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TAMIL NADU ARCHIVES

ERNMENT OF TAMIL NADU

P.W DEPARTMENT

G.O. No. 2080-1 Press.
B.P. No. Mis.

Dated 30-9-1880 197 .

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No. 2544 C.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

GENERAL.

Secretary to the Govt. of Madras
Public Works Depart.

Simla 30th July 1879.

Sir,

I it is understood that the Buckingham Canal suffered some injury in the late cyclone, I am desired to request that with the permission of His Grace the Governor a full report may be submitted to the Government of India with as little delay as possible. It is for consideration the risks attached to Canal in such a position being especially needed with reference to [illegible] Project under similar circumstances elsewhere, which is now

under the consideration of the Government of India.

Have &c.

(Sd) J. Crofton, Major Genl RE

Deputy Secy to the Govt of India

P.W.D.
20 JUNE
No 11

No. 2070. W

GOVERNMENT OF MADRAS, 2080

PUBLIC WORKS DEPARTMENT.

To Secy to the Govt of India P.W.D

Fort St. George, 8 Augt 1879.

Sir,

I am directed to acknowledge receipt of your letter No. 214 dated 30th July 1879, requesting to be furnished with a full report as to the effect of the late Cyclone on the Buckingham Canal.

In reply I am to state that the Supt. Engineer of the Circle has been instructed to expedite the submission of the report already called for on the subject. On its receipt, a copy will be furnished

for the information of the
Govt. of India.

D
J.O

Dessd
8-8-79

Misc Papers

Mar 2 80

No. 462.

OFFICE OF SUPERINTENDENT OF WORKS,
BUCKINGHAM CANAL,
Camp Palar River, 10th May 1880.
Despatched 12th do-

From

THE SUPERINTENDENT OF WORKS,
BUCKINGHAM CANAL,

To

THE CHIEF ENGINEER,
PUBLIC WORKS DEPARTMENT, MADRAS.

SIR,

Enclosure. 2

In continuation of my Letter No. 127 dated 12th April 1880, I have the honor to ~~submit~~ forward a table exhibiting the quantities of Silt deposited in the Canal by the Cyclones of May and November 1879, and the estimates for removing the same to different widths and depths prepared by Mr. (Sub Engineer) Ottmann.

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

A. Awdry, Captain RE
Supdt. of Works Buckingham Canal

Rec'd Secy to the Govt of India

From

The Superintendent of Works,

Buckingham Canal,

P.W.D.
12 JUN 80

No. 3647

The Chief Engineer,

Public Works Department,

Madras.

Dated Palar River 10th June 1880.
Despatched — 12th Do.

No. 462

Enclosure 2

Buckingham Canal—

Forwards a table exhibiting the quantity of silt deposited by the Cyclones of May and November 1879 in the

Cash 13.5.80

All communications should be addressed to the Secretary.

No. 172 I. 2080-1/5

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

Civil Works.
~~GENERAL~~
Irrigation.

To, The Secy to the Govt of Madras.
Public Works Depart.

Simla, 21st June 1880.

Sir,

In compliance with the request made in your letter No. 132 Cash of the 7th Instant, I am directed to forward a copy of Public Works Department letter No. 214 I dated 30th July 1879, and to request that the information therein called for, as to the effect of the cyclone on the Buckingham Canal, may be submitted at an early date.

I have the honor to be,
Sir,
Your most obedt servant,
G.F.L. Marshall Capt. R.E.
Asst to Secy to the Govt of India

P.W.D.
28JUN80
No 1110

Rec'd 28.6.80 Ans 3.9.80

~~Read the following:~~ 6

FOR ORDERS.

27/8
Rec'd

Letter report
No. 1110 dated
Dr. Brunton's letter
dated Nov. 1879
to Secretary GI
No. 1110 dated
1879

The Government of India after the May cyclone of last year called for detailed information as to its effects on the Buckingham Canal. This letter is now missing from the file, but its purport is sufficient as it will be observed from subsequent communications that the general subject of this work has been constantly before both Governments.

and in this office letter,
No. 3047 W of 28th November
1879, the Govt. of India
were assured that they
might "rely on the endeavours
"of those concerned to submit
"a complete estimate at the
"very earliest date practicable"

2. The occurrence of the
second cyclone of 18th and 19th
November interfered with and
delayed the preparation of
the promised estimate; but
this delay far from being a
subject of regret is the reverse,
as the facts already estab-
lished from the damage
sustained should prove
quite invaluable in dealing
with the final estimate for
this great undertaking.

3. That the time has
been well spent I hope will

28.8.80

be sufficiently clear from
the printed collections here-
with submitted.

First come the cyclone
reports recorded with G.O.
of 6th February 1880 No. 283 W,
and ending with a note
by myself after an examina-
tion of the work, which I
had the honor to accompany
His Grace the Governor on
his inspection tour in
January last.

Second are a series of
papers closing with my
Memorandum No. 102 A
dated 29th May 1880.

Lastly a note (see
linked file) dated 17th
June 1880, and which, if
so desired, may be disposed
of separately.

4. The first series of papers contain so much matter of detail that with the exception of one or two points, involving general questions, it would seem doubtful whether there can be any disposal by Govt. till the investigations now in hand by Captain Awdry have been completed. As however, they furnish the information regarding the cyclones called for by the Govt. of India, they should I think be forwarded to Simla.

5. My note of the 29th May deals chiefly with the points of a general character on which the decision of Govt. is called for, so as to guide Captain Awdry regarding the leading features of his estimate.

6. As previously observed my note of the 17th instant, which deals exclusively with the question of the bridges over the Canal, need not necessarily be specially referred to at present in addressing the Govt. of India, though it would be desirable that orders should be passed on it.

7. I have only, it will be observed in all these papers, dwelt on the professional engineering aspects of the work, taking it for granted that His Grace would in all probability desire to record a minute to be forwarded to the Govt. of India explaining the history, objects, and

financial bearings of the work.

8. With the sanction lately granted for a complete survey establishment, Captain Awdry will have all details ready by the end of the current year, and hopes to have the estimate completed for submission to the Govt. of India by June 1881.

9. It is of course disappointing that so long a time should be required, but a perusal of the reports will show that the details involve much thought and enquiry.

10. The map, with the longitudinal section which accompanies, will, it is hoped, convey a general idea to the Govt. of India of the character of the work.

9

Dalt. Lawley Col: R.E.
Secy: to Govt. P.W.D.

23d June 1880.

Boats for approval
19th June 1880
2080/10

From Mr. S. OTTMANN, Sub-Engineer, Buckingham Canal, to the Chief Engineer, Public Works Department, dated Madras, 14th February 1880.

I BEG to send herewith, in part of the information you required me to compile in the memorandum you left with me (on return from your inspection of the canal in last month), the following papers:—

2 Statements of tide range for 1878 and 1879.
1 Statement of draught of boats registered on the canal.
1 Statement of toll-collections from October to January last.
1 Statement of toll-collections for two years preceding under the old rules.
1 Statement of present and proposed toll establishment for the canal.

2. With respect to the tide gauge range, as the gauges have not all been fixed to the same zero, I could not adopt one uniform unit of comparison, say to M.S.L.

3. As regards the statement of draught of boats, I have addressed the officers of Kistna and Godávari districts for information to complete the statement, for only a small percentage of those district boats have as yet been registered on this canal. The present statement comprises only the registered boats for the period named of all districts.

4. The two statements of toll-collections require no notice. The recent ruling of passing empty boats free of tolls will necessarily reduce the collections of the future.

5. The statement of toll establishment present and proposed needs some explanation, &c. I have classified the offices in the order of importance, creating four first class and two second class offices; of the first class offices the Madras office is provided with a superintendent on Rs. 30 it will be observed. This is done to provide for the present head clerk of that office, who will soon put in his time for pension, when the salary may be reduced to the same standard as that of the others.

The present superintendent on Rs. 100 will have to retire, as it will be a heavy charge to retain him, nor will it be equitable to the other offices to admit so great a disparity of salary.

It will be observed also from the statement that there is provision for an establishment at the basin. This I find absolutely necessary; in short there is such an establishment now—a sub-overseer of work establishment and two peons of toll establishment—doing the duty. The large and important business done at the basin and the keeping in order of boats in it, regulating loading and unloading, &c., requires a higher paid individual, and I would suggest one on Rs. 50, who should not be a native, for boatmen seem not to care for them.

In the present scale of toll establishment the division office is provided with two clerks on 30 and 20, an attender on 8, and two peons on Rs. 7. We find the number of hands far short of actual demand for the labor involved, and have had therefore to call in two clerks from the toll offices to assist, and withal it is as much as they all can do to keep apace with the toll department work, that tells very hard indeed on the division office establishment, also there being only one accountant and one assistant available. I have therefore recast the present scale of establishment by which clerks are secured. In the matter of the toll establishment of the division office, I write from the close experience of four months, and trust no reduction will be made, while, on the other hand, I would be glad to see higher salaries given, the work being really hard and which will increase year after year as the traffic increases, which certainly it must.

6. The longitudinal section is in hand.

The district maps were received only yesterday from the Revenue Survey Office. They will be put together at once and the canal map made up therefrom, as per instructions you gave me.

The other papers and statements are being compiled.

Recd 30.8.80.
Cir 23.6.80. Rec 28.8.80
24/16.6.80 Rec

1879.

STATEMENT showing the Range of the Rise and Fall of Tides in different parts of the Buckingham Canal during 1879.

No.	Stations.	JANUARY 1879.				FEBRUARY.				MARCH.				APRIL.			
		Maximum or high tide average during month.	Minimum low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum high tide average during month.	Minimum low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.
1	Pálár river Zero of the gauge 2·50 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	Covelong Zero of the gauge 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Adyar river Zero 4·5 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4	Shadiencoopum lock S.G.	5′ 10″	5′ 6″	6′ 6″	5′ 0″	5′ 5″	5′ 3½″	5′ 10″	5′ 0″	5′ 3″	5′ 2½″	5′ 7″	5′ 0″	6′ 5″	6′ 5″	6′ 8″	6′ 2″
4a	Do. N.G. Zero 6·12 below M.S.L.	5′ 9″	5′ 1″	6′ 6″	4′ 5″	5′ 4″	4′ 9″	5′ 10″	4′ 5″	5′ 0″	4′ 4½″	5′ 7″	4′ 1″	5′ 1½″	4′ 9″	5′ 5″	4′ 5″
5	Ennore Zero 1·5 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
6	Pulicat Zero 0·50 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	Jonagipolium Zero not known.	..	..	..	..	1·14	1·10	2·00	1·10	2·07	1·09	2·20	1·08	2·18	1·10	2·40	1·08
8	Dugarázapatnam Zero not known.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9	Kundailaroo river 4·5 below M.S.L.	..	..	..	..	5′ 10″	3′ 9″	6′ 9″	3′ 9″	5′ 8″	3′ 7″	6′ 3″	3′ 6″	6′ 1″	3′ 8″	6′ 5″	3′ 6″
10	South bank of Pennér Zero 2·50 below M.S.L.	..	..	..	..	3·01	0·18	3·80	0·05	2·72	2·25	3·55	0·05	6·12	2·96	7·90	2·70
11	Pyderoo river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12	Chippalaroo river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	Munnaroo river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	Múshi river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	Rompairu river Zero not known.	5′ 11″	4′ 3″	6′ 10″	3′ 8″	5′ 9″	3′ 8″	6′ 6″	3′ 3″	5′ 10½″	3′ 3½″	6′ 6″	3′ 0″	6′ 1½″	3′ 3″	7′ 0″	3′ 0″
16	Junction canal, Peddaganjam Zero not known.	..	..	..	..	..	..	..	..	4′ 0½″	2′ 11½″	5′ 2″	1′ 9″	3′ 9½″	2′ 11½″	5′ 0″	1′ 8″

Statement showing the Range of the Rise and Fall of Tides in different parts of the Buckingham Canal during 1879—*cont.*

No.	Stations.	MAY.				JUNE.				JULY.				AUGUST.			
		Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.
1	Pálár river Zero of the gauge 2·50 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	Covelong Zero of the gauge 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Adyar river Zero 4·5 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4	Shadiencoopum lock S.G.	6′ 3″	6′ 2″	8′ 0″	5′ 6″	5′ 11½″	5′ 10″	6′ 1″	5′ 10″	6′ 5″	6′ 5″	7′ 3″	5′ 10″	6′ 8″	6′ 8″	7′ 7″	6′ 1″
4a	Do. N.G. Zero 6·12 below M.S.L.	5′ 3″	4′ 10″	7′ 10″	4′ 2″	5′ 3″	5′ 2″	5′ 5″	4′ 11″	5′ 8″	5′ 2″	6′ 10″	4′ 6″	5′ 4″	5′ 2″	6′ 7″	4′ 7″
5	Ennore Zero 1·5 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	1·93	1·15	2·50	0·65
6	Pulicat Zero 0·50 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	1·72	0·83	2·10	·80
7	Jonagipolium Zero not known	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	Dugarázapatnam Zero not known.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9	Kundailaroo river 4·5 below M.S.L.	..	..	..	..	6′ 5″	4′ 0″	7′ 0″	3′ 4″	6′ 8″	4′ 2″	7′ 2″	3′ 9″	6′ 6″	4′ 3″	7′ 0″	4′ 0″
10	South bank of Pennér Zero 2·50 below M.S.L.	6·38	3·32	8·20	2·50	6·50	2·87	7·55	2·60	6·14	3·11	7·00	2·70	6·32	3·28	7·45	2·90
11	Pyderoo river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12	Chippalaroo river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	Munnaroo river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	Múshi river Zero 2·00 below M.S.L.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	Rompairu river Zero not known	6′ 3″	3′ 8″	9′ 0″	3′ 0″	5′ 11″	3′ 6″	6′ 10″	3′ 0″	5′ 7½″	3′ 5″	6′ 7″	3′ 3″	..	..	..	..
16	Junction canal, Peddaganjam Zero not known.	4′ 5″	3′ 2″	7′ 10″	2′ 0″	4′ 9¼″	2′ 11½″	5′ 10″	2′ 0″	4′ 7½″	2′ 5½″	5′ 7″	2′ 0″	4′ 11½″	3′ 2¾″	6′ 2″	2′ 0″

Statement showing the Range of the Rise and Fall of Tides in different parts of the Buckingham Canal during 1879—*cont.*

No.	Stations.	September.				October.				November.				December 1879.				Remarks.
		Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during month.	Lowest tide during month.	
1	Pálár river	..	..	..	..	3·72	2·49	4·40	2·12	4·45	2·21	5·90	2·00	4·14	2·01	4·75	1·90	
	Zero of the gauge 2·50 below M.S.L.																	
2	Covelong	..	..	..	..	2·69	2·53	2·87	2·36	3·52	2·95	4·92	1·70	2·89	2·35	3·35	1·65	Backwater near bar.
	Zero of the gauge 2·00 below M.S.L.																	
3	Adyar river	..	..	..	..	6·69	6·59	8·35	5·00	6·03	4·80	8·00	3·50	5·46	4·10	6·80	3·40	
	Zero 4·5 below M.S.L.																	
4	Shadiencoopum lock S.G.	6′ 5″	6′ 4″	6′ 11″	5′ 8″	7′ 3″	7′ 3″	8′ 2″	6′ 5″	7′ 4″	7′ 3″	9′ 3″	6′ 3″	..	..	..	..	
4a	Do. N.G.	5′ 9″	5′ 6½″	6′ 1″	5′ 3″	6′ 4″	6′ 2″	8′ 2″	5′ 4″	5′ 11″	5′ 10″	7′ 9″	5′ 3″	6′ 3″	5′ 3″	6′ 11″	4′ 9″	
	Zero 6·12 below M.S.L.																	
5	Ennore	1·89	1·53	2·50	1·30	2·66	2·19	4·10	1·40	3·18	2·55	4·80	1·00	2·36	1·05	3·30	0·60	Lake near bar.
	Zero 1·5 below M.S.L.																	
6	Pulicat	1·26	0·80	2·10	0·60	1·98	1·36	3·30	0·70	2·94	2·27	6·40	0·90	1·99	0·97	2·50	0·40	Do.
	Zero 0·50 below M.S.L.																	
7	Jonagipolium	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	On Pulicat lake, 42nd mile.
	Zero not known.																	
8	Dugarázapatnam	..	..	..	..	..	..	..	..	2′ 11″	2′ 3″	3′ 5″	1′ 6″	2′ 10″	1′ 11′	4′ 1″	1′ 3″	Backwater near bar.
	Zero not known.																	
9	Kundailaroo river	6′ 7″	4′ 4″	7′ 2″	4′ 3″	6′ 8″	4′ 5″	8′ 5″	4′ 3″	7′ 4″	5′ 2″	8′ 9″	4′ 3″	6′ 8″	4′ 4″	7′ 3″	4′ 0″	
	4·5 below M.S.L.																	
10	South bank of Pennér	6·37	3·41	7·40	3·00	6·67	3·43	8·20	3·10	7·14	3·94	9·30	3·00	5·61	2·33	8·10	1·05	
	Zero 2·50 below M.S.L.																	
11	Pyderoo river	..	..	..	..	6·88	6·63	7·90	6·20	7·40	6·25	11·00	5·30	5·86	4·21	8·20	1·90	
	Zero 2·00 below M.S.L.																	
12	Chippalaroo river	..	..	..	..	..	..	..	..	8·32	6·61	10·50	5·00	6·19	3·96	8·90	2·20	
	Zero 2·00 below M.S.L.																	
13	Muunaroo river	..	..	..	..	5′ 8½″	4′ 8″	11′ 0″	3′ 8″	6′ 7½″	4′ 9″	8′ 1″	3′ 8½″	5′ 9″	3′ 0¾	7′ 3″	2′ 3½″	
	Zero 2·00 below M.S.L.																	
14	Múshi river	..	..	..	..	5·43	5·49	9·80	4·00	6·38	4·13	11·00	2·1	5·5	2·7	7·2	1·9	
	Zero 2·00 below M.S.L.																	
15	Rompairu river	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	At temporary lock, Ferringidibba.
	Zero not known.																	
16	Junction canal, Peddaganjam ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Commamur junction.
	Zero not known.																	

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

1878.

Statement showing the Range of the Rise and Fall of Tides in different parts of the Buckinghan Canal during the year 1878.

Station.	January 1878.				February.				March.				April.			
	Maximum or high tide average during month.	Minimum or low tide average during month.	Highest spring during the month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.
Coromandel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zero of the gauge not known.																
Jonagipolium	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zero of the gauge not known.																
Dugarázapatnam	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zero not known.																
Rompairu river	5′ 1½″	3′ 6″	6′ 3″	3′ 2″	5′ 1″	3′ 5″	6′ 1″	3′ 4″	5′ 1½″	3′ 2″	6′ 0″	3′ 0″	5′ 0″	3′ 1″	6′ 0″	2′ 11″
Zero not known.																

5

2080-1
2/1/19

STATEMENT showing the Range of the Rise and Fall of Tides in different parts of the Buckingham Canal during the year 1878.

1878.

Station.	MAY.				JUNE.				JULY.				AUGUST.			
	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.
Coromandel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zero of the gauge not known.																
Jonagipolium	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zero of the gauge not known.																
Dugarázapatnam	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zero not known.																
Rompairu river	5′ 5″	3′ 3½″	6′ 2″	3′ 0″	5′ 7″	3′ 7½″	6′ 3″	3′ 3″	5′ 7″	4′ 5″	6′ 6″	3′ 6″	..	..	..	..
Zero not known.																

1878.

Station.	SEPTEMBER.				OCTOBER.				NOVEMBER.				DECEMBER 1878.				Remarks.
	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	Maximum average during month.	Minimum average during month.	Highest spring during month.	Lowest tide during month.	
Coromandel	5·87	5·23	6·05	5·10	5·88	5·31	6·40	5·00	6·09	5·74	6·25	5·35	6·07	5·43	6·35	5·35	In lake 27th mile.
Zero of the gauge not known.																	
Jonagipolium	..	..	..	..	4·37	4·24	4·57	3·85	4·43	4·33	4·57	3·85	4·39	4·27	4·62	3·85	In lake 42nd mile.
Zero of the gauge not known.																	
Dugarázapatnam	..	..	..	..	1·80	1·63	2·20	1·40	1·77	1·60	1·90	1·45	1·83	1·74	2·00	1·60	In backwater 69th mile.
Zero not known.																	
Rompairu river	6′ 5″	5′ 7″	8′ 8″	4′ 10″	6′ 3″	5′ 7″	8′ 8″	1′ 1″	0′ 9″	0′ 6½″	1′ 7″	0′ 1″	3′ 11″	2′ 7″	6′ 8″	0′ 1″	At temporary lock, Ferringidibba.
Zero not known.																	

BUCKINGHAM CANAL.

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

STATEMENT showing the Draught of Water of Boats Licensed for, and plying on, the Buckingham Canal from 8th October 1879 to 31st January 1880.

Sections.	Below 1½ feet.	From 1½ to 2 feet.	From 2 to 2½ feet.	Total Boats.	Remarks.
A or Sadras Section ...	87	15	...	102	Those few only of Kistna and Godávari boats licensed for the canal are included herein. The Kistna and Godávari Officers have been applied to for information in this matter.
B or Madras do. ...	29	4	8	41	
C or Pulicat do. ...	271	170	219	660	
D or Kistnapatam do. ...	3	12	3	18	
E or Ramapatam do. ...	2	18	4	24	
F or Kotapatam do. ...	18	34	10	62	
Total ...	410	253	244	907	

MADRAS,
14th February 1880.

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

STATEMENT showing Toll-collections on the Buckingham Canal from January 1877 to September 1879.

Year.	Month.	Amount. Rs. A. P.
1877 ...	January	1,846 15 9
	February	380 5 0
	March	...
	April	...
	May	733 9 0
	June	5,651 4 0
	July	3,192 9 3
	August	1,392 8 6
	September	1,363 4 0
	October	2,555 15 0
	November	2,889 0 0
	December	3,196 8 9
1878 ...	January	3,110 13 3
	February	2,480 14 3
	March	2,223 14 9
	April	4,472 8 3
	May	7,248 7 0
	June	7,366 15 9
	July	7,704 15 0
	August	4,718 3 0
	September	2,705 8 0
	October	2,485 0 0
	November	1,418 3 0
	December	1,194 11 0
1879 ...	January	2,587 4 0
	February	2,451 8 0
	March	2,484 0 9
	April	2,519 1 6
	May	4,519 7 0
	June	5,663 13 0
	July	5,649 11 0
	August	2,826 1 0
	September	2,396 13 0
	Total ...	1,01,429 11 9

14th February 1880.

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

STATEMENT showing the Amount of Collections of License Fee and Tolls, &c., on Boats plying, from 8th October 1879 to 31st January 1880, on the Buckingham Canal.

Month.	A or Sadras Section. License Fee.	A or Sadras Section. Tolls, &c.	B or Madras Section. License Fee.	B or Madras Section. Tolls, &c.	C or Pulicat Section. License Fee.	C or Pulicat Section. Tolls, &c.	D or Kistnapatam Section. License Fee.	D or Kistnapatam Section. Tolls, &c.	E or Ramapatam Section. License Fee.	E or Ramapatam Section. Tolls, &c.	F or Kotapatam Section. License Fee.	F or Kotapatam Section. Tolls, &c.	Total Collections. Net License Fee.	Total Collections. Net Tolls, &c.	Grand Total of License Fee and Tolls.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Oct. 1879 ..	512 8 0	586 4 0	282 12 0	1,393 11 0	302 7 0	686 6 0	..	525 0 0	63 0 0	281 8 0	164 0 0	213 8 0	1,324 11 0	3,685 11 0	6,010 6 0
Nov. ,, ..	190 0 0	207 4 0	429 12 0	1,880 8 0	763 0 0	614 6 0	..	404 8 0	..	646 4 0	72 0 0	329 4 0	1,454 12 0	3,982 2 0	6,436 14 0
Dec. ,, ..	64 8 0	228 4 0	171 8 0	2,622 6 0	817 8 0	644 4 0	49 8 0	469 0 0	53 0 0	490 4 0	30 0 0	120 6 0	1,186 0 0	4,764 8 0	5,950 8 0
Jan. 1880 ..	373 8 0	205 0 0	238 0 0	1,477 10 0	1,825 8 0	730 10 3	150 0 0	472 12 0	368 8 0	500 12 0	303 8 0	218 14 0	3,249 0 0	3,655 10 3	6,904 10 3
Total ..	1,140 8 0	1,226 12 0	1,122 0 0	7,674 3 0	3,708 7 0	2,625 10 3	199 8 0	1,881 4 0	474 8 0	1,818 12 0	569 8 0	882 0 0	7,214 7 0	16,087 15 3	23,302 6 3

MADRAS,
14th February 1880.

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

COMPARATIVE Statement showing the Present and Proposed Toll Establishment for the Buckingham Canal.

	PRESENT ESTABLISHMENT.				PROPOSED ESTABLISHMENT.					
No.	Description.	Rate per Month.	Per Annum.	No.	Description.	Rate per Month.	Per Annum.	Increase.	Decrease.
	A OR SADRAS SECTION OFFICE.	RS.	RS.		A OR SADRAS SECTION OFFICE.	RS.	RS.	RS.	RS.
	Second Class.				*Second Class.*				
1	Superintendent ..	50	600	1	Superintendent ..	20	240		
1	Clerk	20	240	1	Clerk	15	180		
1	Cashier	15	180	..	....	..	..		
1	Do.	12	144	..	....	..	..		
3	Peons	7	252	2	Peons	7	168		
2	Lascars	7	168	2	Lascars	6	144		
			1,584				732	..	852
	B OR MADRAS SECTION OFFICE.				B OR MADRAS SECTION OFFICE.				
	First Class.				*First Class.*				
1	Superintendent ..	100	1,200	1	Superintendent ..	30	360		
1	Clerk	30	360	1	Clerk	15	180		
1	Do.	15	180	..	....	..	..		
3	Peons	7	252	2	Peons	7	168		
2	Lascars	7	168	2	Lascars	6	144		
			2,160				852	..	1,308
	C OR PULICAT SECTION OFFICE.				C OR PULICAT SECTION OFFICE.				
	First Class.				*First Class.*				
1	Superintendent ..	60	720	1	Superintendent ..	25	300		
1	Clerk	20	240	1	Clerk	15	180		
1	Cashier	15	180	..	....	..	..		
1	Do.	12	144	..	....	..	..		
3	Peons	7	252	2	Peons	7	168		
2	Lascars	7	168	2	Lascars	6	144		
			1,704				792	..	912
	D OR KISTNAPATAM SECTION OFFICE.				D OR KISTNAPATAM SECTION OFFICE.				
	First Class.				*First Class.*				
	As per particulars for Pulicat Section. ..		1,704		As per particulars for Pulicat Section. ..		792	..	912
	E OR RAMAPATAM SECTION OFFICE.				E OR RAMAPATAM SECTION OFFICE.				
	First Class.				*First Class.*				
	As per particulars for Pulicat Section. ..		1,704		As per particulars for Pulicat Section. ..		792	..	912
	F OR KOTTAPATAM SECTION OFFICE.				F OR KOTTAPATAM SECTION OFFICE.				
	Second Class.				*Second Class.*				
1	Superintendent ..	50	600	1	Superintendent ..	20	240		
1	Clerk	20	240	1	Clerk	15	180		
1	Cashier	15	180	..	....	..	..		
1	Do.	12	144	..	....	..	..		
3	Peons	7	252	2	Peons	7	168		
2	Lascars	6	168	2	Lascars	6	144		
			1,584				732	..	852
	DIVISION OFFICE.				DIVISION OFFICE.				
1	Clerk	30	360	2	Clerks	15	360		
1	Do.	20	240	1	Clerk	12	144		
1	Attender	8	96	1	Attender	10	120		
2	Peons	7	168	2	Peons	7	168		
			864				792	..	72
	BASIN OFFICE.				BASIN OFFICE.				
	.... ..	..	..	1	Superintendent ..	30	360		
				2	Lascars	6	144		
							504	504	..
	Total		11,304		Total ..		5,988	504	5,820
					Net Saving by present proposal. ..		..	..	5,316

BUCKINGHAM CANAL DIVISION OFFICE,
14th February 1880.

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

No. From Captain A. AWDRY, R.E., Superintendent of Works, Buckingham Canal, to the Chief Engineer, Public Works Department, dated Buckingham Canal, 15th May 1880, No. 558.

WITH reference to your No. 953 of the 24th March 1880, I have the honor to inform you that I have just received from Mr. Ottmann the survey of the canal and the longitudinal section showing the silt deposited by the cyclones of May and November in last year, the height of the floods, tides and banks, and I forward them herewith.

2. I also return as directed the enclosures to your letter under reply, and with reference to paragraph 2 have had a revised statement made out as required. I have omitted from the calculation all months when bars were closed and have added the readings to the end of April. By the end of this year I hope to have a far more extensive and valuable record of tides, and I shall before the close of the year have checked the line of levels joining the zeros of the gauges. There is a marked change in gauge readings between the canal south and north of the Pennér, for the M. S. L. used on the southern part is deHaviland's, and from the Pennér northwards M. S. L. was arrived at by tidal observations in 1876 for six months at the Pennér by Lieutenant Henderson, R.E. It is actually found in the Northern Canal that in many places the tide does not fall nearly to so low a level as the canal bed (4·50 below M. S. L.) would lead one to suppose, either therefore there must be something wrong in the levelling from the Pennér northwards for determining M. S. L., or else the canal was cut out to more than 4·50 feet below M. S. L.; fortunately the fault as regards depth of canal appears to be on the right side.

3. The average readings of high and low tides on the intermediate stations recently set up is herewith sent as requested in the latter part of your paragraph 2, but I fear that the observations have not been taken long enough to be a very sure guide.

4. With reference to draught of boats I think that in the present state of the canal it will be advisable not to alter the rules as to depth, while I should feel disposed not to interfere with boats loaded beyond the load line of $2\frac{1}{2}$ feet above keel, as if they do overload they will be liable to detention in waiting for high tides, and at present it would, I think, be injurious to growing traffic to measure boats for a greater depth than $2\frac{1}{2}$ feet and register their tonnage accordingly. I quite agree that we should endeavour to make the canal available for steam traffic, and that $4\frac{1}{2}$ feet below M. S. L. is the very least that would do for this, but $4\frac{1}{2}$ feet is a depth which it is impossible practically to work down to by manual labor, and it would require dredging to keep it clear, so that for this depth dredgers would have to be kept up for the whole length of the canal. There is so much still to be done to the canal before we could put steamers on it with any great chance of their doing well, that it will, I should consider, be best to make all gate cills at least 4·50 feet below M. S. L., and for the present endeavour to maintain a depth of 3·00 below lowest tide and make no alteration in the rules, but permit heavy boats to use the canal and take their chance of sticking until a high tide frees them. I do not read the rules as prohibiting boats of deeper draught than $2\frac{1}{2}$ feet although licenses and tolls are only taken on the capacity of the boats when drawing that depth as maximum. I have never quite understood, looking to the slight rise and fall of tides, why a certain distance below *lowest* tide was not taken as the bed of the canal; it is more easy for an inexperienced workman to know whether he has done a sufficient clearance if low water instead of mean tide is used, and if properly worked down to it will allow the whole rise of tide as a margin to assist boats sticking in getting off. Tide readings of intermediate stations will be available by the end of the year, so that the question cannot well be definitely settled until then, as I imagine that a few months gauging would not be accurate as tides vary with the seasons.

5. I have made out a revised statement of the earnings of the canal, the amounts are as follow.

		Rs.
License fees for 1880		19,000
Tolls (at average since October last)		51,600
Sales, &c., say		700
Total per annum ...		71,300

In regard to this it should be noted that the figure is far lower than what may shortly be hoped for, for the rules have only been a short time in force and all the boats formerly plying on the canal have not yet been replaced on it. New boats have not yet come in in large numbers owing to the novelty of the charges and recent cyclones having given the canal an unfavorable chance to start with. Considerable traffic will probably accrue to the canal from the Kistna and Godávari canals in future years, now that the fact has been definitely made known that the Kistna and Godávari grain must be worked out of those canals before their annual closure in April, for the produce was not brought down owing to hopes on the part of the boatmen that the Kistna canals would be kept open and to the objections to the rates of tolls, &c. The more stringently it is enforced that the canals of Kistna should be closed *yearly at a certain date* the better for developing traffic before that date; if the boatmen have no hope of the canals being left open, they will probably push on their carrying operations earlier in the year.

6. In regard to charges for maintenance of the canal I do not consider that it will be necessary to reckon on so large an outlay on the Adyar to Pálár Section of the canal as on the other parts of it. Very little has been spent on clearance in this section of the canal in former years, and I think as an average Rs. 110 per mile might suffice for these 40 miles. The maintenance of the Northern and Junction canals for the present must be expected to be more costly as larger rivers are crossed and the banks are not yet thoroughly consolidated. I reckon for a few years the maintenance of the canal for these 207 miles cannot well be done under Rs. 275 per mile. This makes a total charge for maintenance of Rs. 61,325 per annum, which will, after the Northern canal banks are more consolidated and grown over, the rivers crossing it trained, cattle crossings paved, &c., be capable of considerable reduction.

In regard to charges for establishment I have entered one half of the sanctioned scale, considering that half the time of the establishment is taken up in original work and work for the Salt Department and minor works, which is certainly the case. The toll and lock establishments are now fixed at the lowest figures they can be and have been largely reduced from what they formerly were. The total charges for maintenance establishment and collection are Rs. 85,625.* Interest at 4 per cent. on the capital outlay amounts to Rs. 1,23,946 per annum, and of itself without maintenance establishment and collection charges utterly swamps the receipts, but the through traffic has not yet developed on the canal and will, I trust, in a few years increase the receipts very many fold. The canal received very great damages last year from two cyclones, one of which was exceptionally severe and they have done the development of its traffic much harm; but by clearing out the debris of the old high banks and not replacing them in situations where they are liable to be washed into and block the canal, much will be done towards reducing the possible damage from cyclones, so that traffic will not be likely in the future to be as much impeded by cyclones even if they occur as was the case in 1879.

		Rs.
* Maintenance		61,325
Establishment		16,800
Collection, &c.		7,500
Total ...		85,625

STATEMENT showing the Mean Annual Maximum and Minimum Heights of Tides for the year 1879-80.

Reduced to Heights above and below Mean Sea Level.

No.	Gauge Stations.	Zero of the Gauge below M.S.L.	April 1879.		May.		June.		July.		August.		September.		October.	
			Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.
1	Pálár river near Kadalur	2·50													+ 1·22	− 0·01
2	Covelong	2·00													+ 0·69	+ 0·53
3	Adyar river	4·50													*	*
4	Shadiencoyum lock N.G.	6·12	− 1·00	− 1·37	− 0·87				− 0·46		+ 0·79	− 0·95	− 0·48		+ 2·19	+ 2·09
5	Emore	1·50									+ 0·43	− 0·35	+ 0·03		+ 0·21	+ 0·05
6	Pulicat	2·00									+ 0·22	− 0·67	− 0·24		+ 1·16	+ 0·69
7	Dugarajapatnam ...	4·50	+ 1·58	− 0·84			− 0·50	− 0·33				− 0·25	− 0·70		+ 0·48	− 0·14
8	Kundaleroo river	2·50	+ 3·62	+ 0·46			+ 0·37	+ 0·61			+ 2·00	+ 0·78			*	*
9	South bank of Penner river	2·00									+ 3·82				+ 2·16	− 0·08
10	Pyderoo river ...	2·00					+ 1·92		+ 2·16				− 0·17		+ 4·17	+ 0·93
11	Chippalaroo river ...	2·00					+ 4·00		+ 3·64				+ 0·91		+ 4·98	+ 4·63
12	Mainer do. ...	2·00														
13	Müsili do. ...	2·00													+ 3·70	+ 2·66
14	Gundlakamma do. ...	2·00													+ 4·43	+ 3·49

* Bars closed and the heights in months so marked omitted from calculating averages.

Statement showing the Mean Annual Maximum and Minimum Heights of Tides for the year 1879-80—*contd.*

No.	Gauge Stations.	Reduced to Heights above and below Mean Sea Level—*cont.*												Mean annual maximum height of tides.	Mean annual minimum height of tides.
		November.		December.		January 1880.		February.		March.		April.			
		Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.	Maximum tide average during month.	Minimum tide average during month.		
1	Pálár river near Kadalur	+ 1·95	— 0·29	+ 1·64	— 0·49	+ 0·71	— 0·58	+ 0·16	— 0·66	— 0·08	— 0·65	*— 0·86	*— 0·88	+ 0·93	— 0·45
2	Covalong	+ 1·52	+ 0·95	+ 0·89	+ 0·35	+ 0·35	+ 0·18	*— 0·01	*— 0·09	*— 0·40	*— 0·41	— 0·13	— 0·44	+ 0·66	+ 0·31
3	Adyar river	+ 1·53	+ 0·30	+ 0·96	— 0·40	*+ 0·95	*+ 0·69	*+ 2·06	..	*+ 1·77	..	*+ 0·90	*	+ 1·24	— 0·05
4	Shádiencoopum lock N.G.	— 0·20	— 0·29	— 0·13	— 0·87	— 0·99	— 1·40	— 0·44	— 1·62	— 0·87	— 1·78	— 0·96	— 1·63	— 0·57	— 1·09
5	Ennore	+ 1·63	+ 1·05	+ 0·86	— 0·45	+ 0·37	— 0·89	— 0·04	— 1·02	— 0·13	— 1·00	— 0·33	— 1·04	+ 0·50	— 0·38
6	Pulicat	+ 1·44	+ 0·77	+ 0·49	— 0·53	— 0·10	— 1·19	+ 0·64	— 0·38	+ 0·58	— 0·49	+ 0·41	— 0·69	+ 0·44	— 0·44
7	Pulicat	+ 0·92	+ 0·25	+ 0·83	— 0·08	+ 0·34	— 0·66	+ 0·17	— 0·87	+ 0·08	— 0·96	— 0·16	— 0·75	+ 0·36	— 0·51
8	Dugarázpatnam	+ 2·83	+ 0·67	+ 2·16	— 0·17	+ 1·58	— 0·67	+ 1·33	— 0·84	+ 1·16	— 0·92	+ 1·28	— 0·92	+ 1·85	— 0·42
9	Kundailaroo river	+ 4·64	+ 1·44	+ 3·11	— 0·17	+ 1·69	— 1·58	+ 1·48	— 1·77	+ 1·40	— 1·75	+ 1·39	— 1·84	+ 3·12	— 0·08
10	South bank of Pennér river	+ 5·40	+ 4·25	+ 3·86	+ 2·21	+ 2·08	+ 0·03	+ 1·86	— 0·32	+ 1·77	— 0·33	+ 1·56	+ 0·02	+ 3·06	+ 1·50
11	Pyderoo river	+ 6·32	+ 4·61	+ 4·19	+ 1·96	+ 2·21	+ 0·50	+ 1·73	+ 0·32	+ 1·57	+ 0·30	+ 1·84	+ 0·77	+ 2·98	+ 1·41
12	Chippalaroo river	+ 4·62	+ 2·75	+ 3·75	+ 1·06	+ 3·28	+ 0·51	+ 2·98	+ 0·47	+ 2·95	+ 0·44	+ 3·01	+ 0·71	+ 3·47	+ 1·23
13	Manner do.	+ 4·38	+ 2·13	+ 3·50	+ 0·70	+ 2·98	+ 0·02	+ 2·92	— 0·05	+ 2·89	— 0·23	+ 2·84	+ 0·55	+ 3·42	+ 0·95
14	Múshi do.	+ 3·45	+ 0·99	+ 2·59	+ 0·13	+ 3·58	+ 0·68	+ 4·38	+ 1·40	+ 1·86	— 1·54	+ 2·00	— 0·49	+ 2·98	+ 0·20
	Gundlakamma do.														

* Bars closed and the heights in months so marked omitted from calculating average.

It should be noted that from the Pálár to the Pennér M.S.L. is deHaveland's M.S.L. at Fort St. George, Madras, carried along the canal by levelling. From the Pennér to the Gundlakamma M.S.L. is the mean arrived at by Lieutenant Henderson, R.E., from six months' observations of tides in the Pennér in 1875 carried along the canal by levelling. Both high and low water appear to be at a uniformly higher level in this northern section than in the southern. Possibly deHaveland's result is too high or Lieutenant Henderson's too low.

(Signed) A. AWDRY, Captain, R.E.,
Supt. of Works, Buckingham Canal.

CHEPAUK,
14th May 1880.

14

Number.	Mileage.	Gauge Stations.	Reduced to M.S.L.			Remarks.
			Zero of the gauge below M.S.L.	Mean maximum height of tides.	Mean minimum height of tides.	Differences, Columns Nos. 5 and 6.	
1	2	3	4	5	6	7	8
1	46 1/40 South ..	Pálár river—Kadalur ..	2·50	+ 0·93	— 0·45	1·3	(Bar closed on 2nd April.)
2	VI 32 ,,	Sadras	4·59	..	..	..	..
3	VI 21 ,,	Salamcooppam	2·60	— 0·71	— 0·79	0·08	..
4	1 13 ,,	Covelong	2·00	+ 0·66	+ 0·31	0·35	(Bar open in April)
5	VII 6 ,,	Sholamalloor	2·00	+ 0·03	— 0·33	0·36	..
6	VII 5 ,,	Head of Sadras Canal	4·50	..	..	..	..
7	VI 5 ,,	Adyar river	4·50	+ 1·24	— 0·05	1·29	(Bar closed in April)
8	III 1 ,,	Greenaway's bridge	4·50	..	..	..	..
9	VI North ..	Basin	4·60	..	..	..	(Coovum bar closed in April.)
10	8 ,,	Shádiencoopum lock N.G. ..	6·12	— 0·57	— 1·09	0·52	..
11	12 ,,	Ennore	1·50	+ 0·50	— 0·38	0·88	(Bar open in April.)
12	1 19 ,,	Kalanjee	2·60	— 1·55	— 1·50	0·15	..
13	1 25 ,,	Pulicat	1·50	+ 0·44	— 0·44	0·88	(Bar open in April.)
14	IV 31 ,,	Thanipanthal	2·00	— 0·52	— 1·11	0·79	..
15	IV 37 ,,	Thetupett	2·00	— 0·02	— 0·51	0·49	..
16	V 43 ,,	Jonaghipaliem	2·00	+ 0·45	+ 0·23	0·22	..
17	V 58 ,,	Royudooruva	2·00	+ 0·64	+ 0·45	0·19	..
18	64 ,,	Pumbly	1·50	..	..	..	(Bar open in April.)
19	69 ,,	Dugarazpatnam	2·20	+ 0·36	— 0·51	0·87	(Swarnamukhi river
20	76 ,,	Swarnamukhi river	1·50	+ 0·62	+ 0·20	0·42	bar closed in April.)
21	81 VI 89 ,,	Konoopur	2·00	+ 0·59	— 0·12	0·71	..
22	VI 103 ,,	Kundailaroo river	4·50	+ 1·85	— 0·42	2·27	(Bar open in April.)
23	1 114 ,,	Kodoor	2·00	+ 0·06	— 0·27	0·33	..
24	111 120 ,,	South Bank of Pennér river.	2·50	+ 3·12	— 0·08	3·20	(Bar open in April)
25	IV 193 ,,	Ramatheertham	2·00	+ 1·40	— 0·05	1·45	..
26	VI ,,	Pyderoo river	2·00	+ 3·06	+ 1·50	1·56	(Bar open in April)

The figures in large type are the averages of several months of old gauges (only calculated when bars are open) as per separate statement.

The figures in small type are the averages for one month (April) of the new intermediate gauges.

Statement showing the Mean Maximum and Minimum Heights of Tides—*contd.*

Number.	Mileage.	Gauge Stations.	Zero of the gauge below M.S.L.	Reduced to M.S.L.		Differences, Columns Nos. 5 and 6.	Remarks.
				Mean maximum height of tides.	Mean minimum height of tides.		
1	2	3	4	5	6	7	8
27	127 V North ..	Iskapalle	2·00	+ 1·70	+ 0·56	1·14	..
28	132 VII ,,	Chippalaroc river ..	2·00	+ 2·98	+ 1·41	1·57	(Bar open in April.)
29	142 I ,,	Kottachuttram	2·00	+ 1·81	+ 1·34	0·47	..
30	149 II ,,	Ramapatam	2·00	+ 1·96	+ 1·67	0·29	..
31	160 IV ,,	Manner river	2·00	+ 3·47	+ 1·23	2·24	(Bar open in April.)
32	164 V ,,	Oottaravu Calva at Pakala ..	2·00	+ 2·41	+ 0·49	1·92	..
33	169 IV ,,	Mushi river	2·00	+ 3·42	+ 0·93	2·47	(Bar open in April.)
34	177 VI ,,	Thandaroo creek	2·00	+ 1·80	+ 0·44	1·36	..
35	187 ,,	Gundlakamma river ..	2·00	+ 2·98	+ 0·20	2·78	(Bar open in April.)
36	190 VII ,,	Kanuparthy	2·00	+ 0·93	— 1·00	1·93	..

The figures in large type are the averages of several months of old gauges (only calculated when bars are open) as per separate statement.

The figures in small type are the averages for one month (April) of the new intermediate gauges.

15th May 1880.

(Signed) A. AWDRY, Captain, R.E.,
Supt. of Works, Buckingham Canal.

Revised Statement showing the Draught of Water of Boats Licensed for plying on the Buckingham Canal from 8th October 1879 to 31st March 1880.

Section.	Below 1½ feet.	From 1½ to 2 feet.	From 2 to 2½ feet.	Total Boats.	Remarks.
A or Sadras Section	87	16	..	103	
B or Madras do.	29	5	8	42	
C or Pulicat do.	285	191	265	741	
D or Kistnapatam do.	4	13	4	21	
E or Ramapatam do.	5	21	5	31	
F or Kottapatam do.	18	35	12	65	
Kistna and Godávari boats plying on the Buckingham Canal.	..	..	1,012	1,012	These boats, though licensed for Kistna and Godávari, are also plying on the Buckingham canal, paying tolls for all sections.
	428	281	1,306	2,015	

Buckingham Canal,
17*th May* 1880.

(Signed) A. AWDRY, Captain, R.E.,
Supt. of Works, Buckingham Canal.

Statement showing the Receipts and Charges of the Buckingham Canal.

Receipts.		Charges.		Remarks.
Items.	Amount.	Items.	Amount.	
	Rs.		Rs.	
Amount of license fees for 1880-81, 9,500 tons at Rs. 2 per ton.	19,000	Maintaining the Southern canal, 40 miles, at Rs. 110 =	4,400	
Toll collections	51,600	Do. Junction and Northern canal, 207 miles, at Rs. 275 =	56,925	
Sales of canal produce ..	700		61,325	
	71,300	Present permanent establishment employed in the division, at Rs. 2,800 per mensem for 12 months.	* 16,800	* Half only entered to canal maintenance as the same establishment carries on original works, salt works, and other special works.
Difference	1,38,271	Toll establishment as per revised sanctioned scale, at Rs. 515 per mensem for 12 months.	6,180	
		Lock establishment, at Rs. 110 per mensem for 12 months.	1,320	
			85,625	
		Interest on capital for Rs. 30,98,554 at 4 per cent. per annum.	1,23,946	
Total ..	2,09,571	Total ..	2,09,571	

Chepauk,
17th May 1880.

(Signed) A. AWDRY, Captain, R.E.,
Supt. of Works, Buckingham Canal.

No. . From Captain A. AWDRY, R.E., Superintendent of Works, Buckingham Canal, to the Chief Engineer, Public Works Department, dated Pálár river, 10th May 1880, No. 462.

In continuation of my letter, No. 127, dated 12th April 1880, I have the honor to forward a table exhibiting the quantities of silt deposited in the canal by the cyclones of May and November 1879, and the estimates for removing the same to different widths and depths prepared by Mr. (Sub-Engineer) Ottmann.

The following notes are appended for information in explanation of the computations made in calculating quantities, rates, &c., of this table.

1. There is no record of what the canal bed was before May's cyclone, and for the purpose of this table it is assumed as 4·5 feet below M.S.L. The canal division was created in November 1878. The Northern canal was opened about a year previously.

2. The depths of silt in column 2 for the two cyclones were obtained by first averaging the depths (from the soundings at every furlong) for each mile separately, and subsequently averaging that result again for the *actual* mileage of *such* silting, and not for full mileage of canal. The May's cyclone silt is computed on the 4·5 feet bed below M.S.L. for reasons given in preceding paragraph. The November's cyclone computation of silt is based on three feet bed below M.S.L., below which no work was done according to Mr. O'Shaughnessy's intention, and as means were not available for working to original datum.

3. It should be stated that the canal from Cooum to Pulicat was originally laid with a 6·12 feet datum, that is to say on the level of the Shadiencoopum lock sill.

4. In regard to length of silting, on which the computation of quantities is made, the following were adopted from actual measurement taken from section :—

For May's Cyclone.

For the 4·5 feet datum 160 miles, average depth 1·53 feet.
„ 4 „ „ 138 „ „ „ 1·24 „
„ 3 „ „ 82 „ „ „ 0·78 „

For November's Cyclone.

For the 4·5 feet datum 180 miles, average depth 1·77 feet.
„ 4 „ „ 158 „ „ „ 1·50 „
„ 3 „ „ 97 „ „ „ 1·05 „

The quantities in columns A, B, and C are based on above lengths and depths.

5. It should be stated in regard to the November cyclone that in cases were there was no silt in May (as in 66 to 69 miles for instance) the height actually deposited over the 4·5 feet M.S.L. was adopted, and where both May's and November's lines fell below the 3 feet datum, the difference between the two was taken.

6. In regard to rates of columns A, B, and C an average was adopted between those of sand and slush and between tidal and non-tidal, and which will be found somewhat in excess of the average as would be struck from "table of rates" submitted by me, for the reason that the latter are specific rates, whereas for the purposes of the present table of quantities an average rate had to be computed.

7. It may not be out of place to record here what I have already submitted before in the case of the Pennér island cut, about a mile long, which silted completely up in the first year of opening, that it cost Rs. 11,527 for earthwork alone to re-open the line (which was at Rs. 4-3-2 per cubic yard), and that in last November's cyclone it had silted up again over low tide level. The Mádhi-Pálár cut silted in November's cyclone over low tide level.

8. The impracticability of maintaining a 20 feet channel only *in the old bed*, which is 30 feet and over and especially in backwaters, has been sufficiently tested to permit my submitting for consideration the advisability of retaining the original sole of 30 feet. The passage of boats under sail through a 20 feet clearing in an old 30 feet bed and backwaters has been found to cause the sides, especially in fluid mud, to run down, and fill the cut 6 inches in 24 hours. The silting does not go on of course in that proportion daily, but till the superabundant stuff of the sides settles itself, the process of filling will go on.

And in respect of depth, 3½ feet below the lowest registered tides level, seems a practical limit, for it will allow 6 inches for ordinary silting, and will still leave half a foot between boat bottom and bed.

(Signed) S. OTTMANN,
Sub-Engineer, Buckingham Canal.

22nd April 1880.

BUCKINGHAM CANAL, CENTRAL SUB-DIVISION.

TABLE exhibiting Quantities of Silt deposited in the Canal by the Cyclones of May and November 1879, and the Estimates for removing the same to different widths and depths.

	Average depth of Silt deposited on Canal bed.		A. If cleared to only 3 feet below M.S.L., with bottom width of 20 feet, slopes 4 to 1.				B. If cleared to 4 feet below M.S.L., with bottom width of 20 feet, slopes 4 to 1.				C. If cleared to original section 4½ feet below M.S.L., with bottom width of 30 feet, slopes 2½ to 1 original.			
	Feet.	Inches.	Quantity, Cubic Yards.	Average Rate.	Cost.		Quantity, Cubic Yards.	Average Rate.	Cost.		Quantity, Cubic Yards.	Average Rate.	Cost.	
				RS. A. P.	RS. A. P.			RS. A. P.	RS. A. P.			RS. A. P.	RS. A. P.	
I. As per soundings made after the cyclone of May 1879.	1	6½	4,83,863	0 2 9	83,163	15 3	12,07,873	0 3 3	2,45,349	3 0	21,48,970	0 3 6	4,70,087	0 0
II. As per soundings made after the cyclone of November 1879, computed to 3 feet below M.S.L. only.	...	11½												

N.B.—This table refers to canal from Cooum to Peddaganjam only.

10th May 1880.

(Signed) A. AWDRY, Captain, R.E.,
Supt. of Works, Buckingham Canal.

MADRAS,
22nd April 1880.

(Signed) S. OTTMANN,
Sub-Engineer, Central Sub-Division Office.

No. 102-A.

Memorandum by the Chief Engineer, Public Works Department.

LETTER No. 558, dated 15th May 1880, from the Superintendent of Works, closes a series of reports and communications on the subject of the Buckingham Canal, and it thus appears desirable to submit a selection of the correspondence with plans, &c., as per margin, for the orders of Government with such supplementary remarks as appear called for in reference to the estimate which is now being framed for submission to the Government of India.

G.O., 6th February 1880, No. 283 W.
" " " " " 284 W.
Letter from Chief Engineer, No. 411, of 6th February 1880.
Appendix to G.O., of 6th February 1880, No. 284 W., with Chief Engineer's memorandum, dated 10th April 1880.
Letter No. 462, dated 10th May 1880, from Superintendent of Works, Buckingham Canal, forwarding memorandum from Sub-Engineer Ottmann.
Do. No. 558, dated 15th May 1880.

2. During the past year the canal was visited by two cyclones, one in May, the other in November, and the results of these have been duly recorded in G.Os., Nos. 283 W. and 284 W., of 6th February 1880.

3. Early in January His Grace the Governor made a tour of inspection up the canal, and the undersigned who accompanied His Grace has placed on record the results of his observations in a memorandum, dated 10th April 1880, which has since then been followed up by the correspondence quoted.

4. It would be impossible to condense the details of a work of such magnitude within moderate limits, and as the time has not yet arrived for drawing up the general report of the work for submission to the Government of India, it will suffice here to discuss one or two of the leading points regarding which it is desirable to lay down directions for the guidance of the Superintendent of Works. It is proposed moreover here to deal specifically only with the 196½ miles of channel north of Madras leaving the 40 miles south to Merkanum, which exists under somewhat different and more simple conditions for consideration subsequently.

5. Between the Coum and the Rompairu river where the canal meets the Commamur channel from Bezváda, there are not less than thirty drainages crossing the line on their way to the sea, and none of them admitting of being readily either taken into the canal, or diverted. The most important of these drainages are enumerated in paragraph 75 of Major Vibart's Inspection Report of 27th September 1879, where the catchment areas in each case are shown to vary from 147 to 20,000 square miles.

6. Throughout the whole length, but more especially towards the north, the canal is exposed to the effects of cyclone floods, which, though probably not recurring oftener than once in every seven or eight years, have nevertheless to be provided for, and fortunately the occurrence of two storms in last year, one of which (that on 18th and 19th November) was of exceptional severity, has supplied data on which it may be possible to base certain conclusions, as to the provisions required in the estimate, for securing the safety of the work.

7. The reports on the effects of these storms are as above observed recorded in detail, and the annexed longitudinal section shows in a graphic manner most of the leading facts. The marks of the flood line of November were easily distinguishable all along the banks on the occasion of His Grace's tour, and these, with the soundings taken at every furlong to ascertain the depth of silt deposited in the channel bed, have secured most valuable information for future guidance.

8. From want of precise knowledge as to the previous state of the canal bed, as also in regard to the condition of the work throughout, prior to November's flood, the section purporting to show the facts must be taken with certain reservations, though the soundings taken after each of the floods mentioned are no doubt very correct.

9. In any case it is clear that over and above the clearances effected since opening the canal in 1878, the amount of silt actually deposited in its bed, as shown in Sub-Engineer Ottmann's memorandum of 22nd April 1880, amounted to 2,148,970 cubic yards; and that to remove this quantity so as to restore the channel to its original condition would have cost Rs. 4,70,087 at present rates of working. In many places, such as in the 98th, 103rd, 107th, 112th, 128th, 134th, 143rd, 148th miles the depth of silt reached mean sea level; and in the 161st, 169th, and 178th it ranged from 1' 6" to 2' 3" above it, barring all traffic.

10. Leaving aside the fact that at present the removal of silt from the bed of the canal costs more than it probably will do with more perfect arrangements (though no very great reduction of cost can, it is feared, be looked for even with the most perfect machinery) it is clear that owing to the numerous drainages which cross the line of canal, and which cannot possibly be interfered with in their way to the sea, enormous amounts of silt are liable to be brought in and deposited with each recurring cyclone flood, and that even with the ordinary monsoon freshes silting goes on to a serious extent. As an extreme example of the amount of silt deposited even during the ordinary freshes, the fact may be mentioned that shortly after the opening of the canal in 1878, no less than Rs. 11,000 odd were expended in recovering the section of about 1 mile of canal which crosses portion of the Pennér river delta.

11. The first question that arises in reference to the work to be performed, is whether the section of the canal as originally decided on should not be reduced, so as to minimise the annual clearances, and the next whether expedients for keeping the silt out of certain reaches of the canal may not with advantage be adopted.

12. As regards the first point the Superintendent of Works argues, in paragraph 4 of his No. 558 of 15th May, that while Government should not interfere with the maximum draft for boats being left as now ruled (2½ feet), it will be "practically impossible "to effect annual clearances to a depth of 4½ feet below mean sea level. He also contends for 6 inches being left at all stages of the tide below the keel of the boats, so as to allow a little for silting that cannot at once be removed.

13. The principles on which this decision is based, although leading virtually to the abandonment of the original section of the canal and of its navigation by boats propelled by steam, seem to be sound, and the undersigned would therefore recommend —

1*st*,—that the sole be maintained throughout only 20 feet wide at 3 feet below low tide level;

2*nd*,—that the side slopes for the water section be nowhere less than 4 to 1;

3*rd*,—that tow-paths be made where practicable 3 feet above high water level.

14. The tidal action, though shown in the section by lowest and highest tide level lines, requires more study than it has been possible as yet to give to it, but it may be assumed that, had the reduced section now recommended been originally adopted, about 1 foot of excavation would have been saved throughout. At only 2 annas per cubic yard without any allowance for pumping, the saving on excavation alone would have amounted to Rs. 3,69,000.

15. As moreover argued by Captain Awdry the plan of referring all clearances in future to low water instead of to mean sea level will have the great advantage of being easily understood by the laborers.

16. In regard to the second point, viz., the expedients for keeping silt out of the channel, at least during heavy floods, it can hardly be doubted that the necessity for this would, from a mere inspection of the section, be almost a foregone conclusion.

17. The following brief table shows in a general way the financial aspect of such expedients :—

With a channel of the normal section above, viz., 20 feet breadth of sole and side slopes 4 to 1.

Assumed depths of silt to be removed ...	6″	1′ 0″	1′ 6″	2′ 0″
Corresponding quantity to be removed in cubic yards per mile	2,151	4,582	7,013	9,444
Average cost of removal at 3 annas per cubic yard ... ... Rs.	403	860	1,315	1,771
Equivalent to a capital outlay of an annual recurring charge at 5 per cent. ... Rs.	8,060	17,200	26,500	35,420

In other words, if silt to the depths shown in the first line could be excluded by certain expedients, it would be worth while incurring outlay to the amounts the capital values shown in the last line for each mile of canal.

18. To isolate each reach of the canal intervening between the drainages which must be allowed free vent to the sea, it will be necessary to establish either flood gates or locks at both ends of such reaches, and a western canal bank of such height as to be well above and exclude all cyclone floods.

19. The question of isolating by means of locks is hardly as yet in a condition to be properly discussed. These works would of course keep the water at a higher level in the different reaches than is at present possible, but their actual value in this respect cannot be determined with accuracy till at least the end of the present year, and even if shown that they would with the river bars open retain a higher level in the canal than at present seems probable, it must be borne in mind that—

1*st*,—with closed bars their value would be extremely small;
2*nd*,—their cost would be very heavy, not less than Rs. 15,000 each for those of the cheapest description having earthen slopes instead of masonry chamber walls;
3*rd*,—a heavy establishment would have to be maintained;
4*th*,—each lock would occasion delays to traffic and probably open the door to peculation from the demands of the lock establishments.

20. The time has therefore not as yet apparently arrived for their general adoption as means for isolating the several reaches, though probably for specific objects necessary for the canal in the immediate neighbourhood of Madras, as observed in memorandum of 10th April 1880.

21. A single set of lock gates might however be placed facing outwards at the end of each of the reaches which it is proposed to isolate, and as having only to be closed once and again during the actual progress of extraordinary flood to exclude silt, the establishment for working them may be small, and retained only throughout the cyclone months, say for April and May, and again from 15th October to 15th December; in fact the gates might be worked by the ordinary maintenance establishment at such exceptional times.

22. Should locks be decided on at any subsequent period, it will only be necessary to place extra gates at 120 or 150 feet in rear of each of these flood gates to make them act as such.

23. Each set of gates would cost not more than Rs. 7,000 or 7,500, and comparing this amount with the capitalized cost of silt removal (table paragraph 17) it is clear that it would pay sufficiently well to build such flood gates for reaches of canal only 2 miles* in length if they can be made to keep out even 6 inches in depth of silt.

	Rs.
Capitalized cost of clearing silt to a depth of 6 inches at Rs. 8,060 per mile for 2 miles	16,120
Cost of two flood gates	14,000
Saving ...	2,120

24. But as it will hardly ever be necessary to isolate any reach having a shorter length than 4 or 5 miles (see remarks in memorandum of 10th April) the advantage of constructing such gates must be evident, and the more so if it be considered that as a fact the May cyclone of last year brought in a depth of 1 foot 6½ inches of silt into the channel as an average (see Mr. Ottmann's memorandum of 22nd April) and the November flood added nearly a foot or more in depth.

25. In framing the detailed estimate, flood gates, with the completion of the bank on the western side of the canal to a height of at least 3 feet above the highest flood, it may therefore be assumed, will be needed.

26. The several flood gates required are specified in the memorandum of 10th April 1880 and need not be further adverted to. On precisely the same grounds, the advisability of excavating fresh portions of channel as deviations at the various points specified, in order to keep out silt, or for other reason, is advocated.

27. With reference to the action of the tides on the canal, the lines as laid down on the accompanying section, only in reality show the heights as recorded immediately within the different estuaries at the gauge stations, but do not indicate the level throughout the canal; they are therefore so far misleading. Captain Awdry's letter, however, of the 15th May shows that towards the end of the year, when the registrations at all the intermediate stations shall have been completed, accurate conclusions may be drawn.

28. From his second table giving the results already some what imperfectly obtained, the average difference of level between the mean maximum and mean minimum, as recorded at several intermediate points at distances from the open river bars, appears to be very small. At Pumbly, 64th mile, 5 miles south of Dugarázpatnam, it is only 0·19 feet, and even less (0·15 feet) at Kálanjee, 6 miles south of Pulicat.

29. These with other examples show that, although in the immediate neighbourhood of the several open bars the value of the tidal action is considerable [from particularly the Kundalairoo river (90th mile) northwards,] it apparently ceases at 7 or 8 miles distant from the several bars. South of the Kundalairoo river the action of the tide in keeping up the level of the canal is much diminished, but as above observed the whole question in this respect is at present in rather an inchoate condition.

30. The best means for removing silt from the channel also requires more study, but so far as can at present be seen there is no very distinct prospect of sensibly diminishing the present charges, heavy as they appear to be.

31. The results of the experiments which have been ordered with the "spoon dredge" advocated by His Grace, and other expedients recommended by the undersigned, will have to be awaited.

32. Steam dredges appear at first sight to hold out decided advantages, so far as concerns speed in execution of the work, but, so long as the channel is to be maintained at only 3 feet below low tide level, their utility is not so clear.

33. Upwards of one million cubic yards of silt were deposited in the channel by the May cyclone, and to remove this quantity in two months no less than 33 steam dredges, capable of clearing 500 cubic yards per diem each, would have been needed.

34. The procuring, maintaining, and manning of such a fleet of dredges would obviously be out of the question, particularly as the work, while being performed under conditions disadvantageous to the working of such machines, is well adapted to the capacity and habits of the ordinary working population, using the most simple appliances.

35. In a few places, such as the crossing of the Gundlakamma, Mushi, Pálár, Mannér and Pennér rivers it is quite possible that steam dredges may be advantageously applied, and four or five might after further inquiry be provided for.

36. As regards the other points connected with the estimate for the training of some of the rivers crossed, especially the Pennér (see memorandum of 10th April),

it would be premature to say more than has been already recorded; but that such measures will be found essential the undersigned entertains no doubt.

37. It is needless also to dwell more on subsidiary matters, which, however, will all claim attention in dealing with the detailed estimate which, it is hoped, may be ready by the end of the present year.

38. Captain Awdry in his letter under consideration shows the number of boats already using the canal and the financial condition of the work. This latter, however, is a matter with which no doubt His Grace will himself deal, and therefore calls for no remark at present from the undersigned.

29th May 1880.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

No. 214 I.

GOVERNMENT OF INDIA.

All communications should be addressed to the Secretary.

PUBLIC WORKS DEPARTMENT.

Civil Works
Irrigation

To

The Secy. to the Govt. of Madras.
P. W. Deptt.

Simla 30th July 1879.-

Sir,

As it is understood that the Buckingham Canal suffered some injury in the late Cyclone, I am desired to request that with the permission of His Grace the Governor a full report may be submitted to the Govt. of India with as little delay as possible; reliable information as to the risks attaching to a Canal in such a position being

being especially needed with reference to a Canal project under similar circumstances elsewhere which is now under the consideration of the Govt: of India..

I have the honor to be,
Sir
Your most Obedt: Servt:

G.F.L. Marshall Capt[n]
~~Offg Asst~~ ~~Deputy~~ Secy: to the Govt: of India R.E.

Vide Memo: dd 28-79.

S.W.D.

Memo: by the Chief Engr: S.W.D.

—

Letter No. 558, dated 15th May 1880, from the Supt[t] of Works, closes a series of reports and communications on the subject of the Buckingham Canal, and it does appear desirable to submit a selection of the correspondence with plans, &c., as per margin, for the orders of Govt: with such supplementary remarks as appear called for in reference to the estimate which is now being framed for submission to the Govt:

* G.O. 6th July 1880 No. 283 W
" —do— " 284 W
Letter from Chief Engr: No. 411 of 6th July 1880.
Appendix to G.O. of 6th July 1880.
No. 284 W with Chief Engineer's Memo: of 10th April 1880.
Letter No. 462 of 10th May 1880 from Supt[t] of Works Buckingham Canal forwarding Memo: from Sub Engr: Ottuma.
—do— No. 558 of 15th May 1880.

of India.

2. During the past year the Canal was visited by two cyclones, one in May the other in November and the results of these have been duly recorded in GOs Nos 283 W and 284 W of 6th Feby 1880.

3. Early in January His Grace the Governor made a tour of inspection up the Canal, and the undersigned who accompanied His Grace has placed on record the results of his observations in a Mems: dated 10th April 1880 which has since been followed up by the correspondence quoted.

4. It would be impossible to condense the details of a work of such magnitude within moderate

limits, and as the time has not yet arrived for drawing up the general report of the work for submission to the Govt of India it will suffice here to discuss one or two of the leading points regarding which it is desirable to lay down directions for the guidance of the Supdt of Works. It is ~~I~~ proposed moreover here to deal specifically only with the 196½ miles of channel north of Madras, leaving the 40 miles south to Merkanum, which exists under some-what different and more simple conditions, for con-sideration subsequently.

5. Between the Coum and the Kamparum river

where the canal meets the Commamoor Channel from Bezwada, there are not less than 30 drainages croping the line on their way to the sea, and none of them admitting of being readily either taken into the Canal or diverted - The most important of these drainages are enumerated in para 75 of Major Vibarts Inspection Report of 27th Sept. 1879 where the Catchment areas in each case are shown to vary from 147 square miles to 20000 square miles -

6. Throughout the whole length but more especially towards the north, the Canal is exposed to the effects of cyclone floods which, though probably not recurring oftener than once in every seven or eight years, have nevertheless to be provided for; and fortunately the occurrence of two storms in last year one of which (that on 18th and 19th Nov.) was of exceptional severity has supplied data on which it may be possible to base certain conclusions as to the provisions required in the estimate for securing the safety of the work.

7. The reports on the effects of these storms are as above observed recorded in detail, and the annexed longitudinal section shows in a graphic manner most

of the leading facts. The marks of the flood line of November were easily distinguishable all along the banks on the occasion of His Grace's tour, and these with the soundings taken at every furlong to ascertain the depth of silt deposited in the channel bed, have secured most valuable information for future guidance.

8. From want of precise knowledge as to the previous state of the Canal bed, as also in regard to the condition of the work throughout, prior to Nov.r 3 flood, the section purporting to show the facts must be taken with certain reservations; though the soundings taken after each

of the floods mentioned are no doubt correct.

9. In any case it is clear that over and above the clearances effected since opening the Canal in 1878, the amount of silt actually deposited in its bed, as shewn in Sub Engineer Othmans Mem.: of 22.nd April 1880, amounted to 2148970 cubic yards; and that to remove this quantity so as to restore the channel to its original condition, would have cost Rs 47,0087 at present rates of working. In many places such as in the 98.th, 103.d, 107.th, 112.th, 128.th 134.th, 143.d, 148.th miles the depth of silt reached mean sea level, and in the 161.st, 169.th and 178.th it

ranged from 1'-6" to 2'-3"
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10. Leaving aside the fact that under present arrangements the removal of silt from the bed of the Canal costs more than it probably will do with more perfect arrangements (though no very great reduction of cost can, it is feared, be looked for even with the most perfect machinery) it is clear that owing to the numerous drainages which cross the line of Canal, and which cannot possibly be interfered with in their way to the sea, enormous amounts of silt are liable to be brought in and deposited with each recurring cyclone

flood, and that even with the ordinary monsoon freshes silting goes on to a serious extent. As an extreme example of the amount of silt deposited even during the ordinary freshes the fact may be mentioned that shortly after the opening of the canal in 1878, no less than Rs 11000 odd were expended in recovering the section of about 1 mile of Canal which crosses portion of the Sunnair river Delta.

11. The first question that arises in reference to the work to be performed is whether the section of the Canal as originally decided on

should not be reduced so as to minimise the annual clearances, and the next whether expedient for keeping the silt at certain reaches of the Canal may not with advantage be adopted.

12. As regards the first point the Supt. of Works argues in para 4 of his No. 558 of 15th May that while Gates should not interfere with the maximum draft for boats being left as now ruled ($2\frac{1}{2}$ feet), it will be an "practically impossible" to effect annual clearances to a depth of 4½ feet below mean sea level. He also contends for 6 inches being left at all stages of the tide below the keel of the boats so as to allow a little for silting that cannot at once be removed.

13. The principles on which this decision is based although leading virtually to the abandonment of the original purpose of the Canal and of its navigation by boats propelled by steam seem to be sound; and the undersigned would therefore recommend

1st. that the sole be maintained throughout only 20 feet wide at 3 feet below low tide level.

2nd. that the side slopes for the water section be no where less than 4 to 1.

3rd. that tow paths be made where practicable

3 feet above high water level.

14. The tidal action, though shown in the section by lowest and highest tide level lines, requires more study than it has been possible as yet to give to it, but it may be assumed that, had the reduced section now recommended been originally adopted, about 1 foot of excavation would have been saved throughout. At only 2 annas per cubic yard without any allowance for pumping the saving on excavation alone would have amounted to Rs 369,000.

15. As moreover argued by Captain Awdry the plan of referring all

1930

clearances in future to low water instead of to mean sea level will have the great advantage of being easily understood by the labourers.

16. In regard to the second point, viz: the expedients for keeping silt out of the channel, at least during heavy floods it can hardly be doubted that the necessity for this would, from a mere inspection of the section, be almost a foregone conclusion.

17. The following brief table shews in a general way the financial aspect of such expedients

With a channel of the

normal section above : viz.,
20 feet breadth of sole
and side slopes 4 to 1.

Assumed depths of silt to be removed	6"	1'0"	1'6"	2'0"
Corresponding quantity to be removed in cubic yards per mile	2157	4582	7013	9444
Average cost of removal at 3 annas per cubic yard - Rupees	403	860	1315	1771
Equivalent to capital outlay of an annual recurring charge at 5% - Rupees	8060	17200	26500	35420

In other words if silt to the depths shewn in the first line could be excluded by certain expedients, it would be worth while incurring outlay to the amounts the capital values shewn in the last line for each mile of canal.

18. To isolate each

reach of the canal intervening between the drops which must be allowed free vent to the sea, it will be necessary to establish either flood gates or locks at both ends of such reaches, and a western canal bank of such height as to be well above and exclude all cyclone floods.

19. The question of isolating by means of locks is hardly as yet in a condition to be properly discussed. These works would of course keep the water at a higher level in the different reaches than is at present possible, but their actual value in this respect cannot

be determined with accuracy till at least the end of the present year, and even if shewn that they would with the piers bare open retain a higher level in the canal than at present seems probable, it must be borne in mind that if with closed bars their value would be extremely small.

2nd Their cost would be very heavy - not less than Rs 15000 each for those of the cheapest description having earthen slopes instead of masonry chamber walls.

3rd A heavy Establt would have to be maintained.

4th Each lock would occasion delays to traffic and probably open the door to speculation from the demands of the lock establishments.

20. The time has therefore not as yet apparently arrived for their general adoption as means for isolating the several reaches, though probably for specific objects necessary for the canal in the immediate neighbourhood of Madras, as observed in Memo: of 10th April 1850.

21. A single set of lock gates might however be placed facing outwards at the end of each of the reaches which it is proposed to isolate, and as having only to be closed once and again during the

actual progress of extra-
ordinary flood to exclude
silt, the Establishment
for working them may be
small and retained only
throughout the cyclone months
say for April and May
and again from 15th October
to 15th December; in fact
the gates might be worked
by the ordinary maintenance
establishment at such
exceptional times.

22. Should locks be
decided on at any sub-
sequent period, it will
only be necessary to place
extra gates at 120 or 150
feet in rear of each of
these flood gates to make
them act as such.

23. Each set of gates
would cost not more than
Rs 7,000 or 7,500, and

comparing this amount with
the capitalized cost of
silt removal (table para
17) it is clear that
it would pay sufficiently
well to build such flood
gates for reaches of canal
only 2 miles in length if
they can be made to keep
out even 6 inches in depth
of silt.

24. But as it will
hardly ever be necessary to
isolate any reach having
a shorter length than 4
or 5 miles (see remarks re
Means: of 10th April) the
advantage of constructing
such gates must be evident
and the more so if it be
considered that as a fact
the May cyclone of last
year brought in a depth

* Capitalized cost of clearing silt to a depth of 6 inches at Rs 8,060 per mile. for 2 miles — Rs 16,120
Cost of 2 flood gates — 14,000
Saving Rs 2,120

of 1' 6½" of silt into the channel as an average (see Mr. Othmans Mems: of 22nd April) and the Nov.r flood added nearly a foot more in depth.

25. In framing the detailed estimates, flood gates, with the completion of the bank on the western side of the Canal to a height of at least 3 feet above the highest flood, it may therefore be assumed, will be needed.

26. The several flood gates required are specified in the Mems: of 10th April 880, and need not be further adverted to. On precisely the same grounds the advisability of excavating fresh portions of channel

as deviations at the V 33
various points specified in order to keep out silt, or for other reasons is advocated.

27. With reference to the action of the tides on the Canal, the lines as laid down on the accompanying section only in reality shew the heights as recorded within the different estuaries at the gauge stations, but do not indicate the level throughout the Canal; they are therefore so far misleading. Captain Andrijs letter however of the 15th May shews that towards the end of the year, when at all but intermediate stations the registrations shall

have been completed, accurate
conclusions may be drawn.

28. From his second table
giving the results already
imperfectly obtained the
average difference of level
between the mean maximum
and mean minimum, as
recorded at several inter-
mediate points at distances
from the open river bars,
appears to be very small-
At Symbly, 64 ½ mile, 5
miles south of Dugarázpatam,
it is only 0.19 and even
less (0.15ft) at Kálanjee,
6 miles south of Tuticat.

29. These with other
examples show that, in
although in the immediate
neighbourhood of the several
open bars the value of the

tidal action is considerable,
[from particularly the
Kundalaroo river (90 ½
mile) northwards,] it
apparently ceases at 7 or 8
miles distant from the
several bars. South of
the Kundalaroo river
the action of the tide in
keeping up the level of
the canal is much diminish-
ed, but as above observed
the whole question in this
respect is at present in
rather an inchoate con-
dition.

30. The best means for
removing silt from the
channel also requires
more study, but so far
as can at present be
seen there is no very

distinct prospect of sensibly diminishing the present charges, heavy as they appear to be.

The results of the experiments which have been ordered with the "Spoon dredge" advocated by His Grace, and other expedients recommended by the undersigned, will have to be awaited.

31. Steam dredges appear at first sight to hold out decided advantages, so far as concerns speed in execution of the work, but, so long as the channel is ~~only~~ to be maintained at only 3 feet below low tide level, their utility is not so clear.

32. Upwards of 1 million cubic yards of silt were deposited in the channel by the May Cyclone, and to remove this quantity in 2 months, no less than 33 steam dredges, capable of clearing 500 cubic yards per diem each, would have been needed.

33. The procuring, maintaining, and manning of such a fleet of dredges would obviously be out of the question, particularly as the work, while being performed under contractors disadvantageous to the working of such machines, is well adapted to the capacity and habits of the ordinary working population using the most

simple appliances

34. In a few places such as the crossing of the Gnedlaumma, Moosecpalan, Mynnairoo and Pennair rivers it is quite possible that steam dredges may be advantageously applied, and 4 or 5 might after further enquiry be provided for.

35. As regards the other points connected with the estimate for the training of some of the rivers crossed, especially the Pennair, (see Mem: of 10th April,) it would be premature to say more than has been already recorded: but that such measures will be found essential,

the undersigned entertains no doubt. V&R/36

36. It is needless also to dwell more on subsidiary matters, which however will all claim attention in dealing with the detailed estimate on which it is hoped may be ready by the end of the present year.

37. Captain Hardy in his letter under consideration shows the number of boats already used on the Canal and the financial condition of the work. This latter however is a matter with which no doubt His Grace will himself deal, and therefore calls for no remark at

present from the under-
signed.

R. M. Sankey Col. R.E
Insp. Engineer
S.W. Depts

29th May, 1880.

280w
208/w

Statement shewing the range of the rise and fall of tides in different parts of the Buckingham Canal during 1879.

No.	Stations	January 1879	February	March	April	May	June	July	August	September	October	November	December 1879	Remarks
1	Palar River Zero of the Gauge 2·50 below M.S.L										3·72 2·49 4·40 2·12 4·45 2·21 5·90 2·00 4·14 2·01 4·75 1·90			
2	Covelong Zero of the Gauge 2·00 below M.S.L										2·69 2·55 2·57 1·36 3·52 2·98 4·92 1·70 2·59 2·35 3·35 1·65			Backwater near Bar
3	Adyar River Zero 4·5 below M.S.L										6·69 6·59 8·35 5·00 6·13 4·30 8·00 3·50 5·45 4·10 6·30 3·40			
4	Shadenkuppum lock	3·45 5·10 5·6 6·6 5·6 5·5 5·5½ 5·10 5·0 5·3 5·2 5·7 6·0 6·5 6·5 6·8 6·2 6·3 6·2 8·0 5·6 5·4½ 5·10 6·1 5·10 6·5 6·5 7·5 5·10 6·8 6·8 7·7 6·1 6·5 6·1									5·8 7·3 7·3 8·2 6·5 7·4 7·3 9·5 6·3			
4a	Do Zero 6·12 below M.S.L	4·25 5·9 5·1 6·6 4·5 5·4 4·9 5·10 4·5 5·0 4·4½ 5·7 4·7 5·1½ 4·9 5·5 4·5 5·3 4·10 7·0 4·2 5·5 5·2 5·5 4·4 5·8 5·2 6·10 4·6 5·4 5·2 6·7 4·7 5·9 5·3									5·3 6·4 6·2 8·2 5·4 5·11 5·10 7·6 5·3 6·3 5·3 6·11 4·9			
5	Ennore Zero 1·5 below M.S.L							1·93 1·15 2·30 0·65 1·89 1·30 2·66 2·19 4·10 1·40 3·18 2·55 4·80 1·00 2·36 1·05 3·30 0·60						Lake near Bar
6	Pulicat Zero 0·67 below M.S.L							1·72 0·83 2·0 ·50 1·23 1·10 0·60 1·98 1·36 3·30 0·70 2·94 2·27 6·40 0·90 1·99 0·97 2·50 0·40						Bar
7	Jonagoliem Zero not known	1·14 1·10 2·00 1·10 2·04 1·09 2·20 1·08 2·18 1·10 2·30 1·08												On Pulicat Lake
8	Dugarajapatam										2·11 2·3 3·5 1·6 2·10 1·11 4·1 1·3			Backwater near Bar
9	Kandalakoo River 4·5 below M.S.L	5·10 3·9 6·9 3·9 5·8 3·7 6·3 3·6 6·1 3·8 6·5 3·6						6·5 4·6 7·6 3·7 6·8 4·2 7·2 3·9 6·6 4·3 7·6 4·2 6·7			4·3 6·8 4·5 8·5 4·8 7·4 5·2 8·9 4·3 6·8 4·4 7·3 4·5			
10	Salt Bank of Tamaicois Zero 2·50 below M.S.L	3·01 1·18 3·80 0·05 2·72 2·25 3·55 0·45 6·12 2·95 7·00 2·70 6·38 3·32 8·20 2·80 6·30 2·87 7·55 2·60 6·14 3·11 7·10 2·70 6·32 3·38 7·45 2·90 6·37 3·10									3·20 6·67 3·43 8·20 3·10 7·14 3·94 9·30 3·20 2·61 2·33 8·10 1·45			
11	Pydaroo River Zero 2·00 below M.S.L										6·88 6·63 7·90 6·20 7·40 6·25 11·00 5·30 5·56 4·21 8·20 1·90			
12	Chittalakoo River Zero 2·00 below M.S.L										5·8½ 4·8 11·6 3·8 6·7½ 4·9 8·1 3·8½ 5·9 3·0¾ 7·3 2·3½			
13	Kummakoo River Zero 2·00 below M.S.L										6·13 5·19 9·30 4·00 6·28 4·13 11·10 2·1 5·5 2·7 7·2 1·9			
14	Mooty River Zero 2·00 below M.S.L													At Temporary lock Pherungidibba
15	Romjekoo River Zero Not known	5·11 4·3 6·10 3·8 5·9 3·8 6·6 3·3 5·10½ 3·9½ 6·6 3·6 6·1½ 3·3 7·6 3·6 6·8 3·8 9·6 3·6 5·9 3·6 6·6 3·6 8·7½ 3·5 6·9 3·5												Commencement Junction
16	Junction Canal Tadagampoo Zero not known	4·0¾ 2·11½ 5·2 1·9 3·9½ 2·7½ 5·6 1·8 4·3 3·2 7·11 2·8 4·9½ 2·9½ 5·10 2·5 5·7½ 2·3½ 4·9 2·8 4·11½ 3·2½ 6·2 2·6												

Buckingham Canal
Superintendent's Office

H. Thomas
Public Works Department

Statement shewing the Range of the rise and fall of Tides in different parts of the Buckingham Canal during the year 1878.

2080-1/128

Station	January 1878				February				March				April				May				June				July				August				September				October				November				December				Remarks
	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	Maximum or highest Tide above datum of the Gauge	Minimum or Low Tide below datum of the Gauge	Highest Tide during the month	Lowest Tide during the month	
Cokomandel Zero of the Gauge not known.																																	5.37	5.23	6.05	5.10	5.88	5.31	6.40	5.00	6.09	5.74	6.25	5.35	6.07	5.42	6.35	5.35	In lake 27th Mile
Jamagipolinum Zero of the Gauge not known																																					4.37	4.24	4.57	3.85	4.48	4.33	4.57	3.35	4.39	4.27	4.62	3.35	In lake. 42d Mile
Dugarajapatam Zero not known																																					1.80	1.63	2.20	1.40	1.77	1.60	1.90	1.45	1.83	1.74	2.00	1.60	In backwater 69th Mile.
Kamparoo River Zero not known	5.1½	3.8	6.3	3.2	5.1	3.5	6.1	3.4	6.1½	3.2	6.8	3.0	6.6	3.1	6.6	2.10	6.5	3.3½	6.2	3.0	5.7	3.1½	6.3	3.3	5.7	4.5	6.6	3.6					6.5	5.7	8.8	4.10	6.3	5.7	8.8	1.1	0.9	0.6½	1.7	0.1	3.11	2.7	6.8	0.1	At Temporary lock Pallinguidilla.

Buckingham Canal
Levelling Office ?

Manager
Buckingham Canal
14/2/80

Statement shewing the Draught of Water of Boats licensed for
Cargo plying on the Backing Canal from 8th October 1879 to
31st January 880.

Sections	Below 1½ feet	From ½ to 2 feet	From 2 to 2½ feet	Total Boats	Remarks
For Lagoon Section	87	15		102	These few only of Kistna &
For Kharra do	29	4	8	41	Godavery boats licensed for the
C for Pulicat do	271	170	219	660	Canal are included herein.
D for Nizampatam do	3	12	3	18	The Kistna & Godavery Officers
E for Kanapatam do	2	18	4	24	have been applied to for
F for Kotipatam do	18	34	10	62	information in this matter.
Total	410	253	244	907	

Kharra
14th Feb/80
Ld. DC

H. Thomas Sub Inspector
Backing Canal

October. 2485 0 0

Statement Showing Toll Collections on the Buckingham Canal
From January 1877 to September 1879.-

44

Year	Month	Amount Rupees	a's	Pies	Remarks.-
1877	January—	1846	15	9	
	February—	380	5	0	
	March.—	"	"	"	
	April.—	"	"	"	
	May.—	733	9	"	
	June.—	5651	4	"	
	July.—	3192	9	3	
	August.—	1392	8	6	
	September.—	1363	4	0	
	October.—	2555	15	0	
	November.—	2889	0	0	
	December.—	3196	8	9	
1878	January.—	3110	13	3	
	February.—	2480	14	3	
	March.—	2223	14	9	
	April.—	4472	8	3	
	May.—	7248	7	0	
	June.—	7366	15	9	
	July.—	7704	15	0	
	August.—	4718	3	0	
	September.—	2705	8	0	
	October.—	2485	0	0	

1878	November	1418	3	0
	December	1194	11	0
1879	January	2587	4	0
	February	2451	8	0
	March	2484	0	9
	April	2519	1	6
	May	4519	7	0
	June	5663	13	0
	July	5649	11	0
	August	2826	1	0
	September	2396	13	0
	Total	101,429	11	9

£33 omitted

14th February 1880

Lieut Engineer Buckingham

Ex LBC
12/2

P.W.D.
24MAR80
No. 2101 3226

Comparative Statement showing the present and proposed Establishment for the Buckingham Canal.

468

No.	Present Establishment Descriptions	Rate Per month	Rate Per annum	Amount	No.	Proposed Establishment Descriptions	Rate Per month	Rate Per annum	Amount	Increase	Decrease
	A or Sadras Section Office 2nd Class					A or Sadras Section Office 2nd Class					
1	Superintendent	50	600		1	Superintendent	20	240			
1	Clerk	20	240		1	Clerk	15	180			
1	Cashier	15	180		"	"	"	"			
1	Do.	12	144		"	"	"	"			
3	Peons	7	252		2	Peons	7	168			
2	Lascars	7	168		2	Lascars	6	144			
			1584					732		852	
	B or Madras Section Office 1st Class					B or Madras Section Office 1st Class.					
1	Superintendent	100	1200		1	Superintendent	30	360			
1	Clerk	30	360		1	Clerk	15	180			
1	Do.	15	180		"	"	"	"			
3	Peons	7	252		2	Peons	7	168			
2	Lascars	7	168		2	Lascars	6	144			
			2160					852		1308	
	C or Pulicat Section Office 1st Class					C or Pulicat Section Office 1st Class					
1	Superintendent	60	720		1	Superintendent	25	300			
1	Clerk	20	240		1	Clerk	15	180			
1	Cashier	15	180		"	"	"	"			
1	Do.	12	144		"	"	"	"			
3	Peons	7	252		2	Peons	7	168			
2	Lascars	7	168		2	Lascars	6	144			
			1704					792		912	
						Carried over					3072

Brought forward . 3072

D or Chrishnapatam Section Office 1st Class

As per particulars for Pulicat Section	1704		
D° D°	1704		

D or Chrishnapatam Section Office 1st Class.

As per particulars for Pulicat Section	792		912
D° D°	792		912

E or Ramayapatam Section Office 1st Class.

D° D°	1704		

E or Ramayapatam Section Office. 1st Class.

D° D°	792		912

F or Kottapatam Section Office 2nd Class.

1	Superintendent	50	600		
1	Clerk	20	240		
1	Cashier	15	180		
1	D°	12	144		
3	Peons	7	252		
2	Lascars	6	168		
			1584		

Division Office

1	Clerk	30	360		
1	D°	20	240		
1	Attender	8	96		
2	Peons	7	168		
			864		

Basin Office

"	"	"	"		

F or Kottapatam Section Office 2nd Class.

1	Superintendent	20	240		
1	Clerk	15	180		
"	"	"	"		
"	"	"	"		
2	Peons	7	168		
2	Lascars	6	144		
			732		852

Division Office

2	Clerks	15	360		
1	D°	12	144		
1	Attender	10	120		
2	Peons	7	168		
			792		792

Basin Office

1	Superintendent	30	360		
2	Lascars	6	144		
			504	504	"

Carried over 504 5820

Brought forward 504 5820

Total 11,304 Total 5988 504 5820

49

Net Saving by present proposal 5,316

Buckingham Canal Division Office 14th February 1880

Williams
Sub Engineer. Buckingham Canal.

Statement Shewing the Amount of Collection of Licence fee and Tolls &c on Roads for the Buckingham Canal.

Ending from 8th October 1879 to 31st January 1880.

Month	A or Cuddalore Section	B or Madras Section	C or Palicat Section	D or Pitchnapatam Section	E or Nemapatam Section	F or Kollipatam Section	Total Collection	Grand Total of Licence fee & Tolls	Remarks
	Licence fee / Tolls &c	Licence fee / Tolls &c	Licence fee / Tolls &c	Licence fee / Tolls &c	Licence fee / Tolls &c	Licence fee / Tolls &c	Net Licence fee / Tolls &c		
October 1879	57 28 . 58 6 4 . 28 12 . 139 11 . 30 2 7 . 68 6 .	. . . 5 2 5 . . 6 3 .	28 1 8 . 16 4 . .	21 3 8 . 132 4 11 .	36 8 5 11 .	5 0 10 6 .			
November 1879	1 90 . . 20 7 4 . 42 9 12 . 18 8 0 8 . 7 6 3 . . 6 1 4 6 .	. . . 4 7 8 . .	5 4 6 4 . 7 2 . .	32 9 4 . 14 5 7 2 .	39 0 2 2 .	5 4 3 6 14 .			
December 1879	6 4 8 . 22 8 4 . 1 7 8 . 39 2 2 6 . 8 1 7 8 . 5 2 4 4 . 4 9 8 . 4 5 7 . . 5 8 . .	4 9 0 4 . 3 0 . .	12 0 6 . 11 8 6 .	47 6 4 8 .	59 5 0 8 .				
January 1880	8 7 3 8 . 20 5 . . 23 8 . . 14 7 7 10 . 18 2 5 8 . 7 6 0 10 3 . 15 0 . .	4 7 2 12 . 3 5 4 8 .	5 0 12 . 30 3 8 .	21 8 14 . 32 4 9 . .	36 5 5 10 3	6 9 0 4 10 3			
Total	114 0 8 . 122 6 12 . 112 2 . . 76 7 4 3 . 37 0 8 7 . 36 5 10 3	19 9 8 . 18 6 14 .	7 4 8 .	18 1 8 12 . 56 9 8 .	58 2 . .	7 2 14 7 .	160 8 7 15	3 23 3 0 2 6 3	

Examined
Seb/b

J. Hennius Sub Engineer
Buckingham Canal

SDC
12/2

3. As regards the Statement of Arrangu

Madras 14th February 1880.

P 1/96

To

Colonel R. H. Sankey R.E. C.B.
Chief Engineer P.W.D.

Sir

I beg to send herewith, in part of the information you required me to compile, in the Memorandum you left with me (on return from your inspection of the Canal in last month), the following papers.

Encls. 6.

2 Statements of Side Gauge for 1878 & 1879.
1 Statement of Draught of boats registered on the Canal.
1 Statement of Toll Collections from October to January last.
1 Statement of Toll Collections, for 2 years preceding under the old Rules.—
1 Statement of present & proposed Toll Establishment for the Canal.—

2. With respect to the Side Gauge ranges, as the Gauges have not all been fixed to the same zero, I could not adopt one uniform unit of Comparison, say to M.S.L.—

3. As regards the Statement of draught

of boats, I have addressed the Officers of Kristna & Godavery Districts for information to complete the Statement, for only a small percentage of those District boats have as yet been registered on this Canal.- The present Statement comprises only the Registered Boats for the period named, of all Districts.-

4. The 2 Statements of Toll Collections require no notice. The recent ruling of passing empty boats free of Tolls will, necessarily reduce the Collections, of the future.-

5. The Statement of Toll Establishment present and proposed, needs some explanation. I have classified the Offices in the order of importance creating four 1st Class and 2 2nd Class Offices,- of the 1st Class offices the Madras Office is provided with a Superintendent on 30 rupees it will be observed: This is done to provide for the present Head Clerk of that Office, who will soon put in his time for pension when the Salary may be reduced to the same Standard as that of the others.-

The present Superintendent on 100 rupees, will have to retire, as it will be a heavy charge certain hair, nor will be equitable to the other Officers, to admit so great a disparity of Salary.

It will be observed also from the Statement that there is provision for an establishment at the Basin. This I find absolutely necessary, in short there is such an establishment now, a Sub Overseer of Work establishment, & 2 Peons of Toll Establishment doing the duty. The large and important business done at the Basin, and the keeping in order of boats in it, regulating loading & unloading &c., requires a higher paid individual, and I would suggest one on 50 rupees, who should not be a native, for boatmen seem not to care for them.-

In the present scale of Toll Establishment, the Division Office is provided with 2 Clerks on 30 & 20, an attender on 8 and 2 Peons on 7 rupees: We find the number of hands, far short of actual demand for the Labor involved, and have had therefore to call in 2 Clerks from the Toll Offices to assist, and with that it is as much as

they all can do to keep apace with the Toll Department work, that tells very hard indeed on the Division Office establishment, also there being but one Accountant, and one assistant available. I have therefore recast the present scale of establishment by which Clerks are secured. In the matter of the Toll Establishment of the Division Office, I write from the close experience of four months, and trust no reduction will be made, while on the other hand, I would be glad to see higher Salaries given, this work being really hard, and which will increase year after year, as the Traffic increases, which certainly it must.

6. The Longitudinal Section is in hand.

The District Maps were received only yesterday from the Revenue Survey Office. They will be put together at once, and the Canal map made up therefrom, as per instructions you gave me.

The others papers & Statements are being Compiled.

I am Sir
Your Obed[t] Servant
[illegible]
Div[l] Engineer

Statement shewing the Mean Annual Maximum and Minimum heights of Tides for the year 1879-80

Reduced to heights above and below Mean Sea Level.

No.	Gauge Stations	Zero of the Gauge below M. S. L.	April 1879		May		June		July		August		September		October		November		December		January 1880		February		March		April		Mean Annual Maximum height of Tides	Mean Annual Minimum height of Tides
			Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide	Maximum tide	Minimum tide		
			averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month	averaged during month		
1	Palar River near Kadalur	2·50	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 1·22	− 0·01
2	Covelong	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 0·69	+ 0·53
3	Adyar River	4·50	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 1·77	+ 0·90
4	Chadarpancoppam Lock N.G.	6·12	− 1·00	− 1·37	− 0·87	− 1·29	− 0·87	− 0·95	− 0·46	− 0·95	− 0·79	− 0·95	− 0·37	− 0·48	+ 0·21	+ 0·05	− 0·20	− 0·29	+ 0·13	− 0·87	− 0·99	− 1·40	− 0·44	− 1·62	− 0·87	− 1·78	− 0·96	− 1·63	− 0·57	− 1·09
5	Ennore	1·50	"	"	"	"	"	"	"	"	+ 0·48	− 0·35	+ 0·89	+ 0·20	− 0·86	− 0·45	+ 0·37	− 0·89	− 0·04	− 1·02	− 0·13	− 1·00	− 0·33	− 1·04	+ 0·50	− 0·38				
6	Pulicat	1·50	"	"	"	"	"	"	"	"	+ 0·22	− 0·67	− 0·24	0·70	+ 0·48	− 0·14	+ 1·44	+ 0·77	+ 0·49	− 0·53	− 0·10	− 1·19	+ 0·94	− 0·38	+ 0·58	− 0·49	+ 0·41	− 0·69	+ 0·44	− 0·44	
7	Dugarazupalam	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 0·92	+ 0·25
8	Kundalaroo River	4·50	+ 1·58	− 0·84	"	"	"	"	"	"	+ 1·92	− 0·50	+ 2·16	− 0·33	+ 2·00	− 0·25	+ 2·08	− 0·17	+ 2·16	− 0·17	+ 1·84	− 0·92	+ 1·28	− 0·92	+ 1·84	− 0·92	+ 1·35	− 0·42		
9	South Bank of Pennaur River	2·50	+ 3·62	+ 0·46	+ 3·88	+ 0·82	+ 4·00	+ 0·37	+ 3·64	+ 0·61	+ 3·82	+ 0·78	+ 3·87	+ 0·91	+ 4·17	+ 0·93	+ 4·44	+ 1·09	+ 4·17	− 0·17	+ 3·44	− 1·48	+ 3·30	− 1·75	+ 3·12	− 1·84	+ 3·12	− 0·08		
10	Pydaroo River	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 4·88	+ 4·63
11	Chippalaroo River	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 6·32	+ 4·61
12	Mummaroo River	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 3·70	+ 2·66
13	Moosey River	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 4·43	+ 3·49
14	Gundlacomma River	2·00	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	+ 3·45	+ 0·99

Those closed and the heights in months so marked omitted from calculating average

It should be noted that from the Palar to the Pennaur M.S.L is De Havelands M.S.L at Fort Saint George Madras carried along the Canal
from the Pennaur to the Gundlacomma M.S.L is the mean arrived at by Lieutenant Henderson R.E from six months observations of Tides in the Pennaur in 1875
Spalding. Both High and Low water appear to be at a uniformly higher Level in this Northern Section than in the Southern. Possibly
Mr. Henderson's for low. Moosey.

A. Austen, Captain R.E
Superintendent of Works
Buckingham Canal.

P.W.D.
18MAY80
NR

Buckingham Canal.

Statement shewing
the Mean Maximum
and Minimum
heights of Tides.

P.W.D.
18 MAR 80
No. 3228

Buckingham Canal

Statement shewing the mean, maximum & minimum heights of Tides.

Statement shewing the Mean Maximum and Minimum heights of tides

Number	Mileage	Gauge Stations	Zero of the Gauge below M.S.L.	Reduced to M.S.L. Mean Maximum height of tides	Reduced to M.S.L. Mean Minimum height of tides	Differences Columns 5 & 6	Remarks
1	2	3	4	5	6	7	
1				+ 0·93	46	1·3	(Bar closed on 2nd April)
2	40/VI "	Sadras	4·50	.	.		
3	31/VI "	Salancoopam	2·00	−0·71	−0·79	0·08	
4						0·35	(Bar open in April)
5	13/VII "	Sholanallor	2·00	+0·03	−0·33	0·36	
6	5/VII "	Head of Sadras Canal	4·50	"	"		
7						1·29	(Bar closed in April)
8	5/III "	Greenways Bridge	4·50	"	"		
9	1/VI North	Basin	4·50	"	"		(Coovum Bar closed in April)
10						0·52	
11						0·88	(Bar open in April)
12	19/I "	Kalanjee	2·00	−1·35	−1·50	0·15	
13						0·88	(Bar open in April)
14	31/IV "	Thanipanthab	2·00	−0·32	−1·11	0·79	
15	37 "	Thetapett	2·00	−0·02	−0·51	0·49	
16	43/V "	Jonaghipallem	2·00	+0·46	+0·28	0·22	
17	59 "	Royadoorum	2·00	"	"		
18	64 "	Pumbly	1·50	+0·64	+0·45	0·19	
19						0·88	(Bar open in April)
20	76 "	Soonamooky River	1·50	+0·62	+0·20	0·42	(Soonamooky River bar closed in April)
21	7	#12#	5	5	5	4	

1	2	3	4	5	6	7	
21	81 / VI	Kanoopur	2.00	+0.59	-0.12	0'.71	
22						2'.27 (Bar	open in April)
23	103 / I	Kodoor	2.00	+0.06	-0.27	0'.33	
24						3'.20 (Bar	open in April)
25	120 / IV	Ramatheertham	2.00	+1.40	-0.05	1'.45	
26						1'.56 (Bar	open in April)
27	127 / V	Iskapally	2.00	+1.70	+0.56	1'.14	
28						1'.57 (Bar	open in April)
29	142 / I	Kottachuttram	2.00	+1.81	+1.34	0'.47	
30	149 / II	Ramapatam	2.00	+1.96	+1.67	0'.29	
31						2'.24 (Bar	open in April)
32	164 / V	Ottaravu below at Pakala	2.00	+2.41	+0.49	1'.92	
33						2'.47 (Bar	open in April)
34	177 / VI	Thondaroo Creek	2.00	+1.80	+0.44	1'.36	
35						2'.78 (Bar	open in April)
36	190 / VII	Kanuparthy	2.00	+0.93	-1.00	1'.93	

The figures in Red are the averages of several months of old gauges (only calculated when Bars are open) as per separate Statement.

The figures in Black are the averages for one month (April) of the new intermediate gauges.

A. Alcock. Captain R.E.
Superintendent of Works
Buckingham Canal

15th May 1880

Return Statement showing the Draught of water on the Buckingham Canal from 5th October 1879 to 31st March 1880.

Section

	Below 1½ ft.	From 1½ to 2 ft.	From 2 to 2½ feet	Total Boats	Remarks
A or Sultan Section	57	16	-	103	
B or Madras Do.	29	5	8	42	
C or Pulicat Do.	285	191	265	741	
D or Krishnapatam Do.	11	13	4	21	
E or Ramapatam Do.	5	21	5	31	
F or Kottapatam Do.	18	35	12	65	
Krishna & Gundlacamma Canal					
	428	281	1306	2015	

Above Boats Cleared for Ships Cargo on the Buckingham Canal

Above Boats Cleared for Sand Ballasting on the Buckingham Canal

Above Boats Cleared for Passengers on the Buckingham Canal

Office of the Superintendent of Works
Buckingham Canal
17th May 1880

A. Alcock. Captain R.E.
Superintendent of Works
Buckingham Canal

56

P.W.D.
10MAY80
No. 3225

Buckingham canal

Revised Statement shewing the Draught of water of Boats licenced for and plying on the Buckingham Canal from 8th October 1879 to 31st March 1880.

57
57

Buckingham Canal Division

Statement showing the Receipts and Charges of the Buckingham Canal

18
56

Receipts

Items	Amount
Amount of License fees for 1880-81. 9,500 Tons at Rs 2 per Ton	19,000
Toll Collections	51,600
Sales of Canal produce	700
	71,300
Difference	138,271
	209,571

Office of the Superintendent of Works
Buckingham Canal
Chepauk 17th May 1880

Charges

Items	Amount	Remarks
Maintaining the Southern Canal 40 miles at Rs 110 = 4,400		
Do Junction and Northern Canal 207 miles at Rs 275 = 56,925	61,325	
Present permanent Establishment employed in the Division at Rs 2,800 per mensem for 12 months	16,800	*Half only entered to Canal maintenance as the same Establishment carries on Original Works, Salt Works, and other Special Works.
Toll Establishment as per revised sanctioned scale at Rs 515 per mensem for 12 months	6,180	
Lock Establishment at Rs 110 per mensem for 12 months	1,320	
	85,625	
Interest on Capital for Rs 3,098,664 at 4 per cent per annum	123,946	
	209,571	

A. Awdry, Captain R.E.
Superintendent of Works
Buckingham Canal

P.W.D.
18 MAY 80
No. 3228

Statement shewing
the receipts and
charges of the
Buckingham Canal

No 558 Office of Superintendent of Works
Buckingham Canal
15th May 1880.
Desp. 17th do

From,
The Superintendent of Works,
Buckingham Canal.

To,
The Chief Engineer
Public Works Department.

Sir,

With reference to your No. 953 of the 24th March 1880 I have the honor to inform you that I have just received from Mr. Ottmann the Survey of the canal and the longitudinal Section shewing the silt deposited by the cyclones of May and November in last year the height of the Floods, Tides and Banks; and I forward them herewith.

2. I also return as directed the enclosures to your letter under reply and with reference to para 2 - have had a revised Statement made out as required. I have omitted from the calculation all months when bars were closed and

* Part of ms. Co. 2495 and ms. to Addy 18 April 80

Enclosures. 7.

and have added the readings to the end of April. By the end of this year I hope to have a far more extensive and valuable record of Tides and I shall before the close of the year have checked the line of levels joining the Zeros of the Gauges. There is a marked change in Gauge readings between the Canal South and North of the Pennair for the M.S.L. used on the Southern part is De Havillands', and from the Pennair northwards M.S.L. was arrived at by tidal observations in 1891 for six months at the Pennair by Lieutenant Henderson. R.E. It is actually found in the Northern Canal that in many places the tide does not fall nearly to so low a level as the canal bed (4.50 below M.S.L.) would lead one to suppose, either therefore there must be something wrong in the levelling from the Pennair Northwards for determining M.S.L

or else the canal was cut out to more than 4.50 feet below M.S.L, fortunately the fault as regards depth of canal appears to be on the right side.

3. The average readings of High and Low Tides on the intermediate Stations recently set up is herewith sent as requested in the latter part of your para 2, but I fear that the observations have not been taken long enough to be a very sure guide.

4. With reference to draught of Boats I think that in the present state of the canal it will be advisable not to alter the Rules as to depth, while I should feel disposed not to interfere with boats loaded beyond the load line of 2½ feet above Keel as if they do overload they will be liable to detention in waiting for high tides, and at present it would I think be injurious to growing traffic to measure boats

boats for a greater depth than 2½ feet and register their tonnage accordingly. I quite agree that we should endeavour to make the canal available for steam traffic and that 4½ feet below M.S.L is the very least that would do for this, but 4½ feet is a depth which it is impossible practically to work down to by manual labour and it would require dredging to keep it clear so that for this depth dredgers would have to be kept up for the whole length of the canal. There is so much still to be done to the canal before we could put steamers on it with any great chance of their doing well, that ~~for the present~~ it will I should consider be best to make all gate cills at least 4.50 feet below M.S.L and for the present endeavour to maintain a depth of 3.00 below lowest tide and make no alteration in the Rules but permit heavy boats to use the canal and take their chance of sticking until a high Tide

8112

Tide frees them. I do not read the rules as prohibiting boats of deeper draught than 2½ feet although licences and Tolls are only taken on the capacity of the boats when drawing that depth as maximum. I have never quite understood — looking to the slight rise and fall of tides — why a certain distance below lowest Tide was not taken as the bed of the canal, it is more easy for an inexperienced workman to know whether he has done a sufficient clearance if low water instead of mean Tide is used and if properly worked down to it will allow the whole rise of tide as a margin to assist boats sticking in getting off. Tide readings of intermediate stations will be available by the end of the year so that the question cannot well be definitely settled until then as I imagine that a few months ganging would not be accurate a tide vary with the seasons

5. I have made out a revised statement of the Earnings of the canal, the amounts are as follows:-

Licence fees for 1880- Rupees 19,000

Tolls (at average since October last) Rupees ——— 51,600

Sales &c. say Rupees 700

Total Rs 71,300 per annum

In regard to this it should be noted that the figure is far lower than what may shortly be hoped for, for the rules have only been a short time in force and all the boats formerly plying on the canal have not yet been replaced on it. New boats have not yet come in in large numbers owing to the novelty of the charges and recent cyclones having given the canal an unfavorable chance to start with. Considerable traffic will probably accrew to the canal from the Kristna and Godaveri canals in future years now that the fact has been definitely made known that the Kristna and Godaveri grain must be worked

worked outs of those canals before their annual closure in April; for the produce was not brought down owing to hopes on the part of the Boatmen that the Kistna canals would be kept open and to the objections to the rates of Tolls &c. The more stringently it is enforced that the canals of Kristna should be closed yearly at a certain date the better for developing traffic before that date, if the Boatmen have no hope of the canals being left open they will probably push on their carrying operations earlier in the year.

6. In regard to charges for maintenance of the canal I do not consider that it will be necessary to reckon on so large an outlay on the Adyar to Palar Section of the canal as on the other parts of it. Very little has been spent on clearance in this Section of the canal in former years and I think as an Average Rupees 110 per mile might

migh suffice for these 40 miles. The maintenance of the Northern and Junction canals for the present must be expected to be more costly as larger rivers are crossed and the banks are not yet thoroughly consolidated: I reckon for a few years the maintenance of the Canal for these 207 miles cannot well be done under Rupees 275 per mile. This makes a total charge for maintenance of Rupees 61,325 per annum which will, after the Northern Canal banks are more consolidated and grown over, the Rivers crossing it trained, cattle crossings paved, &c., be capable of considerable reduction.

In regards to charges for Establishment I have entered one half of the sanctioned scale, considering that half the time of the Establishment is taken up in Original work, and work for the Salt Department and minor works, which certainly is the case. The Toll and Lock Establishments are now fixed at the lowest figures they can be and have been largely reduced from what they formerly were. The Total charges for maintenance, Establishment and collection are Rupees 85,625.

* Maintenance R 61325
Establishment R 16,800
Collection R. R 7500
R 85,625

Interest at 4 percent on the Capital outlay amounts to Rupees 1,23,946 per annum and of itself without maintenance Establishment and collection charges utterly swamps the Receipts, but the through traffic has not yet developed on the Canal and will I trust in a few years increase the Receipts very many fold. The Canal received very great damages last year from two Cyclones, one of which was exceptionally severe and they have done the development of

of its traffic much harm, but by clearing out the debris of the old high banks and not replacing them in situations where they are liable to be washed into and block the canal much will be done towards reducing the possible damage from cyclones, so that traffic will not likely in the future to be as much impeded by cyclones even if they occur as was the case in 1879.

I have the honor to be
Sir,
Your most Obedient Servant
A. Awdry. Captain. R.E.
Superintendent of Works
Buckingham Canal.

MS

From,
The Superintendent of Public Works
Buckingham Canal

To,
The Chief Engineer
P. W. Department.

P.W.D.
ICHABOD
No. 3228

Dated 15th May 1880
Despatched 17th do—

92. 558.

Enclosures. 7 + 13 × 12 Plans

2 Inland Dept—
By Railway—

Buckingham Canal—
Forwards the Survey
and Longitudinal
Section with statements
of Receipts and
Expenditure &c. of the—

appended for information
in explanation of the co
made, in calculating qua
rates &c. of this Table.

1. There is no record of
Canal bed was before
and for the purpose of
it is assumed as 4·5 fee
M. P. L. The Canal D
was created in Novembe
The northern Canal wa
about a year previously

2. The depths of Silt
2 for the 2 Cyclones, we
by first averaging the
from the Soundings at
for each mile separat
Subsequently, averaging
results gain for the
mileage of Such silt
for full mileage of
Mayo Cyclone Silt, a

para. The Nouemlier's Cyclone
computation of Silt is based
on 3 ft level below M. S. L.;
level below which no work was done
cross ship Mr. O'Shaughnessy's
intention, and as means were
not available for work up to
original datum.—

3. It should be stated
that the Canal from Louis
Pulleat was originally laid out
a 6.19 ft datum, that with top
on the level of the Shadaupaw =
coopsaw Lock Sill

4. In regard to length of Silting
on which the computations of
quantities is made, the follow
were adopted from actual =
measurement taken from the
Section

For Inrays Cyclone

For the 4·5 ft datum	160 3/8 miles	Av: depth	1·53 ft
" 4 ft	" 138 3/8	miles	" 1·24 ft
" 3 ft	" 82 3/8	miles	" 0·78 ft.

For the 4·5 ft datum — 180 3/8 miles Av: depth 1·77 ft
" 4 ft " 158 3/8 " " " 1·50 ft
" 3 ft " 97 3/8 " " " 1·05 ft

The quantities in Columns
are based on above length
depths —

5. It should be state
regard to the Nouemlie
that in cases where there
silt in May (as in 66 to 69
for instance) the height
deposited over the 4·5 ft
was adopted, and whe
Inrays & Nouemlier's line
below the 3 ft datum,
difference between the
taken.—

6. In regard to rate
A. B. C. an average w
between those of Sand
and between Tidal. It
and which will be fo
somewhat in excess of
as would be struck fro
of rates" submitted by

specific rates, whereas for purposes of the present Table of quantities, an average rate had to be computed.-

7. It may not be out of place to record here, what I have already submitted before, that in the case of the Pamban Island Cut, about a mile long, which silted completely up, in the first year of opening, that it cost Rs. 11,527 for earthwork alone to reopen the line (which was at Rs. 4-3-2 per cubic yd. and that in last November's Cyclone it had silted up again over low tide level.- The Moodoo Palaroo Cut, silted in a November Cyclone over low tide level.

8. The impracticability of maintaining a 20 ft channel only, in the old bed, where it is 30 ft and over, and to specially in backwaters, has been sufficiently tested, to prevent my

the advisability of retaining original sole of 30 ft. for passage of boats under load, through a 20 ft. clearing, in old 30 ft bed and backwaters has been found, to cause the especially in fluid mud, to cut down, and fill the cut in 24 hours.- The silting does go on of course in that proportion daily, but till the Superabundant stuff of the sides settles itself, the process of filling will go on.-

And in respect of depth, 3½ ft below the lowest registered Tide level, seems a practical limit, for it will allow 6 inches for ordinary silting, and will still leave ½ ft between boat bottom and bed.-

C. Pennant Sub Engineer
Central Sub Division
Bridges

10.5.80

22nd April/80

Central Sub. Division

Buckingham Canal.

Table exhibiting quantities of Silt deposited in the Canal by the Cyclones of May & November 79 and the Estimates for removing the same, to different widths and depths.

Average depth of Silt deposited on Canal bed		A If cleared to only 3 feet below M.S.L. with bottom width of 24 feet Slopes 4 to 1			B If cleared to 4 feet below M.S.L. with bottom width of 30 feet Slopes 4 to 1			C If cleared to original Section 4½ feet below M.S.L. with bottom width of 30 feet. Slopes 2½ to 1	
Feet	Inches	Quantity Cubic Yards	Average Rate	Cost	Quantity Cubic Yards	Average Rate	Cost	Quantity Cubic Yards	Average Rate
As per soundings made after the Cyclone of May 1879	1 6½	483863	" 2 9	083163 15 3	12,07,87.3	" 3 3	2,45,349 3	21,48,970	" 3 6 4,70,087
II As per soundings made after the Cyclone of November 1879, computed to 3 feet below M.S.L. only	" 11 3/4								

N.B. This Table refers to Canal from Cooum to Peddagunjam only.

Madras Basin
22nd April 1880

Exd. Dwn Capts
Supt Pnl Works

Executive Engr
Central Sub Division

P.W.D.
1880
No. 3092
/2

No. 2080 R

B.P.W. Clarke

PUBLIC WORKS DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 3d. Sept. 80.
again

Read the following:—

^

0	Letter from the Govt. of India	(Ft. No. 214 I. dy 30th July 1879)	
4	do to do	(" 290 W " 14th Augt. ")	
1	Govt. Order P.W.D.	(" 283 W " 6th Feby 1880	
2	do do	(" 284 W " 6th ")	
3	Mem: by the Chief Engr. P.W.D.	(" 411 " 6th ")	
4	From The Supt. of Works Buckingham Canal	(" 462 " 10th May ")	
5	do do	(" 558 " 15th ")	
6	Mem: by Chief Engineer P.W.D.	(" 102 A " 29th ")	
7	From The Govt. of India	(" 172 I " 21st June ")	

Ordered that the
preceding printed collection
of papers be forwarded
to the Govt. of India for
information.

Ft. 3/10

Supt. of Works Buckingham Canal ✓
do — Kistna ✓
Revenue Dept. } for information.

Copied 14/9/80

No. 2081 dated 3rd Septr/80.

To,
The Secy: to the Govt. of
India P.W.D.

Sir,

With reference to your letter of the 30th July 1879, No. 2114 I, I am directed to forward a printed collection of papers on the subject of the Buckingham Canal, containing, amongst other matter which will, it is believed, be of interest, reports on the damages sustained by the Buckingham Canal from the action of the cyclones of May and Nov. 1879.

2. I am to say that the complete estimate of the proposed project will be ready for submission to the Govt. of India by June 1881. The occurrence of the cyclone of Nov. interfered with

and delayed the preparation of the estimate, but His Grace the Governor in Council is disposed to consider this delay to be far from a matter of regret, as the facts already established from the damage caused by the storm will, he hopes, prove of the highest value in dealing with the final estimate for this great undertaking.

3. The papers now laid before the Govt. of India deal, it will be observed, with the professional engineering aspects of the works. Together with the estimate there will be forwarded complete explanation of the history, objects, and financial

20201
72

bearings of the project, of which a general idea will, it is hoped, be conveyed by the map and longitudinal section which accompany this letter.

28/8/80

28/8 Posted to Swiss. with G.C. no 285 W. 284 W with appendix & Crews No 411

14-9-80

Map & longitudinal Section sent by Parcel Post.

19-9-80.

2080
73

Con. N. Hadlyme

Buckingham

Canal

Scale

4124

Govt. of [1880] Madras.

PUBLIC WORKS.

To

Dated

Issued

Rect. Encl.

G. O., 30 Sept. 1880, No. 2080-12

Nos. 14-15
16

Ennur Canal

Re Collection of Statistics on the subject of the expenditure incurred in the damages sustained by the Cyclones of May and November 1879 and ordered to be forwarded to the S. of S.

21/5 28/2

a further Collection

Forwarding papers on the subject of the Collection of Statistics on the damages sustained by the Kalkinghan Canal from the action of the Cyclones of May & November 1879, and stating that the Statement will be ready by June 1881.