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Government of Madras.

*Public Works* DEPARTMENT.  
*En 1078/60*

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Not to be folded or roughly handled

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*2/11/38*

1

*Proceedings of the Madras Government, Public Works Department,  
for the month of March 1860.*

No. 103. Read the following letter from Colonel J. H. BELL, Chief Engineer, to the Secretary to Government, dated 23rd February 1860, No. 10548.

I have the honor, with reference to paragraph 11 of the Order of Government as per margin, to submit the accompanying letters as per margin from the District Engineers of the Coast provinces on the subject of sandy and other deposits at the mouths of rivers.

November 24, 1857, No. 2167.

From District Engineer, Ganjam, 4th August 1859, No. 157.  
Do, District Engineer, Godavery, 7th September 1859, No. 71, with 1 enclosure.  
Do District Engineer, Krishna, 25th July 1859, No. 69.  
Do. District Engineer, 19th January 1860, No. 210.  
Do. District Engineer, Nellore, 7th July 1859, No. 1508, with 1 enclosure.  
Do. District Engineer, Canara, 2nd August 1859, No. 449, with 3 Plans.  
Do. Do. 14th December 1859, No. 2.  
Do. District Engineer, Chingleput, 25th May 1859, No. 113.  
Do. District Engineer, South Arcot, 2nd do No. 1.  
Do. District Engineer, Tinnevely, 26th July 1859, No. 46.  
Do. District Engineer, Malabar, 16th May 1859, No. 134.  
Do. District Engineer, Madura, 2nd do No. 4.  
Do. District Engineer, Tanjore, 29th July 1859, No. 93.  
Do. District Engineer, Vizagapatam, 13th December 1859, No. 807.

2. The abstract of these reports will inform the Government of the observed facts regarding the bars of rivers; but they do not furnish "general results" from which a law governing the formation of deposits and a "general system for their timely removal" can be deduced. The law does not, I believe, differ from that which obtains in other quarters of the globe; but the case of every river must be treated on its merits, since the line of coast on which it disembogues, the form of the outlet, the depth of sea, the set of the ocean currents and waves, the extent and character of the tidal basin, the power and duration of the land floods, and the species of soil brought down, with other circumstances, all tend to modify the operation of the general law.

3. Consequently, every river has to be studied by itself and when its characteristics are known, its improvement for the purpose of harbouring vessels may be undertaken upon general principles which are applicable to all rivers, and which are well stated in Captain Rundall's reports; the essential conditions of success being the establishment of a capacious and well-defined tidal basin, and a fixed outlet.

4. The improvement of harbours is not at present a very pressing question, compared with others, in this Presidency. The harbour of Cocanada which promises to be of the greatest importance, has been already much improved; and the gradual completion of the works already projected is all that appears to be required there for some time. In most other situations the trade is of too little importance to justify expensive improvements. Cochin, however, is an exception, and money would doubtless be well laid out in perfecting as far as possible so good a natural harbour.

Summary of replies to Circular about deposits of sand, &c., at the mouths of rivers.

GANJAM.—The restoration of the mouth of the Rushkulia river to its original and proper site is represented to be expedient for the purpose of facilitating the passage of boats from the Custom House and merchants' stores and godowns to the shipping. The river takes its rise in the Súrada Hills and after receiving the waters of the Mahánadi, Loharakundi and Buddumuddi rivers near Aska, falls into the sea at the port of Ganjam. The District Engineer is, however, of opinion, that works required to ensure a permanent opening at the required site will be more expensive than can at present be recommended.

GODAVERY.—The District Engineer describes the outlets of the rivers which have more particularly come under his own notice, viz.

The Godavery.

Cocanada river.

Oopootair.

Vizagapatám backwater.

Bimlipatám river.

Calingapatám.

Each of the above outlets exhibits distinct peculiarities arising from the difference of their positions, the size of their tidal basins, the slope of the freshwater bed, and configuration of the adjacent coast. In the Coringa river the shoal which impedes the entrance of large vessels is the result simply of a want of regulation of the enormous tidal volume which daily rolls into the river, which is caused by a sudden expansion of the river from a width of 300 to 1,500 yards. In the main northern branch of the Godavery, the bar is evidently the result of the action of the waves. This outlet has been moved several miles to the northward during the last 50 years, thus showing that the sand and other matter which is continually set in motion by the southerly current is thrown up by the action of the wave. In the south, or Narsapur branch the formation of the bar is also due to the action of the wave, but from the fact of its being partially sheltered from the north-east monsoon the bar is during its prevalence kept low, while, on the contrary, it rises during the south-west monsoon and has an extremely high surf rolling in upon it. The Cocanada river previous to the commencement of the improvements was open to the effect of both the surf and the current setting into the bay of Coringa before Point Godavery had reached its present limit; but, by the protection now afforded from the action of the surf and by the projection of its mouth into the bay, the very action of the tidal current into and out of the Coringa river, which before tended to close its mouth and to turn it annually further to the southward, now operates to keep the entrance deep by scouring past the projecting groyne. The unfavorable nature of the entrance to the Oopootair is due to its position so far in such a shallow bight as Masulipatam Bay. The Vizagapatam backwater presents a different feature. The tidal basin is small compared with that of the Oopootair, but it is not situated in a large bight, and the projecting head-land protects the entrance from the south-west monsoon, while its being swept by the northerly current tends to prevent the accumulation of sand upon the bar. The Bimlipatam river disembogues on a plain unprotected coast. The soil and sand in front of it is in constant movement, but the small amount of power contained in its tidal basin is unable to overcome the action of the wave, and hence the District Engineer believes it to be irremediable. The mouth of the Calingapatam river is situated at the end of a small indentation on the coast, and has a larger tidal basin with a reef of rocks projecting a good distance into the sea just south of it. Being thus protected from the southerly current and roll of the sea, the action of the surf is in this instance somewhat diminished, while that of the tidal water is increased. From these examples the following general principles are deduced:—

1. That rivers debouching on a plain open coast unprotected from the action of the surf, and exposed to all the prevailing winds and currents, will have high bars.
2. That rivers emptying themselves at either end of large bight, will have more water on their bars and be practicable at some seasons.
3. That such as discharge at the head of a shallow bight exposed to the ocean currents and actions of the surf, have their entrance closed by a high and broad bar.
4. That those which discharge themselves into a sheltered bay, may have their bars kept low.
5. That those situated at the head of a deep bay will, if properly regulated, have no bar at all.
6. That rivers or backwaters sheltered from the prevailing winds by projecting head lands will have a more practicable bar than those which be wholly exposed.

The general rule that can be prescribed as to the means of improving the entrances of tidal rivers, is the strict conservation of the tidal volume, and next its due regulation. The exact works that will be requisite can only be determined by the particular situation to be operated upon; but even in such rivers as disembogue on an unsheltered open coast small breakwaters, thrown out in front of the openings, and parallel or nearly so to the coast, might operate beneficially in protecting them from the blow of the surf, thus making artificially-sheltered bays, and admitting of an unimpeded ebb and flow of tide.

KRISHNA.—The District Engineer reports having recently visited the mouth, and ascertained that to make a report really of any use would require considerable time and require the

services exclusively of an Officer or Upper Subordinate, who should be provided with the necessary appliances for carrying out his investigations. It is not, however, from one investigation that much can be expected, but rather from a comparison of those of successive years.

NELLORE.—Furnishes a few observations regarding the rivers and backwaters which join the sea, and states that at present the services of nobody can be spared to take the necessary surveys of the mouths of rivers.

CANARA.—The District Engineer confines his observations to the Black River, the Tuddry, the Kandapur and the Naitrawatti. Though the Black River has a bar it has yet a channel, which appears to have found a resting place, being deflected by the Black Rock, which forms a natural groyne, and will probably keep it in its proper place in future. This channel has a depth of 12 feet at low water springs; and as the site of the proposed harbour in Beikul Bay outside the river with which it is to be connected by a canal, nothing will then be required to be done. The Tuddry River has a bar 11 feet deep at low water over its shallowest part. It is an excellent harbour and will speedily recover from any ill effects that may have resulted by the accident to the "Rose Ellis." Lieutenant Hunter promised to have the mouth of the Kandapur river surveyed before offering any opinion as to its improvement as the natural outlet for the export reaching the coast by the two ghats. This has not yet been done, and Captain Walker states that the matter may be held in abeyance until the survey for a Coast Canal is taken up from Kandapur northward. He adds, that he is not aware that the bar shifts much, though the sand banks within may to a certain extent. As regards the Mangalore bar, the District Engineer adverts to the unsuccessful attempt to bring about the junction of the two mouths of the Bantwal and Guspur rivers. Generally, the cause of bars at the mouths of rivers is the sand, &c., brought up by the sea at high water, while the counteracting influence is the force of the ebb rushing out of the river. To raise the latter to a maximum, and reduce the former to a minimum, might be done by narrowing the mouths of the channels by means of parallel dykes. The success of these measures is, however, only temporary.

CHINGLEPUT.—The rivers in this district only come down in freshes occasionally, and except in cases of storms, there is seldom a sufficient quantity of water to force open the bars at the mouth and to resist the action of the current along the coast. The current seldom, if ever, acts direct on the coast, but generally in an angular direction. The bars of rivers might be kept open all the year round by throwing out groynes so as to extend into deep water; but the District Engineer does not feel assured that they will have this effect.

SOUTH ARCOT.—The District Engineer reports that from the observations he has made at the harbours of Cuddalore and Porto Novo, it seems clear that no periodical freshes in a river, no matter how great the body of water that is poured into the sea during their continuance, can be depended on for keeping open a communication with the sea. A navigable passage through the bar can only be maintained either by a constant flow of water in the river or by the tidal action of a backwater. The only two rivers in this district the fall of whose bed is sufficiently gradual to allow of there being a large tidal area at their mouths, are the Paravanor and the Vellar. Slight freshes in the rivers appear to cause deposits in their mouths, more especially when the surf is high at the time of the freshes; but a great flood usually clears away the deposits of months, or even years. Nevertheless, in the intervals of these floods some of the shoals and obstructions to the passage of boats should be removed by other means, and the best way of doing so will be by keeping a dredge of sufficient power at each of the ports. With the material dredged out, embankments can be formed in particular places to assist and direct the scouring action of the rivers during floods and the effect of the ebb and flow of the tide.

TINNEVELLY.—As the rivers in this district are small and unnavigable, no particular notice has been taken of the effects produced by the deposit of sand, &c., at their mouths.

MALABAR.—The rivers on the coast of Malabar have a tendency to disembogue to the southward of their general course, which is the reverse of the case on the other coast. In one or two rivers this does not appear to be so, but this is owing to a chain of rocks which extends to the southward of the outlets. As some of the rivers have very little discharge in the dry season, in

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such cases the work of keeping open a deep bar would be one of peculiar difficulty. The Parani is one of these. In former years this river on its south bank was producing great injury to the town by washing away the roadway, &c., near the mouth; but this was prevented by a few groynes which were thrown up at intervals.

MADURA.—The District Engineer wishes to be allowed further time for the preparation of his report.

TANJORE, VIZAGAPATAM.—District Engineers promise to report, but have not yet done so.

No. 104.

ORDER THEREON, 7th March 1860, No. 498.

Ordered to be recorded.

(Signed) J. D. BOURDILLON,  
Secretary to Government.

Summary of replies  
to Circular about deposits of sand  
&c. at the mouths of Rivers.

Ganjam. The restoration of the mouth  
of the Pochkorla River to its origi-  
nal and proper site is represented to  
be expedient for the purpose of facilitating  
the passage of Boats from the Custom  
House and Merchants Stores and  
Godown to the Shipping. The river  
takes its rise in the Girada Hills  
and after receiving the waters of the  
Mahanadi, Loharakundi and Pustam  
rivers near Astia falls into the sea at  
the port of Ganjam. The District  
Engineer is however of opinion that works  
required to ensure a permanent opening  
at the required site will be more  
expensive than can at present be  
recommended. The District Engineer  
describes the outlets of the River which

which have more particularly —  
come under his own notice viz

The Godavari

Nocanasa River

Opisthai

Vijayapattam Backwater

Pemilipattam River

Kolujapattam

Each of the above outlets exhibits distinct  
peculiarities arising from the difference  
of their position, the size of their  
Tidal Basins, the slope of the fresh  
water bed and configuration of the  
adjacent Coast. In the Donga River the  
shoal which impedes the entrance of large  
Vessels is the result simply of a want  
of regulation of the enormous tidal volume  
which daily flows into the River which  
is caused by a sudden expansion  
of the River from a width of 300 to 1500  
yards. In the main Northern Branch  
of the Godavari the Bar is evidently  
the result of the action of the waves.  
This outlet has been moved several  
miles to the Northward during the last

Navigation

50 years, thus showing <sup>that</sup> the sand and  
other matter which is continually ~~up~~ in  
motion by the southerly Current is thrown  
up by the action of the waves. In the  
South or Surampore branch the formation  
of the Bar is also due to the action of  
the wave, but from the fact of it  
being partially sheltered from the  
North East Monsoon the Bar is during  
its prevalence kept low, whereas the  
entrance is raised during the S. E. Monsoon  
and has an extremely high surf rolling  
in upon it. The Nocanasa River previous  
to the commencement of the improvements  
was open to the effect of both the surf  
and the Current rolling into the Bay  
of Donga before South Godavari had  
reached its present limits, but by the  
protection now afforded from the action  
of the surf and by the projection of  
its mouth into the Bay, the very action  
of the tidal Current into and out of  
the Donga River which before tended  
to close the mouth and turn it annually  
further

further to the Southward now operates  
to keep the entrance deep by scouring  
past the projecting groyne. The  
unfavorable nature of the entrance  
to the Opoistair is due to its  
position so far in such a shallow  
bay as Masulipatam Bay. The  
Vizagapatam Backwater presents a  
different feature. The Tidal Basin  
is small compared with that of the  
Opoistair but it is not situated in  
a large Bay, and the projecting Head  
land protects the entrance from the  
S. E. Monsoon, while the being  
swept by the Northerly Current  
tends to prevent the accumulation  
of sand upon the Bars. The Bim-  
patam River discharges on a plain  
unprotected coast. The soil and  
sand in front of it is in constant  
movement, but the small amount  
of power contained in its Tidal basin  
is unable to overcome the action of  
the wave, and hence the Disturb-  
Engineer believes it to be irretrievable.

The

The mouth of the Nallajapatam River is  
situated at the end of a small  
dentation on the coast and has a large  
Tidal Basin with a Reef of Rocks  
projecting a good distance into the sea  
just South of it. Being thus protected  
from the Southerly Currents and roll of  
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that of the Tidal water is increased.  
From these examples the following general  
principles are derived.

1. That Rivers discharging on a  
plain open coast unprotected from the  
action of the surf, and exposed to all  
the prevailing winds and currents  
will have high bars.
2. That Rivers emptying themselves  
at either end of a large Bay will  
have more water on their Bars and  
be practicable at some seasons.
3. That such a discharge at  
the head of a shallow bay exposed  
to the ocean Currents and action of

the surf have their entrance obstructed by a high and broad bar.

4. That those which discharge them selves into a sheltered bay may have their bars kept low.

5. That those situated at the head of a deep bay will if properly regulated have no bar at all.

6. That Piers or bastionated shelters from the prevailing winds by projecting Head lands will have a more practicable Bar than those which be wholly exposed.

The general rule that can be prescribed as the means of improving the entrance of Tidal Rivers is the strict conservation of the Tidal Volume and such the due regulation. The exact works that will be requisite can only be determined by the particular situation to be operated upon, but even in such Rivers as discharge on an unsheltered open coast small bastionated thrown out in front of the opening and parallel or nearly so

to the Coast might operate beneficially in protecting them from the blow of the surf thus making artificially sheltered bays and admitting of an unimpeded ebb and flow of tide.

Ristnach

W. H. A.

The District Engineer reports having recently visited the mouth and ascertained that to make a report really of any use would require considerable time and require the services exclusively of an Officer or Upper Subordinate who should be provided with the necessary assistance for carrying out his investigations. It is not however from one investigation that much can be expected but rather from a comparison of those of successive years.

W. H. A.

Surveys a few observations regarding the Rivers and Bastionates which join the sea, and states that at present the service of nobody can be spared to take the necessary surveys of the mouths of Rivers.

The

The District Engineer Anara  
confines his observations to the Black  
River, the Surry, the Cunsapoor  
and the Nairavally. The Black  
River has a bar it has yet a channel  
which appears to have found a  
meeting place being deflected by the  
Black Rock which forms a natural  
groynes and will probably keep  
it in its proper place in future. This  
Channel had a depth of 12 feet  
at low water spring and as  
the site of the proposed Harbour  
in Bickul Bay outside the  
River with which it is to be con-  
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then be required to be done. The  
Surry River has a bar 11 feet deep  
at low water over its shallowest  
part. It is an excellent harbour  
and will spudgy power from any  
ill-effects that may have resulted  
by the accident to the "Paco Star"  
Lieut.

Went to all  
Cops for

13  
Lieutenant Hunter promised to have  
the mouth of the Cunsapoor River  
surveyed, before offering any opinion  
as to its improvement as the natural  
outlet for the export reaching the  
coast by the two Ghats. This has  
not yet been done, and Captain  
Walker states that the matter  
may be held in abeyance until  
the Survey for a Coast Canal is  
taken up from Cunsapoor north-  
ward. He adds that he is not  
aware that the Bar depth is much  
less than the sand banks within may  
be to a certain extent. He refers to  
Mangalore Bar the District Engineer  
ascribes to the unsuccessful attempt  
to bring about the junction of the  
two mouths of the Buntwal and  
Gunspar Rivers. Generally the  
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Rivers is the sand brought up  
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river

river. To raise the latter to a maximum and reduce the former to a minimum might be done by narrowing the mouths of the channels by means of parallel dykes. The success of these measures is however only temporary.

The rivers in this District discharge only come down in freshes occasionally and except in cases of storm there is seldom a sufficient quantity of water to force open the bars at the mouth and to resist the action of the current along the coast. The currents seldom, if ever, set direct in the coast, but generally in an angular direction. The bars of rivers might be kept open all the year round by throwing out groynes so as to extend into deep water; but the District Engineer does not feel assured that they will have this effect.

The District Engineer reports South Creek that

that from the observations he has made at the Harbours of Quddalore and Porto Novo it seems clear that no periodical freshes in a river no matter how great the body of water that is poured into the sea during their continuance can be depended on for keeping open a communication with the sea. A navigable passage thro' the bar can only be maintained either by a constant flow of water in the river or by the tidal action of a backwater. The only two rivers in this District the fall of whose beds is sufficiently gradual to allow of there being a large tidal area at their mouths are the Paravanor and the Vellar. Slight freshes in the rivers appear to cause deposits in their mouths more specially when the surf is high at the time of the freshes, but a great flood usually clears away the deposits of months or even years. Nevertheless in the intervals of these floods some of the

the shoals and obstructions to the passage of boats should be removed by other means and the best way of doing so will be by keeping a dredge of sufficient power at each of the Poles. With the material dredged out embankments can be formed in particular places to arrest and direct the running action of the rivers during floods and the effect of the ebb and flow of the tides.

As the rivers in this District immediately are small and unmanageable no particular notice has been taken of the effects produced by the deposit of sand &c. at their mouths.

The rivers in the coast of Malabar & Malabar have a tendency to discharge to the Southward of their general course which is the reverse of the case in the other Coast. In one or two rivers this does not appear to be so, but this is owing to a chain of hills which extends to the Southward of the outlet. The same

the Rivers have very little discharge in the dry season, in such cases the work of keeping open a deep bar would be one of peculiar difficulty. - The Parangy is one of these. In former years the river on its South bank was producing great injury to the town by washing away the roadway &c. near the mouth; but this was prevented by a few groins which were thrown up at intervals.

Madura

The District Engineer wishes to be allowed further time for the preparation of his report.

Tanjore

Vijayapatnam

District Engineer promises to report but has not yet done so.

Central Office of Mr  
Sepsitham  
23 Feb/60

J. M. W. Colonel  
Chief Engineer

X.R.H.



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3. Consequently every river has to be studied by itself and when its characteristics are known its improvement for the purpose of harbouring vessels may be undertaken upon general principles which are applicable to all rivers, and which are well stated in Captain Piusalle's reports, the essential conditions of success being the establishment of a spacious and well defined tidal basin, and a fixed outlet.

4. The improvement of harbours is not at present a very pressing question.

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Sept 11<sup>th</sup> 1860  
25 Feb 1860

Shave the honor to be,

Sir,

Your most obedt Servt

A Bell Esq  
Chief Engineer

To  
The Secretary to  
Government P.M.D.

X<sup>o</sup> R. F.

One 24 November 1853

From the blue Eng 7 8 24  
April 1840. No 1020. and 10.

16: 41 age 1: 1019.

From. 16: 23 June 1840  
1867.

No 498

John records

From 1840  
10 2 June 1840

From the blue Eng 7 8 24  
April 1840. No 1020. and 10.

No 1020

One 24 July 1840

From 1840 24 July  
No 1020. and 10.

No 1020

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No 498

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No 1020

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No 1020

From the blue Eng 7 8 24  
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