Public Works (1896) Department.

2107

G.O., No. 1089-90 I

DATED 23d December 1896

23/1/97

[Despatch Abstract.]

Kalingarayan Channel. The recommendation of the Chief Engineer for Irrigation that renewal of sanction ~~to be applied for~~ to the Estimate for improvement & Extension of the Coimbatore Division be applied for, Approved, and the Govt. of India requested to grant the extension of the sanction for a further period of 5 years from 31st January 1896

~~Kalingarayan Channel~~. Requesting that the sanction ~~to the project be extended~~ for a period of five years from 31st January 1896

[illegible]

INDEXED

JC 2/8/12

V 28/12

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

IRRIGATION.

Government {1896} of Madras.

PUBLIC WORKS.

Recd.
Regd. } 1896.

Enclosures
Spare copies

Letter, No. 1090 I., 23rd December 1896.

DECEMBER.

Kalingaroyen Channel

Requesting that the sanction to the — project be extended for a period of five years from 31st January 1896.

No. 1090 I., 23RD DECEMBER 1896.

PUBLIC WORKS DEPARTMENT.

Irrigation.

LETTER—from

W. HUGHES, ESQ., B.A.,
Joint Secretary to the Government of Madras,
Public Works Department,
Irrigation Branch.

To

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

SIR,

With reference to your letter No. 143 I., dated 20th July 1896, I am directed to explain that, as the rules in paragraph 18, chapter V of the Public Works Department Code, Volume II, contemplate the submission, on or before the expiry of sanction to an irrigation and navigation work, of a statement showing the actual expenditure incurred against the sanction and the sum remaining available for future expenditure and as no outlay had been incurred on the sanction accorded to further improvements and extension of the Kalingaroyen channel, owing to funds not having been sanctioned by the Government of India, an extension of sanction was not applied for.

2. I am also directed to forward a copy of Proceedings of Madras Government, No. 1089 I., dated 23rd December 1896, from which it will be observed that the sanctioned estimates need modification, but in the meantime, I am to request that the Government of India may be pleased to extend the sanction to the project for a period of five years commencing from the 31st January 1896.

I have the honour to be,
Sir,
Your most obedient servant,

Joint Secretary to Government,
Irrigation Branch.

FORT ST. GEORGE,
23rd December 1896.

Exd. Md. Pahilvan.

IRRIGATION.

Government {1896} of Madras.

PUBLIC WORKS.

Recd. } 1896. *Enclosures*

Regd. } *Spare copies.*

G.O., No. 1089 I., 23rd December 1896.

DECEMBER.

Kalingaroyen Channel

The recommendation of the Chief Engineer for Irrigation that renewal of sanction to the estimate for the improvement and extension of the —, Coimbatore division, be applied for, approved; and the Government of India requested to grant the extension of the sanction for a further period of five years from 31st January 1896.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper:—

From J. HANNAN, Esq., Superintending Engineer, IV Circle, to the Chief Engineer for Irrigation, dated Coimbatore, 12th November 1896, No. 219 I.

With reference to G.O., No. 705 I. of 17th August 1896, and your memo. No. 12/IV., dated 30th October 1896, I have the honour to inform you that the estimate for the Kalingaroyen channel will have to be revised for the following reasons:—

(1) Defective designs and omissions.
(2) Insufficient rates.

The resulting excess will probably be about 7½ per cent. on the sanctioned estimate.

2. I am of opinion that, if the Bhaváni project is to be sanctioned, and I cannot at present see any reason why it should not, this project for extending the Kalingaroyen channel should be given up, as the equivalent to the area some 15,000 acres which it is proposed to irrigate can be more economically and effectively irrigated under the Bhaváni reservoir. The Kalingaroyen channel is already 56 miles long; it passes through very porous soil, the sluices along it are to be numbered by hundreds. Experience shows the difficulty of getting water down to the ends of long channels of this description even in deltaic soil. The lands to be irrigated are light sandy and porous, and for their efficient irrigation would require much more water than more suitable soil.

The proposed extension is 33 miles, so that the total length of channel would be 89 miles. Please to let me know if the estimate is to be revised. The revision will take about six months.

One of the three following courses might be adopted:—(*a*) the estimate as it stands might be resubmitted for sanction, (*b*) it might be cancelled altogether in favour of the Bhaváni project, and a revised estimate submitted for sluicing the existing channel, and (*c*) the present estimate might be revised and resubmitted for sanction.

If proposal (*a*) is adopted, I would recommend that the extension of the channel should not be commenced until the existing channel has been entirely resluiced; when this is done, we will have data to go on for deciding the question of the extension. The existing channel will have to be resluiced in any case. If proposal (*b*) is approved, the estimate for the reservoir could be submitted in six months. On the whole I consider that perhaps proposal (*a*) had best be adopted. It will be time enough to submit a revised estimate when a decision is come to in favour of extending the channel.

No. 230 I.

Note by the Chief Engineer for Irrigation.

Submitted to Government with reference to G.O., No. 705 I., dated 17th August 1896. The undersigned has been unable as yet to form an opinion as to the merits of the project as it stands, but considers that there is probably something in the Superintending Engineer's doubt as to the possibility of passing water down to the 89th mile.

2. It is recommended that renewal of sanction be applied for and the Superintending Engineer directed to submit an estimate for resluicing the channel as soon as practicable.

CHEPÂK,
11th December 1896.

(Signed) W. HUGHES,
Chief Engineer for Irrigation.

ORDER—No. 1089 I., dated 23rd December 1896.

The recommendations of the Chief Engineer for Irrigation are approved.

2. The following letter will be sent to the Government of India.

[Here enter No. 1090 I., dated 23rd December 1896.]

(True Extract.)

Under Secretary to Government,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, IV Circle.
" Examiner, Public Works Accounts.

Exd Md. Pahilvan.

Renewal of Sanction for the Kaliyaroyen Channel - Construction

Public Works (189) Department.

CURRENT No. 11561

H.C.

Order

From The Chief Engr Irrign
Madras

No. 230 I

Dated 11 Dec. 96.

Received 19.12.96

Enclosures X 6

Spare copies

SUBJECT.

Kaliyaroyen channel Project. Submitting Supt Engrs letter with the recommendation that Renewal of sanction for the — be applied for and that the Supt. Engr. be directed to submit an Estimate for Sluicing the Chl.

Issue
17/12/96

BR
16-12-96

From the Supdg: Engineer IV Circle. No 219/J dy 12 Nov/96.
No 2305

Note by the Chief Engineer for Irrigation.

Submitted to Government with reference to G O No: 705 I, dated 17th August 1896. The undersigned has been un-able as yet to form an opinion as to the merits of the pro-ject as it stands, but considers that there is probably -- something in the Superintending Engineers doubt as to the possibility of passing water down to the 89th mile.

2. It is recommended that renewal of sanction be ap-plied for and the Superintending Engineer directed to ~~--~~ submit an estimate for resluicing the channel as soon as -- practicable.

Chepak. 11 Dec 1896

W. Hudson

Chief Engineer for Irrigation

To,

The Joint Secretary to Govt: P.W.D. Irrigation Branch.

BACK PAPERS.

No.	Date.
705-I	17-8-96
572-I	16-7-96
280-I	21-3-91
279-I	21-3-91
579-I	16-9-90
743-I	17-12-88
657-I	30-10-88

FURTHER PAPERS.

No.	Date.

Cir No 4/12/12 Rolo 16/12

No. 219
21

Supg. Engineer's office, 4th Circle,
Coimbatore 12th November 1896.

From,

J. Hannan, Esq.,
Supg. Engineer, 4th Circle,

To,

The Chief Engineer
for Irrigation.

Sir,

With reference to G.O. No. 705 I of 17th August 1896 and your Memorandum No. 12-IV, dated 30th October 1896, I have the honor to inform you that the Estimate for the Kalingarayan Channel will have to be revised for the following reasons:-

(1) Defective designs and omissions,
(2) Insufficient rates.

The resulting excess will probably be about 7½ per cent on the sanctioned estimate.

2. I am of opinion that if the Bhavani project is to be sanctioned and I cannot at present see any reason why it should not, this project for extending the Kalingarayan Channel should be given up, as the equivalent to the area some 15,000 acres which it is proposed to irrigate can be more economically and effectively irrigated under the Bhavani reservoi

The

The Kalingarayen channel is already 56 miles long: it passes through very porous soil the sluices along it are to be numbered by hundreds. Experience shews the difficulty of getting water down to the ends of long channels of this description even in deltaic soil. The lands to be irrigated are light sandy and porous and for their efficient irrigation would require much more water than more suitable soil.

The proposed extension is 33 miles, so that the total length of channel would be 89 miles. Please to let me know if the estimate is to be revised. The revision will take about 6 months.

One of the three following courses might be adopted (a) The estimate as it stands might be resubmitted for sanction (b) It might be cancelled altogether in favour of the Bhavani project and a revised estimate submitted for sluicing the existing channel (c) The present estimate might be revised and resubmitted for sanction.

If proposal (a) is adopted, I would recommend that the extension of the channel should not be commenced until

until the existing channel has been entirely presluiced: when this is done we will have data to go on for deciding the question of the extension. The existing channel will have to be presluiced in any case. If proposal (b) is approved the estimate for the reservoir could be submitted in 6 months. On the whole I consider that perhaps proposal (a) had best be adopted. It will be time enough to submit a revised estimate when a decision is come to in favour of extending the channel.

I have the honor to be,
Sir,
Your most obedt. servant,

Hammond
Supg. Engineer, 4th Circle.

HH

CHIEF ENGINEER
FOR IRRIGATION.
No. 7666

P.W.D. 4.6
1150/96

No 10893 dy 23 December 1896

PUBLIC WORKS DEPARTMENT,
IRRIGATION BRANCH.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Dropped

UNDER date the

READ the following

Letter from the Supg: Engr: IV Circle, (H.E. No:219/ I, dated 12th Novr:
Note by the Chief Engr: for Irrigation (H.E. No:230-I, dated 11th Decr: 189

The recommendations of the Chief Engineer for Irrigation are approved.

A.S.H. 14.12.96

2. The following letter will be sent to the Government of -- India.

To,

The Chief Engineer for Irrgn:
" Supg: Engineer, Fourth Circle.
" Examiner P.W. Accounts.

P.W. No. 1090 dy 23 December 189

To,

The Secretary to the
Govt: of India.

Sir,

N.W.D.

A.S.H. 14.12.96

With reference to your -- letter, No:143 I, dated 20th July 1896, I am directed to explain that as the rules in paragraph-18, Chapter V of the P.W.D. Code, Vol II, contemplate the submis-sion, on or before the expiry of sanction to an irrigation & navigation

navigation work, of a statement--
showing the actual expenditure in-
-curred against the sanction and
the sum remaining available for
future expenditure and as no out-
-lay had been incurred on the --
sanction accorded to further im-
-provements and extension of the
Kalingarayan Channel, owing to funds
not having been sanctioned by the
Government of India, an extension
of sanction was not applied for.

2 I am also directed to
forwarded a copy of P.M.G. No: 1089
I, dated 23 Dec/96 from
which it will be observed that the
sanctioned estimates need modifi-
-cation, but in the meantime, I am
to request that the Government of
India may be pleased to extend
the sanction to the project for
a period of five years commencing
from the 31st January 1896.

Draw add
1089/96
13/11/96

W.H.

...ic Works (189) Department.

CURRENT No.

R 21-IV

From The Supg. Engineer
4th Circle.

No. 200/J.

Dated 14th October 1896.

Received 26-10-96

Enclosures Two.

Spare copies

SUBJECT.

Schedules of demands under Irrigation for 1897-98.

Forwards the —

F.R.I.

17/10

Checked
PD 21/10/96

Copy
16/10 -

17.10.

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.
I	12- W	30/10/96	
R	44 C.I	12 Nov 96	

Imperial – Major Works.

10932

Public Works Department

Budget Estimate

of

Revenue and Expenditure

under

Irrigation – Major Works

in the

Fourth Circle

for the year

1897-98.

Coimbatore,
14th October 1896.

Supg. Engineer, 4th Circle.

S.W.S.

Imperial

Major works.

G.O.

Detail of the Budget Estimate for Original Work
for the year 1897-98.

Executive Division	Locality	Sub Division of expenditure	Item No.	Detail of work.
				Capital Expenditure not charged to Revenue.
				49. Irrigation.
				Works not commenced.
Coimbatore	"	"	1	Improvements to Kalingarayan Channel

e circle

arges

rt II

nder Irrigation Major works in the South circle

ant / ate	Outlay: To end of 1895-96	Outlay: Probable during 1896-97.	Grant 1897-98	Item No.	Remarks and References.
					G.O. No 519 I, dated 16th September 1890.
000	"	"	100,000	1	G.O. No 279 I, dated 21st March 1891.

A.

Schedule of demands on Imperial Funds for expenditure on Major Works for 1897-98.

P.W.D. 1.3.1 / 1150/96

A

Schedule of Demands on Imperial Funds for Expenditure on Major Works for 1897-98.

Receipts collected in the P.W.D.				Names of Systems and Divisions.	works above Rs 2500 each in progress.		works above Rs 2500 each not commenced		works below Rs 2500 each.		Maintenance and Repairs		Tools and plant		Charges for land &c included in col. 6 to 13.		Remarks.
Actuals 1895-96.	Budget Estimate 1896-97.	Revised Estimate 1896-97.	Budget Estimate 1897-98.		1897-98	1896-97	1897-98	1896-97	1897-98	1896-97	1897-98	1896-97	1897-98	1896-97	1897-98	1896-97	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
				49. Capital Expenditure not charged to Revenue													
"	"	"	"	Kalingariyapa channel Project	"	"	100000	"	"	"	"	"	1500	"	"	"	
				Total	"	"	100000	"	"	"	"	"	1500	"	"	"	

S.D.O.

Supg. Engineer, 4th Circle.

OF
FOR IRRIGATION.
10 001.00
No.

P.W. 4-2
11561/96

Imperial Major works.

Fourth Circle

Charges

Part III

Detail of the Budget Estimate for maintenance and repairs of Irrigation Major Works in the 4 Circle of the Madras Presidency for the year 1897-98.

Executive Division		Estimate, 1897-98		Estimate, 1896-97.	
		Amount	Total	Amount	Total
	Irrigation				
	42. Major works				
	(Working expenses)				
Salem	Barur Project	1,500		1,500	
			1,500		1,500

Hammond

Supg. Engineer, 4 Circle.

P.W.S.

CHIEF ENGINEER
FOR IRRIGATION.
15 OCT 96
No. 21-III

P.W. E.3
1156/96

No. 200/I

Supg. Engineer's office, 4 Circle,
Coimbatore 14th October 1896.

From,

J. Harman, Esq.,
Supg. Engineer, 4 Circle,

To,

The Chief Engineer
for Irrigation.

Sir,

Encls: 2.

I have the honor to forward the under-mentioned Schedules of Demands for Irrigation works for the year 1897-98.

1. Schedule of demands on Imperial Funds for expenditure on major works.
1 — do — do — on Provincial Funds for expenditure on minor works.

I have the honor to be,
Sir,
Your most obedt. servant,

J. Harman
Supg. Engineer, 4 Circle

CHIEF ENGINEER
FOR IRRIGATION,
No. 21-IV

P.W. 4-4
1156/96

Memo No 72-IV of 30/10/96

Major Works budget estimate for 1897-98, IV Circle.

The undersigned has the honour to inform the Supdg Engr. IV Circle, that the following amounts will be included in the Schedule of demands on Imperial funds shortly to be submitted to the Govt. of India :—

49. Capital Expenditure not charged to Rev.

Kalisarogya Channel Project.

	Rs
Works . . .	100000
Establ . .	23,000
Tools & Plant .	1,500
Total	1,24,500

42. Major Works (Working Expenses)

Irrigation Repairs	1500
Establ . . .	345
Total	1845

2. The attention of the Supdg Engr. is drawn to Govt. No 7055 I, 17 Aug 96, & enclosure.

CHIEF ENGINEER
FOR IRRIGATION.
20 AUG. 96
No. 4659

IRRIGATION.

Government {1896} of Madras.

PUBLIC WORKS.

Recd. } 1896. *Enclosures*

Regd. *Spare copies*

G.O., No. 705 I., dated 17th August 1896.

AUGUST.

Kalingaroyen Channel

The Superintending Engineer, IV Circle, directed to report as soon as possible whether any modifications are now considered necessary in the sanctioned estimates for the improvement and extension of the —, Coimbatore division.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

From N. F. MACKENZIE, Esq., Under Secretary to the Government of India, Public Works Department (Civil Works—Irrigation), to the Secretary to the Government of Madras, Public Works Department, dated Simla, the 20th July 1896, No. 143/I.

I am directed to point out that as the sanction of the Secretary of State to the revised estimate for the improvement and extension of the Kalingaroyen channel, which was communicated to the Government of Madras in Public Works Department letter No. 36 I., dated the 7th March 1891, expired on the 30th January 1896, an application for an extension of that sanction for a further period of five years should have been submitted for the orders of the Government of India in accordance with the rules in paragraph 18, Chapter V of Public Works Department Code, volume II, and I am to request that this may now be done.

ORDER—No. 705 I., dated 17th August 1896.

It is observed that the ruling quoted by the Government of India contemplates the submission, on or before the expiry of sanction to an irrigation and navigation work, of a statement showing the actual expenditure incurred against the sanction and the sum remaining available for future expenditure. No outlay having been incurred on the sanction accorded to further improvements and extension of the Kalingaroyen channel, owing to funds not having been sanctioned by the Government of India, an extension of sanction was not applied for. Before, however, submitting the application now called for, the Superintending Engineer, IV Circle, will report, as soon as possible, whether, owing to the prevailing rates for labour and materials or other causes, any modifications are now considered necessary in the sanctioned estimates for the project.

(True Extract.)

(Signed) R. R. E. DRAKE-BROCKMAN, Col., R.E.,
Secretary to Government,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, IV Circle.
" Examiner, Public Works Accounts.

Exd. C. M. Brisson.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following papers:—

Telegram from the Inspector-General of Irrigation, to the Secretary to the Government of Madras, Public Works Department, Irrigation Branch, dated Simla, 13th May 1896.

If sufficient money could be provided what amount could you spend from 49. on New works and Open Canal Capital including any proposals in Cauvery delta during next three years? Wire details by canals.

Telegram from the Inspector-General of Irrigation, dated 8th June 1896.
" to " " " " 17th " "
" from " " " " 18th " "
" from " " " " 4th July "

No. 136 I.

Submitted to Government. The requirements of the Superintending Engineers concerned during the next three years under "49. Capital expenditure not charged to Revenue" are shown below:—

	Rs.
Gódávari delta	4,45,000
Kistna "	10,67,000
Pennér anicut	33,000
Sangam "	28,000
Cauvery delta (including Trichinopoly portion)	10,30,000
Periyár project	2,00,000
Srívaikuntam anicut	16,000
Kalingaroyen channel	3,00,000
Total ...	31,19,000

2. In his letter No. 147 G.L., dated 26th June 1896, the Superintending Engineer, II Circle, stated that the amounts required for the Pennér and Sangam anicut systems under Open Capital account will be reported on receipt of information from the Executive Engineer, Nellore division. These amounts were reported only on the 4th instant in the Superintending Engineer's No. 158 G.L.

(Signed) R. R. E. DRAKE-BROCKMAN, Col., R.E.,
Chief Engineer for Irrigation.

11th July 1896.

No. $\frac{592}{A}$ I., 16TH JULY 1896.

ORDER—No. $\frac{592}{A}$ I., dated 16th July 1896.

The forecast of the expenditure proposed to be incurred during the next th
years under "49. Capital expenditure not charged to Revenue" is approved.

2. Ordered that the following deferred telegram be sent:—

To the Inspector-General of Irrigation, Simla.

Your telegram, 18th ultimo. In modification of my telegram 17th idem, next three ye
requirements under 49. are as follows:—

	Rs.
Gódávari	4,45,000
Kistna	10,67,000
Pennér	33,000
Sangam	28,000
Cauvery	10,30,000
Periyár	2,00,000
Srivaikuntam	16,000
Kalingaroyen	3,00,000
Total ...	31,19,000

(True Extract.)

(Signed) *R. R. E. DRAKE-BROCKMAN, Colonel, R.E.,*
Secretary to Govt., P.W.D.,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineers, I, II, IV, V, VI Circles.
" the Superintending Engineer, Special Duty, Cauvery Completion Estimates.
" the Examiner, Public Works Accounts.

Exd. T. K. Narayana Aiyangar.
Spare Copies

FOR IRRIGATION.
29 JUL.96
No. 2107

IRRIGATION.
ACCOUNT.

Govt. of {1896} Madras.

PUBLIC WORKS.

Dated July, 16*th*.

Recd. *Encl.*

G.O. No. 592/A I., 16th July 1896.

JULY.

Expenditure

The forecast of the — proposed to be incurred during the next three years under "49. Capital expenditure not charged to Revenue," approved; and a telegram intimating the figures, ordered to be sent to the Inspector-General of Irrigation, Simla.

IRRIGATION.

Govt. of {1891} Madras.

PUBLIC WORKS.

Dated March, 21*st*.

Recd. *Encl.*

21st Mar. 1891, No. 280 I.

MARCH.

Kalingaroyen Channel, Coimbatore District

The Government of India requested to return the portfolio of the maps and plans of the — project.

PUBLIC WORKS DEPARTMENT.

Irrigation.

Letter—from

G. T. WALCH, Esq.,
Joint Secretary to the Government of Madras,
Public Works Department,
Irrigation Branch,

To

The SECRETARY to the GOVERNMENT of INDIA,
Public Works Department.

Sir,

In acknowledging the receipt of your letter No. 36 I., dated 7th March 1891, communicating the sanction of the Secretary of State to the improvement and extension of the Kalingaroyen channel in the Coimbatore district, I am directed to request an early return of the portfolio of the maps and plans of the project forwarded with my letter No. 520 I., dated 16th September 1890.

I have the honor to be,
Sir,
Your most obedient servant,

(Signed) G. T. WALCH,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

Fort St. George,
21st March 1891.

Exd. A. D. Xavier.
Spare Copies

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

Read—the following paper:—

From C. VINCENT, Esq., Under-Secretary to the Government of India, Public Works Department (Civil Works—Irrigation), to the Secretary to the Government of Madras, Public Works Department, dated Calcutta, 7th March 1891, No. 36 I.

In continuation of Public Works Department letter No. 202 I., dated the 15th December 1890, I am directed to forward, for information, the accompanying copy of a despatch No. 3 P.W., dated the 29th January 1891, from the Secretary of State for India, communicating sanction to the improvement and extension of the Kalingaroyen channel in the Coimbatore district at a total estimated cost of Rs. 8,71,000, of which Rs. 8,25,000 are for direct and Rs. 46,000 for indirect charges.

2. The sanction accorded by the Secretary of State has been registered in this office as No. 2 I. of 1890-91.

Enclosure.

Despatch from the Right Honorable Her Majesty's Secretary of State for India, to His Excellency the Most Honorable the Governor-General of India in Council, dated India Office, London, 29th January 1891, No. 3 (Public Works).

I have considered in council the scheme submitted with your Public Works letter No. 75, dated 10th December 1890, for the improvement and extension of the Kalingaroyen channel in the Coimbatore district of the Madras Presidency at a total cost of Rs. 8,71,000 for direct and indirect capital expenditure, which it is proposed to charge against Loan funds.

2. The need for the improvement of the Kalingaroyen channel has long been recognized and the expectation that the revenue derived from the scheme will be sufficient to allow its inclusion in the class of works constructed out of borrowed funds appears to me well founded. I accordingly sanction Your Excellency's proposals.

Order—dated 21st March 1891, No. 279 I., Public Works.

Communicated to the officers concerned for information.

2. The Superintending Engineer, IV Circle, will report, at an early date, the amount required for expenditure next year on improving and extending the Kalingaroyen channel in the Coimbatore district.

3. This sanction has been registered as No. 168 I. of 1890-91.

4. The following letter will be sent to the Government of India.

(Here enter No. 280 I., dated 21st March 1891.)

(True Extract.)

(Signed) G. T. WALCH,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, IV Circle.
" Examiner, Public Works Accounts.
" Revenue Department.

Exd. A. D. Xavier.
Spare Copies

330 11

IRRIGATION.

Govt. of {1891} Madras.

PUBLIC WORKS.

Dated March, 21st.

Recd. *Encl.*

G.O., 21st Mar. 1891, No. 279 I.

MARCH.

Kalingaroyen Channel, Coimbatore District

Letter from the Government of India communicating sanction of the Secretary of State to the improvement and extension of the —, communicated to officers concerned.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

No. 189 I.

Note by the Acting Chief Engineer for Irrigation.

With reference to the observations contained in letter No. 185 I., dated 15th October 1888, from the Under-Secretary to Government of India, Public Works Department, on the Kalingaroyen channel improvement and extension project, it was thought that the index map and sections forwarded would, together with the detailed report of the Executive Engineer, have given a clear general idea of what was intended, and that this would have been sufficient (see para. 1514 of the Madras Public Works Code); but, as it appears that more is required, the additional plans and documents are now sent—see the appended list of all accompaniments.

2. The statement referred to in para. 3 of the letter under notice was certainly not strictly accurate; it should have been to the effect that the channel for the greater part of its length is to have a bedfall of nearly 1 foot per mile.

3. The explanation of the matter which para. 4 deals with and which has not been understood is this: the existing channel is in many places far too wide; the estimate received from the Superintending Engineer provided for filling in with earth at such places to reduce the width to the intended section; this was not approved, and instead it was decided that the channel, where much too wide, should be brought gradually to the proper section by planting it up with the grass known as "nanul" or "Lanka grass," which is, in this Presidency, extensively used for training rivers.

4. The regrading of the old channel will be carried out in accordance with the remarks made in para. 5, and the longitudinal section is altered accordingly where necessary; the alteration reduces the total estimate by Rs. 14,000 (Rs. 11,000 on earthwork of improvements, Rs. 3,000 on earthwork of extension), making the total Rs. 9,34,000 instead of Rs. 9,48,000. In all cases, except that of the railway bridge in the 15th mile, the floors of the bridges will be lowered to that of the sole of the channel.

5. As regards the heights of the top of the proposed banks above F.S.L. in the channel, the left bank for the greater part of its length is not only the channel bank, but also a river flood bank, and the height and width proposed are considered necessary to guard against floods breaking into the channel and to provide a bridle-path for inspection purposes. The right bank may, as suggested, be reduced in height, and the estimate is now altered reducing it to only $3\frac{1}{2}$ feet above full supply level where the amount of earth required for "embankments" is in excess of that given by the "cutting."

6. No criticism was offered on the design received, and to some extent described in para. 24 of the Executive Engineer's report for the aqueduct over the Nóyil river, because it was not approved, and it was decided that the work might "be built lower down the river than the site proposed so as to allow of free waterway being provided;" in the design sent in, the springing of the arches is only 1'·75 above the true bed of the river, and the floor under them is sunk to 6'·25 below that bed; the work is, in fact, treated as an inverted syphon; this is considered unwise, but it is useless to go into detail criticisms of the design which is disapproved of *in toto*. A site will be selected farther down the river where waterway can be obtained without

putting the work down in a hole; but, as said in the note No. 86 I., dated 28th May 1888, this modification "can be carried out without any material increase to the estimates as submitted;" indeed, it is believed that, as the length of channel will be shortened and possibly the necessity for some of the proposed minor masonry works done away with, the modification will result in a saving, and therefore, as said in the note already quoted, "it has not been thought desirable to defer the submission of the project to admit of the revision which may be done afterwards."

7. As regards the disposal of cross drainage, the tabular statements herewith give the areas of the various basins and the anticipated flood discharges. It is not possible within reasonable cost to take the flood waters either over or under the channel at the places where inlets and outlets have been provided, and it would be useless providing "regulators" across the channel at the places unless establishments were provided to work them; these establishments would be expensive and would only very seldom be of any use, for the rainfall of the part of the country traversed is small and floods in the drainages are of rare occurrence. The arrangements proposed are admittedly rough and would undoubtedly necessitate occasional considerable clearance of silt brought in by the drainages, but they are such as in many places exist under somewhat similar conditions, and are there considered cheaper in the long run than the provision of expensive sub or super-passages or regulators with establishments which cannot be effectually supervised and are idle for, say, $\frac{19}{20}$ths of their time. It must be remembered that the channel is not intended to be navigable.

8. Tracings of the pipe sluices, referred to in para. 16 of the Executive Engineer's report, and para. 4 of the note of Chief Engineer for Irrigation, are forwarded as directed.

CHEPÂK,
11th December 1888.

(Signed) G. T. WALCH,
Ag. Chief Engineer for Irrigation.

To the Acting Joint Secretary to Government,
Public Works Department, Irrigation Branch.

List of Plans, &c., accompanying this note.

Index map, 2 sheets.
Longitudinal and cross sections (condensed), 2 sheets (numbered 99 and 39).
1 Guard file containing 36 plans (25 improvements, 11 extension).
3 Plans (4 sheets), pipe sluices.
1 Specification—Target's pipe sluice.
2 Tabular statements.

Note.—The abstract estimate will be found in Proceedings of Madras Government, No. 332 I., of 8th June 1888, but is modified to the extent shown in para. 4 of this note.

ORDER—dated 17th December 1888, No. 743 I., Public Works.

Ordered that a copy of these Proceedings be forwarded to the Government of India with reference to their letter No. 185 I., dated 15th October 1888.

(Here enter No. 744 I., dated 17th December 1888.)

(True Extract.)

(Signed) G. T. WALCH,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, IV Circle.
" Examiner, Public Works Accounts.
" Revenue Department.

Exd. J. Henricus.
Spare Copies

CHIEF ENGINEER
No. 24 11
16 JAN 89
ACCOUNTANT.

IRRIGATION.

Govt. of {1888} Madras.

PUBLIC WORKS.

Dated December, 17th.

Recd. *Encl.*

G.O., 17th Dec. 1888, No. 743 I.

DECEMBER.

Kalingaroyen Channel

Note by the Acting Chief Engineer for Irrigation on remarks of the Government of India on the plans and estimates for improving and extending the —, ordered to be forwarded to the Government of India.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

READ—the following papers:—

Proceedings of Government, Public Works Department, dated 8th June 1888, No. 332 I.
" " " 30th Oct. " " 651 I.
" " " 17th Dec. " " 743 I.
Proceedings of Government, Public Works Department, dated 25th February 1889, Nos. 94 and 95 I.
Proceedings of Government, Public Works Department, dated 1st March 1889, No. 107 I.
Memorandum to Superintending Engineer, IV Circle, dated 24th June 1889, No. IV/12 C.I.
Endorsement from " IV " " 3rd Aug. " " 81 E.I.
Memorandum to " IV " " 10th " " " IV/15 C.I.
Letter from Superintending Engineer, IV Circle, and enclosure, dated 31st October 1889, No. 121 E.I.
Memorandum to Superintending Engineer, IV Circle, dated 26th December 1889, No. IV/26 C.I.

From J. W. MARTIN, Esq., Executive Engineer, Coimbatore Division, to the Superintending Engineer, IV Circle, dated Coimbatore, 16th February 1890, No. 758.

Adverting to your endorsement No. 34 C.I., dated 16th January 1890, on memo. No. IV/26 C.I., dated 26th December 1889, from the Chief Engineer for Irrigation, in the matter of design for aqueduct over Nóyil river for extending the Kalingaroyen channel, I have the honor to forward a plan and estimate, amounting to Rs. 26,970, prepared in accordance with the instructions of the Chief Engineer.

2. In regard to the waterway provided for the passage of the water of the Nóyil in comparison with the waterway of the South Indian Railway bridge over the river, the bridge is about $3\frac{1}{4}$ miles below the site selected for the aqueduct. It consists of six openings of 50-feet span each. The total waterway from bed of river to bottom of girders is 3,836·00 square feet, and to the level of the highest recorded flood is 2,513·00 square feet—*vide* the accompanying plan showing the piers and the line of the bottom of the girders. On the other hand the waterway provided for the aqueduct from bed of river to springing line is 3,360 square feet, and to flood level 2,977 square feet. There are no important drainages falling into the Nóyil between the site selected for aqueduct and the railway bridge, and the bridge itself is not provided with masonry flooring between the piers.

3. With regard to finding the F.S.L. of the Nóyil from observations, the flood level shown on the design was ascertained from inspecting the appearance of the banks, and besides this, I am sending cross section of the river taken at every quarter of a mile for a mile and a quarter above and below; the site for the aqueduct with the F.L., ascertained from observations, shown on each cross section, and the area of waterway from bed to F.L. is also shown. The average waterway of the ten cross sections, including cross section at site for aqueduct, is 3,415·64 square feet against 3,360 square feet, the waterway to springing line provided in the design.

4. From what I have stated it will be noticed, (1) that the difference between the total waterway of railway bridge and waterway to springing line of aqueduct is (3,836—3,360) = 476 square feet; (2) between waterway of aqueduct to flood level, and waterway of railway bridge to highest recorded flood level is (2,977—2,513) = 464 square feet; and (3) between the average waterway to flood level of ten cross sections of the river and waterway of aqueduct to springing line is (3,415·64—3,360·00) = 55·64 square feet.

5. Again there is the anicut across the Nóyil just below the railway which affords information about flood discharges. Its length is 327 feet and the level of the crest is 407·91. There are two flood marks on the upper wings, viz., 414·19 and 414·42, but these indicate the floods in Cauvery on 10th October 1887 and 22nd July 1882, respectively, so they need not be considered any further. There is, however, a padugai monigar now employed named Ponnusawmy Pillai who states that, on about the end of October 1887, and after the flood in Cauvery of 10th October 1887 subsided below the crest of the anicut, a high flood came down the Nóyil river, and that he himself marked on two trees above the anicut the height of that flood. The marks are still visible and the level is 415·92. This is also the flood recorded on the railway bridge. Taking the information furnished by the monigar as correct, the discharge over the anicut was 24,796·41 cubic feet per second, arrived at as follows:—

Length of anicut 327 feet.
Depth on anicut = 415·92—407·91 = 8·00 feet.
$D = 327 (\frac{2}{3} \times 8 \times \cdot628 \times 8 \sqrt{8})$
$= 327 (\frac{2}{3} \times 8 \times \cdot628 \times 8 \times 2\cdot83) = 24,796\cdot41$ cubic feet per second. This calculation does not take into account velocity of approach, but it gives a fair idea of what the discharge was approximately, and agrees fairly with calculated discharge, viz., 21,971·37 shown on plan for aqueduct.

6. As the difference in each case mentioned in para. 4 is not much, and as the calculated discharge of the river shown on plan, viz., 21·971·37 cubic feet per second agrees fairly with what was probably the discharge over the anicut at the time referred to, I think the waterway proposed for the aqueduct is ample, but not excessive, and that it is not desirable to reduce it.

7. In regard to the estimate, it provides for excavating to the rock level the soil in bed of river at the site for aqueduct, allowing a slope of 4 to 1 on each side, for the soil, for the most part, is sand, and a rate of Rs. 5 per 1,000 cubic feet is allowed for excavating and filling in, which, taking into consideration that probably the soil will be very wet while being removed, is not excessive. For baling Rs. 2,000 are allowed, but this may be exceeded, if there should be much water or powerful springs in the river.

No. 23 E.I.

Forwarded to the Chief Engineer for Irrigation with reference to his memo. No. IV/26 C.I. of 26th December 1889.

2. The undersigned considers that the waterway provided for the aqueduct as compared with that of the South Indian Railway bridge over the river about 3¼ miles below the proposed site for the aqueduct is ample and not excessive.

3. The omission of the wells and floor in the plan under reference and the revision of design, &c., already made has resulted in a saving of Rs. 47,060 which will materially increase the anticipated return from the project, viz., from 6·11 to 6·45 per cent. on direct charges or from 5·8 to 6·1 per cent. on direct and indirect charges—*vide* G.O., No. 332 I., of 8th June 1888.

Mangalore,
26th February 1890.

(Signed) D. McN. CAMPBELL, Major, R.E.,
Superintending Engineer, IV Circle.

Memorandum to the Superintending Engineer, IV Circle, dated 14th April 1890, No. IV/4 C.I.

Kalingaroyen channel extension—Aqueduct over the Nóyil.

With reference to No. 23 E.I., dated 26th February 1890, from the Superintending Engineer, IV Circle, the undersigned has the honor to say that, subject to the remarks in para. 3, he approves generally of the design for the aqueduct submitted therewith with the following modifications:—

(*a*) The concrete bases to some of the piers will not do and, excepting any necessary filling in of any inequalities of the rock at the places, the piers should be entirely of brick-work; the concrete bases to the wings as designed may be allowed provided they can be put into and fully fill foundation trenches dug for them.

(*b*) The wings and side walls should be coped with stone: it is believed that what is known as "burnt stone" very suitable for the purpose can be obtained at no very great expense not many miles from the site towards Karúr.

2. A careful specification will have to accompany the plan and estimate.

3. It appears that no borings have been taken in the true bed of the river and it is quite impossible that the design for such an important work can be passed without trustworthy information as to its foundations; borings are to be taken and the result shown as noted on the plan about the middle of the river and at each 40 feet on either side.

4. Provided the result of the borings does not necessitate any important change in the design, there will be no necessity to again send the plan and estimate for separate provisional approval; they will be incorporated with the general revised estimate for the whole improvement and extension of the channel called for in No. IV/12 C.I., dated 24th June 1889, which it is hoped the Superintending Engineer will get in a complete form ready for submission to the Government of India before the end of June at latest.

5. The proposal made in para. 4 of Mr. Martin's letter, No. 4056, dated 17th October 1889, with Superintending Engineer's No. 121 E.I., dated 31st October 1889, to allow the previous estimate below C.S. No. 77 to stand unaltered, is approved.

6. All the plans* and documents* received from the Superintending Engineer with the letter under reply are returned to him.

* There was no necessity to have sent them all for merely the consideration of the aqueduct plans.

(Signed) G. T. WALCH,
Chief Engineer for Irrigation.

From Major D. McNEIL CAMPBELL, R.E., Superintending Engineer, IV Circle, to the Chief Engineer for Irrigation, dated Coimbatore, 21st June 1890, No. 59 E.I.

I have the honor to resubmit the papers in connection with the Kalingaroyen channel extension duly revised with reference to your memo. No. IV/4 C.I. of 14th April 1890.

2. The revision has resulted in the reduction of the estimated cost of the project by Rs. 48,630; this will increase the return expected from the work to 6·46 per cent. on direct charges or 6·11 per cent. on direct and indirect charges.

3. I beg to forward letter No. 2605 of 6th instant, from the Executive Engineer, Coimbatore division, which accompanied the papers under reference.

Enclosure.

From G. B. LAMBERT, Esq., Executive Engineer, Coimbatore Division, to the Superintending Engineer, IV Circle, dated Coimbatore, 6th June 1890, No. 2605.

With reference to your endorsement No. 286 C I., dated 21st April 1890, on memo. No. IV/4 C.I. of 14th idem, from the Chief Engineer for Irrigation, returning design for aqueduct over the Nóyil river, and papers in connection with the Kalingaroyen channel extension, I have the honor to return all the enclosures duly revised as desired by him.

2. As regards the aqueduct, borings have been taken in the middle of the river and at each 40 feet on either side, and their results are noted in red as "actual line of rock" on the longitudinal section.

3. It will be observed from the above section that the actual line of rock now ascertained runs in some portions above the probable line of rock noted by Mr. Martin, and therefore no change in the design is necessary, except a slight reduction in the depth of foundations of five of the piers, and this has been allowed in the accompanying revised estimate.

4. The abutments and piers will be built entirely of brick-work and any irregularities in the rock will be filled in with concrete, the cost of which can be met from contingencies. Concrete bases have been allowed to the wings, and will fully fill the foundations trenches dug for them.

5. It will be noticed from the revised general abstract estimate for the Kalingaroyen channel extension that the total saving is Rs. 48,630 which will result by building the aqueduct over the Nóyil river at the new site, as detailed below :—

	Rs.	Rs.
Amount of estimate for making channel on old line from 3rd mile to C.S. No. 77	19,670	
Amount of original estimate for aqueduct No. 1	48,100	
Do. do. " 2, which will not now be required	10,450	
Amount of estimate for two foot bridges which will not now be rquired	1,520	
Amount of estimate for one masonry sluice and two pipe sluices which will not now be required	660	
		80,400
Amount of estimate for making channel on new line from 3rd mile to C.S. No. 77	4,170	
Amount of estimate for building aqueduct over Nóyil river at new site	27,600	
		31,770
Difference ...		48,630

6. All the papers connected with the project have been examined and necessary revised statements, &c., are substitued for those which were altered and found useless.

7. A specification report is now drawn up and attached to the revised estimate for the aqueduct over the Nóyil river.

8. The sheet of longitudinal and cross sections on the whole length of Kalingaroyen channel extension, plotted on reduced scale, is now replaced by a fresh sheet showing the full length of the channel extension on the new line of the proposed diversion.

EXTENSION.

Tabular Statement to accompany estimate for Irrigation Projects.

Distance from head.	Name of work.	Channel. Bed width.	Channel. Depth of water—full supply.	Channel. Depth of water—maximum.	Channel. Side slope.	Channel. Bed fall.	Discharge. Mean velocity.	Discharge. Discharge calculated.	Discharge. Discharge required.	Falls. Bays. Number.	Falls. Bays. Width.	Falls. Drop in bed.	Width of land occupied.	Cross Drainage. Area of drainage basin.	Cross Drainage. Calculated flood discharge.	Cross Drainage. Discharge provided for.	Bridges. Arches. Number.	Bridges. Arches. Span.	Bridges. Width of road-way.	Reduced level of bed.
MILE. FEET.		FEET.	FEET.	FEET.	1 IN.	1 IN.	FEET PER SECOND.	C. FEET PER SECOND.	C. FEET PER SECOND.	Number.	FEET.	FEET.	FEET.	SQUARE MILES.	C. FEET PER SECOND.	C. FEET PER SECOND.	Number.	FEET.	FEET.	FEET.
0 3,165	Bridge No. 1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	14	12	446·21
3 1,970	Aqueduct for Nóyil river No. 1	41	5	2	1	6"	1·5	348	340	..	..	..	..	..	..	..	16	20	..	444·61
1 870	Foot bridge No. 1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	9	6	441·84
1 3,714	Bridge No. 2	35	5	2	1	1	1·75	329	320	..	..	..	..	..	..	..	2	14	12	441·30
2 100	Aqueduct No. 2	..	..	..	..	..	..	..	..	..	..	..	..	3·5	807	807	6	6	..	440·98
2 860	Bridge No. 3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	14	12	440·85
3 0	Do. " 4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	14	12	440·00
4 2,250	Foot bridge No. 2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	13	6	438·58
4 5,080	Inlet and outlet No. 1	..	..	..	..	..	..	..	..	..	..	..	..	11	1,730	1,730	182½ ft. length.	..	..	438·05
5 3,510	Foot bridge No. 3	34	5	2	1	1	1·73	819	314	..	..	..	..	..	..	..	2	13	6	437·34
6 1,580	Do. " 4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	13	6	436·70
6 3,540	Do. " 5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	13	6	436·32
7 320	Railway bridge existing	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	435·94
7 970	Foot bridge No. 6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	13	6	435·82
7 4,470	Do. " 7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	13	6	435·15
8 5,150	Do. " 8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	12	6	434·02
9 1,420	Aqueduct No. 3	30	5	2	1	1	1·73	280	275	..	..	..	..	3½	807	807	2	6	..	433·72
10 4,970	Bridge No. 5	..	..	..	..	..	..	314	280	..	..	..	..	..	..	..	6	12	12	432·06
13 3,960	Inlet and outlet No. 2	30	5	2	1	1	1·73	280	264	..	..	..	..	8½	1,468	1,468	2	155 ft. length.	..	429·25
14 1,460	Foot bridge No. 9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	12	6	428·73
14 5,205	Do. " 10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	12	6	428·01
15 3,880	Bridge No. 6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	12	12	427·27
16 430	Foot bridge No. 11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	12	6	426·92
16 3,320	Do. " 12	..	..	..	..	..	..	..	..	..	..	..	..	10	1,625	1,625	2	12	6	426·37
17 110	Inlet and outlet No. 3	30	4½	2	1	1	1·67	257	241	..	..	..	..	..	..	..	171½ ft. length.	..	..	425·98
17 1,990	Bridge No. 7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	12	12	425·62
17 4,690	Foot bridge No. 13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	10	6	425·14
18 4,640	Do. " 14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	10	6	424·11
19 3,620	Bridge No. 8	28	4½	2	1	1	1·57	217	215	..	..	..	..	..	..	..	2	12	12	423·35
20 1,720	Aqueduct No. 4	..	..	..	..	..	..	216	216	..	..	..	..	..	..	..	..	..	..	422·68

N.B.—Zero of reduced levels to be Mean Sea Level (or otherwise as the case may be). Mile = 5,280 feet. Dimensions of channel given when change occurs.

Tabular Statement to accompany estimate for Irrigation Projects—*cont.*

Distance from head.	Name of work.	Channel.					Discharge.			Cross drainage.			Width of land occupied.	Falls.			Bridges.			Reduced level of bed.
		Bed width.	Depth of water—full supply.	Depth of water—maximum.	Side slope.	Bed fall.	Mean velocity.	Discharge calculated.	Discharge required.	Area of drainage basin.	Calculated flood discharge.	Discharge provided for.		Bays. Number.	Bays. Width.	Drop in bed.	Arches. Number.	Arches. Span.	Width of roadway.	
MILE. FEET.		FEET.	FEET.	FEET.	1 IN.	1 IN.	FEET PER SECOND.	C. FEET PER SECOND.	C. FEET PER SECOND.	SQUARE MILES.	C. FEET PER SECOND.	C. FEET PER SECOND.	FEET.		FEET.	FEET.		FEET.	FEET.	FEET.
20 3,690	Foot bridge No. 15									..	..	..	..	..	..	..				
21 2,360	Inlet and outlet No. 4									..	..	..	..	..	..	..				
21 0	Do. do.	28	4½	2	1	1	1·57	217	198	¾	134	134	..	..	..	..	2	10	6	422·29
21 3,615	Foot bridge No. 16									1½	460	460	..	..	..	..	15 feet length.	..	..	421·56
22 2,460	Do. ,, 17																			
23 617	Do. ,, 18																49 feet length.	..	..	..
23 4,380	Bridge No. 9	28	4	2	1	1	1·45	178	173	..	..	..	..	..	..	..	2	10	6	421·30
24 3,685	Foot bridge No. 19									..	..	..	..	..	..	..	2	10	6	420·53
25 3,705	Do. ,, 20	28	4	2	1	1	1·45	178	173	..	..	..	..	..	..	..	2	10	6	419·89
26 820	Do. ,, 21									..	..	..	..	..	..	..	2	12	12	419·19
27 1,450	Bridge No. 10									..	..	..	..	..	..	..	2	10	6	418·31
27 4,840	Inlet and outlet No. 6	24	4	2	1	1	1·4	148	137	..	..	..	..	..	..	..	2	10	6	417·30
28 2,020	Foot bridge No. 22									..	..	..	..	..	..	..	2	9	6	416·85
29 2,700	Do. ,, 23									¾	728	..	..	..	..	..	1	16	12	415·73
29 4,620	Inlet and outlet No. 7									..	..	..	..	..	..	..	77 feet length.	..	..	415·08
30 1,910	Foot bridge No. 24	12	3½	2	1	1	1·26	58	50	¾	134	..	..	..	..	..	2	9	6	414·61
																	1	12	6	413·49
																	15 feet length.	..	..	413·13
																	1	12	6	412·63

N.B.—Zero of reduced levels to be Mean Sea Level (or otherwise as the case may be). Mile = 5,280 feet. Dimensions of channel given when change occurs.

COIMBATORE,
6th June 1890.

(Signed). G. B. LAMBERT,
Executive Engineer.

IMPROVEMENTS.

TABULAR Statement to accompany estimate for Irrigation Projects.

Distance from head.	Name of work.	Channel.					Discharge.			Cross drainage.			Width of land occupied.	Falls.			Bridges.			Reduced level of bed.
		Bed width.	Depth of water—full supply.	Depth of water—maximum.	Side slope.	Bed fall.	Mean velocity.	Discharge calculated.	Discharge required.	Area of drainage basin.	Calculated flood discharge.	Discharge provided for.		Bays. Number.	Bays. Width.	Drop in bed.	Arches. Number.	Arches. Span.	Width of roadway.	
MILE. FEET.		FEET.	FEET.	FEET.	1 IN.	1 IN.	FEET PER SECOND.	C. FEET PER SECOND.	C. FEET PER SECOND.	SQUARE MILES.	C. FEET PER SECOND.	C. FEET PER SECOND.	FEET.		FEET.	FEET.		FEET.	FEET.	FEET.
0 1,150	Bridge No. 1							..		..	..	..	..	..	..	..	2	25	13½	532·48
0 2,740	Sand sluice No. 1							253		..	..	..	..	..	..	..	..	..	..	532·22
1 1,900	Do ,, 2	38	6	2·5	1	·93	1·85	293	520	..	..	..	..	..	..	..	..	..	..	531·39
2 1,650	Acqueduct ,, 1							529		5	1,314	..	..	..	..	..	..	..	..	..
3 2,235	Foot bridge ,, 1							..		..	..	..	..	..	..	..	4	10	8	529·46
5 2,970	Do. ,, 2									..	..	..	..	..	..	..	4	10	8	527·49
5 3,098	Surplus weir ,, 1									3	930	928	..	..	..	..	..	..	..	527·48
.. ..	Inlet ,, 1																			
7 1,118	Foot bridge ,, 3	53	5	2·5	1	·93	1·71	526	485	..	..	..	..	..	..	..	4	10	8	525·96
8 1,690	Surplus weir ,, 2									14	2,614	2,627	..	..	..	..	..	..	..	524·93
.. ..	Inlet ,, 2																			
9 580	Foot bridge ,, 4									..	..	..	..	..	..	..	4	10	8	524·17
11 349	Bridge ,, 2									..	..	..	..	..	..	..	2	22½	13½	522·37
11 4,983	Foot bridge ,, 5	52	5	2·5	1	·93	1·71	512	475	..	..	..	..	..	..	..	4	11	4	521·56
13 2,935	Do. ,, 6									..	..	..	..	..	..	..	4	10	7½	520·09
13 4,950	Acqueduct ,, 2						·93	3·15	450	48·5	4,634	3,850	..	..	..	..	..	..	..	519·64
.. ..	Drop ,, 1						..	..	..	..	..	..	..	..	..	..	..	..	..	518·99
																				Crest
14 4,950	Sand sluice ,, 3						..	..	..	..	..	..	..	..	..	..	..	..	..	518·93
14 990	Bridge ,, 3						..	..	..	..	..	..	..	..	..	..	5	16	..	518·74
14 1,650	Drop ,, 2						..	..	..	..	..	..	..	1	9	4·51	..	..	..	518·60
																				Crest
14 3,630	Do. ,, 3					1	1·8	500	450	..	..	..	..	1	9	4·87	..	..	..	514·09
		48	5	2·5	1															513·67
																				Crest
15 507	Sand sluice ,, 4						..	..	238	..	..	..	..	..	..	..	..	..	..	508·80
15 3,154	Do. ,, 5						..	..	415	..	..	..	..	..	..	..	..	..	..	508·40
16 ..	Foot bridge ,, 7						..	..	..	..	..	..	..	..	..	..	..	..	..	507·90
16 4,385	Do. ,, 8						..	..	..	..	..	..	..	..	..	..	4	10	8½	507·50
17 2,640	Do. ,, 9						..	..	..	..	..	..	..	..	..	..	3	10½	4½	506·68
																	1	9¼	6	506·00
18 2,540	Bridge ,, 4						..	..	..	..	..	..	..	..	..	..	3	13		
19 3,449	Foot bridge ,, 10						..	..	..	..	..	..	..	..	..	..	2	20	12	505·02
																	3	13	6	503·84

N.B.—Zero of reduced levels to be Mean Sea Level (or otherwise as the case may be). Mile = 5,280 feet. Demensions of channel given when change occurs.

Tabular Statement to accompany estimate for Irrigation Projects—*cont.*

Distance from head.	Name of work.	CHANNEL.					DISCHARGE.			CROSS DRAINAGE.			Width of land occupied.	FALLS.			BRIDGES.			Reduced level of bed.
		Bed width.	Depth of water—full supply.	Depth of water—maximum.	Side slope.	Bed fall.	Mean velocity.	Discharge calculated.	Discharge required.	Area of drainage basin.	Calculated flood discharge.	Discharge provided for.		Bays. Number.	Bays. Width.	Drop in bed.	Arches. Number.	Arches. Span.	Width of roadway.	
MILE. FEET.		FEET.	FEET.	FEET.	1 IN.	1 IN.	FEET PER SECOND.	C. FEET PER SECOND.	C. FEET PER SECOND.	SQUARE MILES.	C. FEET PER SECOND.	C. FEET PER SECOND.	FEET.		FEET.	FEET.		FEET.	FEET.	FEET.
20 1,686	Foot bridge No. 11																2	11		
20 2,789	Do. ,, 12																2	11½	8	503·18
21 1,993	Do. ,, 13																3	12	6	502·97
22 1,726	Do. ,, 14																3	12	6	502·12
23 990	Do. ,, 15																3	12	6	501·17
23 990	Drop No. 4	46	5	2·5	1	1	1·81	448	438								2	10		
23 2,310	Do. ,, 5																1	9	6	500·19
24 1,118	Surplus weir No. 3																			
..	Inlet No. 3																			
24 1,320	Drop ,, 6									10	2,090	2,090	1	10·5	2·5	..	..	..	..	497·70
24 3,625	Do. ,, 7												1	12	1·5	..	..	..	..	496·05
..	Foot bridge No. 16																			495·12
25 990	Drop No. 8												1	13·5	1	..	..	..	..	..
25 3,153	Do. ,, 9												1	10	2·68	..	..	..	..	494·25
..	Foot bridge No. 17																			491·12
26 2,310	Drop No. 10	45	5	2·5	1	1	1·81	439	425				1	10·5	2	1	24	9½	49·80	
27 1,674	Foot bridge No. 18												1	10	3·5	..	..	..	..	488·64
30 2,970	Do. ,, 19																			484·73
..	Drop No. 11												1	13	1	2	10½	3	488·23	
31 4,950	Foot bridge No. 20																			482·94
..	Drop No. 12															3	12	6½	482·14	
32 330	Do. ,, 13												1	10	2·5	..	..	..	..	478·76
32 3,960	Do. ,, 14																			476·28
33 3,685	Do. ,, 15	44·5	5	2·5	1	1	1·81	429	411				1	10	4	..	..	..	..	474·95
..	Foot bridge No. 21												1	10	3·5	..	..	..	..	470·93
33 4,024	Sand sluice ,, 6												1	13	1	..	..	..	..	467·31
33 4,228	Bridge No. 5												1	13	1	..	..	..	..	465·64
34 2,970	Foot bridge No. 22																			463·63
35 1,808	Bridge No. 6															3	9¼	8½	464·64	
35 2,008	Sand sluice No. 7																			463·62
38 3,147	Do. ,, 8	44	5	2·5	1	1	1·81	402	400							1	24	..	..	463·58
38 3,257	Foot bridge ,, 23							267								3	11	5½	462·82	
40 2,390	Sand sluice ,, 9	43	6	2·5	1	·5	1·46	405	396							2	15½	21½	462·04	
41 4,96	Foot bridge ,, 24							401									..	..	..	462·01
41 3,591	Do. ,, 25							214								4	6	9½	459·08	
																3	11	6	459·07	
																3	11	6	458·16	
																			457·83	
																			457·54	
42 3,330	Do. ,, 26	41	6	2·5	1	·5	1·45	392	380											
43 1,590	Bridge No. 7																			
43 3,760	Foot bridge No. 27																			
44 2,157	Do. ,, 28																			
45 ..	Aqueduct No. 3																			
45 3,734	Foot bridge No. 29						5·87	382	382	20	2,580	3,800					3	11	6	456·64
46 2,213	Do. ,, 30	41	5	2·5	1	1	1·77	385	380								2	6¾	14	456·73
47 710	Surplus weir ,, 4	40	4·5	2·5	1	1·5	2·06	381	378								2	5¾		
..	Inlet No 4																3	11	6	456·51
47 2,793	Foot bridge No. 31	39	5	2·5	1	1	1·77	367	367	20	2,580	2,580					3	11	6	456·18
49 4,620	Do. ,, 32																..	..	..	455·64
51 2,310	Bridge No. 8																3	11	6	455·18
53 2,310	Do. ,, 9	43	5	2·5	1	·5	1·28	337	340								3	10	6	454·26
53 4,770	Do. ,, 10																..	..	..	453·25
																	..	..	..	..
																	2	9½	6	452·86
																	2	9¾	5	450·51
																	5	6	4½	449·17
																	3	9	30	448·17
																	2	14	12	447·94

N.B.—Zero of reduced levels to be Mean Sea Level (or otherwise as the case may be). Mile = 5,280 feet. Dimensions of channel given when change occurs.

CALICUT,
22nd February 1890.

(Signed) H. S. TAYLOR,
Executive Engineer.

No. 124 I.

Note by the Chief Engineer for Irrigation.

With endorsement No. 333 I., dated 8th June 1888, on Proceedings of the Madras Government, No. 332 I., dated 8th June 1888, estimates for improving and extending the Kalingaroyen channel, Coimbatore division, were sent for sanction to the Government of India which communicated certain remarks and observations on the project with its letter No. 185 I., dated 15th October 1888, printed with Proceedings of the Madras Government, No. 651 I., dated 30th October 1888.

2. Those remarks and observations were dealt with in the note by the Chief Engineer for Irrigation printed with Proceedings of the Madras Government, No. 743 I., dated 17th December 1888, and forwarded to the Government of India with endorsement No. 744 I. of the same date, on receipt of which the Government of India telegraphed that approved plans of the proposed Noyil aqueduct in place of those not approved (see para. 6 of the note by the Chief Engineer for Irrigation last referred to) were absolutely necessary before the project could be dealt with, and on the 7th March * all the plans and estimates were returned.

* See letter No. 53 I., from the Secretary to the Government of India, Public Works Department.

3. The Superintending Engineer, IV Circle, was then directed to select a new site for the proposed aqueduct in accordance with certain instructions and to submit plans for the work, and this he did with his No. 121 E.I., dated 31st October 1889, but it was considered that certain modifications were necessary and that more definite information as to the level at which rock would be met with for the foundations was required than "the probable line of rock" shown on the design. This having been obtained by borings, the revised plan for the work and the revised estimate for the whole project has now, with his letter No. 59 E.I., dated 21st June 1890, been submitted by the Superintending Engineer, and it is recommended for sanction.

4. The entries in the forecast statement No. III (Estimate of growth of Irrigation, &c.,) remain the same as when the project was originally sent in, but those in Nos. 1, 2 and 4 are altered to agree with the revised estimate now sent.

5. The general description of the project is the same as that given in the "Report" printed with Proceedings of the Madras Government, No. 332 I., dated 8th June 1888, modified as regards paras. 22 and 24 to 26 to the extent necessary to suit the altered position for the Noyil aqueduct which is 5,710 feet lower down the river than that before proposed; and the necessary revision of the paragraphs referred to is appended.

OOTACAMUND,
21st August 1890.

(Signed) G. T. WALCH,
Chief Engineer for Irrigation.

PARAGRAPHS to be substituted for those in Report printed with Proceedings of the Madras Government, No. 332 I., dated 8th June 1888.

For para. 22.—The "*Extension*" follows generally the contour of the country, the line being consequently somewhat tortuous, but straight cuts have been provided for where practicable without heavy cutting. The bedfall is an uniform one of 1 foot per mile. The average calculated velocity is 1·5 feet per second. The dimensions of the channel, which passes through hard soil, have been calculated by Kutter's formula to carry a discharge of 3 cubic yards per acre per hour. A table of the dimensions with the discharge at various points is given in appendix F.

* * * * *

For paras. 24, 25 *and* 26.—In the 4th mile of the extension the canal will be carried across the Noyil river by an aqueduct of 16 spans of 20 feet each. The maximum discharge of the river calculated from cross sections by Kutter's furmula is 21,971 cubic feet per second, and this agrees very nearly with the calculated discharge over an anicut on the river not far away. The actual waterway of the river to its maximum flood level at the site of the aqueduct is 2,977 square feet; the total waterway of the aqueduct to the springing of the arches is 3,360 square feet.

The river bed consists of from 4 feet to 13 feet of sand over rock, on which the foundations of the work will be laid. The trough of the aqueduct will have a mean breadth of 12 feet 5 inches and a slope of 1 in 800 which will with the full depth intended, viz., 5 feet, pass the maximum quantity required for the 15,000 acres to be irrigated below the work, at the rate mentioned in para. 22.

(Signed) G. T. WALCH,
Chief Engineer for Irrigation.

ENCLOSURES.

COIMBATORE DISTRICT, ERODE TALUK.

Kalingaroyen Channel Extension Project.

No. I.—SUMMARY of the actual and estimated direct charges on Capital Account.

Years.			Works.			Establishment.	Tools and plant.	Total.
			Land compensation.	Execution of works.	Total.			
1			2	3	4	5	6	7
			RS.	RS.	RS.	RS.	RS.	RS.
Actuals ..	Previous years	..	..	2,042	2,042	20,917	59	23,018
Estimate ..	First year	..	10,000	1,25,000	1,35,000	28,750	1,232	1,64,982
	Second year	..	7,542	2,27,000	2,34,542	52,210	3,248	2,90,000
	Third ,,	..	..	1,86,958	1,86,958	43,000	2,042	2,32,000
	Fourth ,,	..	..	91,458	91,458	21,036	2,506	1,15,000
	Total	..	17,542	6,32,458	6,50,000	1,65,913	9,087	8,25,000

No. II.—SUMMARY of the actual and estimated indirect charges on Capital Account (excluding interest).

Years.			Capitalised abatement of Land Revenue.	Leave and Pension allowances.	Total.
1			2	3	4
			RS.	RS.	RS.
Actuals ..	Previous years	.. ..	..	2,928	2,928
Estimate ..	First year	.. ..	12,500	4,025	16,525
	Second year	.. ..	10,272	7,309	17,581
	Third ,,	.. ..	..	6,020	6,020
	Fourth ,,	.. ..	..	2,946	2,946
	Total	..	22,772	23,228	46,000

23rd August 1890.

(Signed) H. E. CLERK,
for Chief Engineer for Irrigation.

No. III.—ESTIMATE of the growth of Irrigation and Revenue Receipts and charges.

Years.	Irrigated area at end of year including old irrigation.	Revenue Receipts and Charges.					
		Gross revenue due to the project.			Charges both direct and indirect at 8 annas an acre.	Net revenue.	
		Direct receipts.	Indirect revenue excluding collection charges at 5 per cent.	Total.		Including indirect revenue.	Excluding indirect revenue.
1	2	3	4	5	6	7	8
	ACRES.	RS.	RS.	RS.	RS.	RS.	
Fifth year ..	13,000	..	15,500	15,500	6,500	9,000	As all irrigation revenue is collected in the Revenue Department, it is shown under "Indirect Revenue." If it is excluded there will be no net revenue.
Sixth ,, ..	15,000	..	26,000	26,000	7,500	18,500	
Eighth ,, ..	17,000	..	36,500	36,500	8,500	28,000	
Ninth ,, ..	20,000	..	51,500	51,500	10,000	41,500	
Tenth ,, ..	22,000	..	61,500	61,500	11,000	50,500	
Eleventh ,, ..	23,000	..	66,500	66,500	11,500	55,000	
Twelth ,, ..	23,000	..	66,500	66,500	11,500	55,000	
Thirteenth ,, ..	23,000	..	66,500	66,500	11,500	55,000	
Fourteenth ,, ..	23,000	..	66,500	66,500	11,500	55,000	
Fifteenth ,, ..	23,000	..	66,500	66,500	11,500	55,000	
Total ..	..	..	5,90,000	5,90,000	1,12,500	4,77,500	

26th April 1888.

(Signed) J. H. A. TREMENHEERE,
Acting Collector.

(Signed) H. R. MEAD, Colonel., R.E.,
Chief Engineer for Irrigation.

N.B.—The estimated ultimate net revenue will give a return of 6·66 per cent. on the estimate of direct charges or 6·31 per cent. on the total estimate including indirect charges without taking into account the probable sale-proceeds of 2,500 acres of waste land which will, it is anticipated, fetch Rs. 40 an acre.

23rd August 1890.

(Signed) H. E. CLERK,
for Chief Engineer for Irrigation.

No. IV.—ESTIMATE of net financial results for ten years after the probable date of completion of the preject.

Years.	Direct capital outlay during the year.	Direct capital outlay to end of the year.	Simple interest at 4 per cent. on capital outlay to end of the previous year and at 2 per cent. on the outlay of the year.	Net revenue including indirect revenue, *vide* column 7 of table III.	Simple interest less net revenue.	Net revenue less simple interest.
1	2	3	4	5	6	7
	RS.	RS.	RS.	RS.	RS.	RS.
First year	1,64,982	1,88,000	4,220	..	4,220	..
Second ,, ...	2,90,000	4,78,000	13,320	..	13,320	..
Third ,, ...	2,32,000	7,10,000	23,760	..	23,760	..
Fourth ,, ...	1,15,000	8,25,000	30,700	..	30,700	..
Fifth ,, ...	..	8,25,000	33,000	9,000	24,000	..
Sixth ,, ...	..	8,25,000	33,000	18,500	14,500	..
Seventh ,, ...	..	8,25,000	33,000	28,000	5,000	8,500
Eighth ,, ...	..	8,25,000	33,000	41,500	..	17,500
Ninth ,, ...	..	8,25,000	33,000	50,500	..	22,000
Tenth ,, ...	..	8,25,000	33,000	55,000	..	22,000
Eleventh ,, ...	..	8,25,000	33,000	55,000	..	22,000
Twelth ,, ...	..	8,25,000	33,000	55,000	..	22,000
Thirteenth ,, ...	..	8,25,000	33,000	55,000	..	22,000
Fourteenth ,, ...	..	8,25,000	33,000	55,000	..	22,000
Fifteenth ,, ...	..	8,25,000	33,000	55,000	..	22,000
Total ..	..	8,25,000	33,000	55,000	..	22,000
Deduct interest charges unpaid.	..	..	4,35,000	4,77,500	1,15,500	1,58,000
Net surplus at end of 15th year.	..	..	..	..	..	1,15,500
			..	..	..	42,500

23rd August 1890.

H. E. CLERK,
for Chief Engineer for Irrigation.

CLASSIFIED Abstract Estimate for improving and extending the Kalingaroyen Channel.

No.	Mileage.	Sub-head.	Name of work.	Amount of estimate.	Total.
1	2	3	4	5	6
	MILE. FT.		(2) MAIN CANALS AND BRANCHES. *Improving the Channel from the head to the vicinity of the Noyil River.*	RS.	RS.
1	....	A. Preliminary expenses.	Expenditure incurred on investigation ..	2,042	2,042
2	14 1,650	E. Falls and Weirs ..	Drop No. 2	1,330	
3	14 3,630	Do. ..	Do. ,, 3	1,330	
4	23 2,310	Do. ..	Do. ,, 5	1,156	
5	24 1,320	Do. ..	Do. ,, 6	1,085	
6	25 990	Do. ..	Do. ,, 8	1,122	
7	26 2,310	Do. ..	Do. ,, 10	1,085	
8	30 2,970	Do. ..	Do. ,, 11 foot-bridge	1,298	
9	31 4,950	Do. ..	Do. ,, 12 do.	1,336	
10	32 330	Do. ..	Do. ,, 13	1,330	
11	32 3,960	Do. ..	Do. ,, 14	1,085	12,157
12	13 4,950	F. River and Hill Torrent works	Aqueduct No. 2, improvements	1,340	
13	45 0	Do. ..	Do. ,, 3 do.	4,190	
14	5 3,098	Do. ..	Surplus weir No. 1	2,550	
15	8 1,690	Do. ..	Do. ,, 2	5,780	
16	24 1,118	Do. ..	Do. ,, 3	4,767	
17	47 710	Do. ..	Do. ,, 4	5,696	
18	5 3,098	Do. ..	Inlet No. 1	220	
19	8 1,690	Do. ..	Do. ,, 2	600	
20	24 1,118	Do. ..	Do. ,, 3	448	
21	47 710	Do. ..	Do. ,, 4	542	26,133
22	11 349	G. Bridges	Bridge No. 2, improvements	109	
23	18 2,540	Do.	Do. ,, 4 do.	1,133	
24	35 1,808	Do.	Do. ,, 6 do.	925	
25	43 1,590	Do.	Do. ,, 7 do.	366	
26	51 2,310	Do.	Do. ,, 8 do.	910	
27	53 2,310	Do.	Do. ,, 9 do.	1,764	
28	53 4,770	Do.	Do. ,, 10 do.	1,218	
29	3 2,235	Do.	Foot-bridge No. 1	208	
30	7 1,118	Do.	Do. ,, 3	208	
31	9 580	Do.	Do. ,, 4	208	
32	16 4,385	Do.	Do. ,, 8	200	
33	17 2,640	Do.	Do. ,, 9	800	
34	19 3,449	Do.	Do. ,, 10	800	
35	20 1,686	Do.	Do. ,, 11	160	
36	20 2,789	Do.	Do. ,, 12	800	
37	21 1,993	Do.	Do. ,, 13	800	
38	22 1,726	Do.	Do. ,, 14	800	
39	23 990	Do.	Do. ,, 15	950	
40	24 3,625	Do.	Do. ,, 16	175	
41	25 3,153	Do.	Do. ,, 17	862	
42	33 3,985	Do.	Do. ,, 21	456	
43	34 2,970	Do.	Do. ,, 22	420	
44	38 3,257	Do.	Do. ,, 23	350	
45	41 496	Do.	Do. ,, 24	774	
46	41 3,591	Do.	Do. ,, 25	774	
47	42 3,330	Do.	Do. ,, 26	774	
48	43 3,760	Do.	Do. ,, 27	774	
49	44 2,157	Do.	Do. ,, 28	774	
50	45 3,734	Do.	Do. ,, 29	736	
51	46 2,213	Do.	Do. ,, 30	320	
52	47 2,793	Do.	Do. ,, 31	210	
53	49 4,620	Do.	Do. ,, 32	1,60,800	20,532
54	..	L. Earthwork	Channel improvements	150	
55	..	Do.	Baling	8	1,60,950
56	0 2,740	O. Miscellaneous ..	Sand sluice No. 1	25	
57	1 1,900	Do. ..	Do. ,, 2	80	
58	14 4,950	Do. ..	Do. ,, 3	33	
59	33 4,024	Do. ..	Do. ,, 6	103	
60	35 2,008	Do. ..	Do. ,, 7	327	
61	38 3,147	Do. ..	Do. ,, 8	253	
62	40 2,390	Do. ..	Do. ,, 9		
63	..	Do. ..	8 cast-iron pipe sluices 6 inch diameter at Rs. 193 each	1,544	
64	..	Do. ..	9 do. 6 inch ,, at Rs. 174 each.	1,566	
65	..	Do. ..	8 do. 5 ,, ,, ,, 180 ,,	1,440	
66	..	Do. ..	4 do. 5 ,, ,, ,, 174 ,,	696	

Classified Abstract Estimate for improving and extending the Kalingaroyen Channel—*cont.*

No.	Mileage.	Sub-head.	Name of work.	Amount of estimate.	Total.
1	2	3	4	5	6
	MILE. FT.			RS.	RS.
67			*Improving the Channel from the head to the vicinity of the Noyil River*—cont.		
68	..	O. Miscellaneous	6 cast-iron pipe sluices 5 inch diameter at Rs. 167 each.	1,002	
69	..	Do.	7 do. 4 inch " at Rs. 166 each.	1,162	
70	..	Do.	82 do. 4 " " " 162 "	13,284	
71	..	Do.	50 do. 4 " " " 152 "	7,600	
72	..	Do.	45 do. 3 " " " 158 "	7,110	
73	..	Do.	21 do. 3 " " " 154 "	3,234	
74	..	Do.	85 do. 3 " " " 151 "	12,835	
75	..	Do.	49 do. 3 " " " 148 "	7,252	
			53 do. 3 " " " 144 "	7,632	
					67,186
			Total ..	..	2,89,000
76			*Extending the Channel from the vicinity of the Noyil River to Karur.*		
77	..	A. Preliminary expenses.	Clearing jungle	700	700
78	..	B. Land	Compensation for land	17,542	17,542
79	2	F. River and Hill Torrent works.	Aqueduct No. 1	27,600	
80	9 100	Do.	Do. " 2	7,280	
81	20 1,420	Do.	Do. " 3	5,570	
82	4 1,720	Do.	Outlet No. 1	8,950	
83	13 5,080	Do.	Do. " 2	4,170	
84	17 3,960	Do.	Do. " 3	3,620	
85	21 110	Do.	Do. " 4	2,310	
86	21 2,360	Do.	Do. " 5	716	
87	27 0	Do.	Do. " 6	1,400	
88	29 4,840	Do.	Do. " 7	1,752	
89	4 4,620	Do.	Inlet No. 1	622	
90	13 5,080	Do.	Do. " 2	490	
91	17 3,960	Do.	Do. " 3	422	
92	21 110	Do.	Do. " 4	458	
93	21 2,360	Do.	Do. " 5	66	
94	27 0	Do.	Do. " 6	150	
95	29 4,840	Do.	Do. " 7	214	
	4,620	Do.		54	
96	0 3,165	G. Bridges			65,844
97	1 3,714	Do.	Bridge No. 1	1,175	
98	2 860	Do.	Do. " 2	1,175	
99	3 0	Do.	Do. " 3	1,175	
100	10 4,970	Do.	Do. " 4	1,175	
101	15 3,880	Do.	Do. " 5	1,175	
102	17 1,990	Do.	Do. " 6	1,117	
103	19 3,620	Do.	Do. " 7	1,117	
104	23 4,380	Do.	Do. " 8	1,117	
105	27 1,450	Do.	Do. " 9	1,090	
106	1 870	Do.	Do. " 10	1,030	
107	4 2,250	Do.	Foot-bridge No. 1	802	
108	5 3,510	Do.	Do. " 2	720	
109	6 1,580	Do.	Do. " 3	650	
110	6 3,450	Do.	Do. " 4	650	
111	7 970	Do.	Do. " 5	650	
112	7 4,470	Do.	Do. " 6	650	
113	8 5,150	Do.	Do. " 7	650	
114	14 1,460	Do.	Do. " 8	650	
115	14 5,205	Do.	Do. " 9	630	
116	16 430	Do.	Do. " 10	630	
117	16 3,320	Do.	Do. " 11	630	
118	17 4,590	Do.	Do. " 12	630	
119	18 4,640	Do.	Do. " 13	630	
120	25 3,690	Do.	Do. " 14	595	
121	21 3,615	Do.	Do. " 15	595	
122	22 2,460	Do.	Do. " 16	595	
123	23 617	Do.	Do. " 17	595	
124	24 3,685	Do.	Do. " 18	530	
125	25 3,705	Do.	Do. " 19	530	
126	26 820	Do.	Do. " 20	530	
127	28 2,020	Do.	Do. " 21	530	
128	29 2,700	Do.	Do. " 22	510	
129	30 1,910	Do.	Do. " 23	510	
			Do. " 24	370	
				370	25,003

Classified Abstract Estimate for improving and extending the Kalingaroyen Channel—*cont.*

No.	Mileage.	Sub-head.	Name of work.	Amount of estimate.	Total.
1	2	3	4	5	6
	MILE FT.			RS.	RS.
			Extending the Channel from the vicinity of the Noyil River to Karur—cont.		
			Inspection bungalow	2,000	2,000
130	..	K. Buildings	Channel	2,27,300	2,27,300
131	..	L. Earthwork ..	Thirty-five masonry sluices at Rs. 300 each.	10,500	
132	..	O. Miscellaneous ..	Two pipe sluices 6 inches diameter at Rs. 170 each	340	
133	..	Do. ..	Three pipe sluices 6 inches diameter at Rs. 200 each	600	11,440
134	..	Do. ..	Total ..	..	3,49,829
			Lump sum for unforeseen works ..	..	11,171
			Total for improvements and extension for the channel	..	6,50,000
			Establishment.	RS.	
			Proportionate share of the cost of establishment employed on the investigation of the project Twenty-three per cent. on Rs. 6,30,416 the total estimate for works excluding Rs. 17,542 provided for land compensation and Rs. 2,042 expenditure incurred on the investigation of the project	20,917	..
			Tools and Plant	1,44,996	.. 1,65,913
			Total ..	..	9,087
				..	8,25,000
			Indirect Charges.		
			Capitalised abatement of Land Revenue	22,772	..
			Leave and Pension allowances ..	23,228	.. 46,000
			Grand Total ..	..	8,71,000

(Signed) H. E. CLERK,
for Chief Engineer for Irrigation.

ORDER—dated 16th September 1890, No. 519 I., Public Works.

The revised estimates, amounting to Rs. 8,25,000 for direct charges, or Rs. 8,71,000 including indirect charges, for improving and extending the Kalingaroyen channel in the Coimbatore district, are approved and will be submitted to the Government of India for sanction with the following letter.

(Here enter No. 520 I., dated 16th September 1890.)

(True Extract.)

(Signed) G. T. WALCH,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Chief Engineer for Irrigation.
" Superintending Engineer, IV Cricle.
" Examiner, Public Works Accounts.
" Revenue Department.

Exd. J. Moses.
Spare Copies

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following paper :—

From R. B. BUCKLEY, Esq., Under-Secretary to the Government of India, Public Works Department (Civil Works—Irrigation), to the Secretary to the Government of Madras, Public Works Department, dated Simla, 15th October 1888, No. 185 I.

I am directed to acknowledge the receipt of your endorsement No. 333 I., dated the 8th June 1888, forwarding the plans and estimates, amounting to Rs. 9,48,000, for improving and extending the Kalingaroyen channel in the Coimbatore division of the Madras Presidency.

2. In reply, I am directed to communicate the following remarks and observations :—

The information furnished on the engineering details of the project is meagre. The index map (in two sheets) shows only the lines of the present and proposed canal, and the sheet of sections (longitudinal and transverse) gives only a general idea of what the Executive Engineer of the B. Project division proposed to do.

3. In his note, dated the 28th May 1888, the Chief Engineer approves of the project as submitted by the Executive Engineer with the exception of certain points. The channel will, it is said, be improved, the present irregular fall being corrected by means of drops and a uniform bedfall of 1 foot per mile worked out, &c. It appears, however, from the longitudinal section that a uniform slope of 1 foot per mile was not contemplated by the Executive Engineer.

4. The Chief Engineer does not approve of the Executive Engineer's proposal to remodel the section of the channel by adding earth to the present banks, but proposes to effect it by a systematic planting along both banks and to revet parts of the banks wherever necessary. It is not understood what is meant by systematic planting, nor how it will effect the object in view.

5. As regards the regrading of the old channel, it appears that the floors of those bridges which cannot be altered should have been made obligatory points and the bed slopes worked from them as centres. Where the existing bridges have too little waterway, the fault could as a rule be remedied by locating a drop at the bridge ; in no case should bridge floors be allowed to stand up over the bed and obstruct the flow of the water. The provision of height of top of proposed banks over the full supply of water in the channels seems to be excessive. In other canals in India the general height is 3 feet, which includes the height of dowel on the edge of the bank. In the present case the height varies from $3\frac{1}{2}$ to $5\frac{1}{2}$ feet. The bed slopes of the remodelled channel should be such as will, as far as possible, give an even velocity.

6. The crossing of the Nóyil river appears to present some rather unusual difficulties. The river is 250 feet wide by 8 feet deep in flood ; its bed slope is 14 feet per mile. The bridges which already exist over this river are in the backwater of the Cauvery. The Chief Engineer does not approve of the site of the aqueduct selected by the Executive Engineer and proposes to place it lower down the river, but he does not offer any criticism on the design which seems to require modification. The size of the drainages which cross the canal channels is not shown anywhere ; if their discharge