether the Aqueduct is very far from being either well designed or well built, and nothing but the importance of getting water below the 23rd mile this year would warrant the expenditure of

a considerable additional sum on a work the stability of which is extremely doubtful. 17

I have the honor to be,
Sir,

Your most Obedient servant,
John H. Williams, Captain, U.S.A.,
Consulting Engineer. S. H. C. Co.

25th March 1865 A.D.

No 269

Documents in continuation of his letter within margin a letter No 133 of the 13th Dec^r from the Agent, together with the original estimate No 2010 bearing reference to the plan showing the modifications of the additional work to the Madhabpeth Aqueduct with certain observations

No 1025-17th April 1865

Enc: 3

Dated 21st March 1865

For the Hon^{ble} Secy to Govt of Madras
From the Hon^{ble} Secy to Govt of Madras
Dated 21st March 1865

No 665 and 681 of 1865
Madras Government
No 1025-17th April 1865

Civil Works
Proceedings of the Madras Government
Under date the 19th April 1865
Read the following

From the Congregr & Co
Submits for the consideration of Govt a revised Estimate No 44908
A plan for the Madhabpeth Aqueduct in the 23rd mile of the main Canal

No 18th Feb/65 No 208.
No 22nd Feb/65 No 211.
No 21st March/65 No 230

From ——— No ——— No ———
From ——— No ——— No ———

The work intended to in the foregoing letter is an aqueduct intended to carry the Irrigation Company's main Canal across a stream near Madhabpeth in the second section of the Canal. The estimate for this section, sanctioned by Govt on the 24th Dec. 1861, contained an item of Rs. 11,747 for a culvert of three arches of 9 feet span: by which it was proposed to take the Canal across the stream in question.

Subsequently it was found that this culvert did not allow sufficient waterway, and an aqueduct was substituted, with three arches of 25 feet span.

S. C. W. 2369.

W. H. W.

The estimate for this work, Rs. 29,717, being Rs. 17,870 in excess of the original estimate, was sanctioned by Govt. on the 6th May 1864.

With the first of the letters recorded above, the Consulting Engineer ^{for this work,} submitted a revised estimate amounting to Rs. 44,908; but this, it appeared, required subsequent modification; and Captain Mullins has now forwarded a newly revised estimate, amounting to Rs. 46,308; being in excess of the amount ~~but~~ already sanctioned by Rs. 16,591.

This excess has been partly caused by an omission to include, in the first estimate for the aqueduct, the sum of Rs. 7,282, spent on the culvert, and which expenditure was rendered useless by the change in the design for the work. The rest of the excess is due to the insufficiency of the original estimate, chiefly in the matter of foundations.

and on this point the omission to make suitable provision seems unaccountable, as the designer of the aqueduct had before him the experience of the work executed on the original culvert, for which it had been found necessary to construct much deeper foundations than were allowed in the subsequent estimate.

When they look to the series of Right Blunders of which this work has been the ~~victim~~ ^{subject} the Govt. cannot but share the fears ~~of~~ expressed by the Consulting Engineer as to its stability; but as it is of great importance that water for irrigation purposes should be conveyed during the current year, to the sections of the canal below Kadichah, the Govt. in Council is unwilling ~~to~~ to offer any obstacle to the early completion of the aqueduct, and he therefore sanctions the supplemental estimate now before him, amounting to Rs. 16,591 —

To the Cons Engineer J.H. Co Manager of
19th April
1864
J.P.B.

Copy in a letter to Eng?
of 30th May 1865 No 34/65

4th 1865 2nd 2nd
Wm. G. G. G. G. G.

2nd 1865
Wm. G. G. G. G. G.

1865

The supplement
to the annual account
to 30th 1865, for the
completion of the
transmission of the
value of the 1865
from of the 1865
transmission
transmission.

267 @ 270