

TABLE OF CONTENTS

PART I

		Dhananjayrao Gadgil Library	PAGE
1.	Introductory		1-2
2.	Meetings held	GIPE-PUNE-069925	3-4
3.	Present Condition of each Port and Creek		5-9
4.	Siltation—Causes and effect of —		10-18
5.	Suggestions for—		
	(A) Dredging		19-22
	(B) Improvements at Dhollera		22-25
	(C) Removal or marking of shoals		25-32
	(D) Preventing siltation in future		33
	(E) Other hindrances to trade		33-35
6.	Suggestions for Development of Vehicular Roads		36-37
7.	Suggestions and Recommendations for Landing and other Facilities		38-57
8.	Summary of the recommendations and their approximate cost		58-59
9.	Suggestions for financing the schemes		60-63
10.	Concluding remarks		64-65

PART II

APPENDICES

I.	Communique and Questionnaire together with a list of persons to whom sent, from whom replies received and who appeared and gave evidence before the Committee.		} Not printed.
II.	Short description of ports and navigable channels etc.		69-136
III.	Statement showing value of Import and Export trade, number of vessels and numbers of steamer passengers.		137-161
IV.	Statement showing cost of the Committee		} Not printed.
V.	Sketches of Ports and Creeks		} Not printed.

PART I.

CHAPTER 1.

INTRODUCTORY.

The following resolution was passed at its 4th Session by the Ratnagiri District Co-operative Conference in 1935 :—

“ *Resolution 12.*—Transport by water is cheaper than transport by land and the former helps the agriculturists to get their necessaries of life at cheap rates. Transport of goods through the creeks used to be carried on in this district in former times ; but now-a-days, owing to the silting up of these creeks, the same has become impossible. This conference, therefore, requests the Government and the Ratnagiri District Local Board to take steps to dredge these creeks and make them fit for navigation. ”

After consulting the Departments concerned on the above resolution Government were pleased to appoint by Government Resolution, Revenue Department, No. 6540/33, dated the 9th December 1937, a Committee consisting of the following members to investigate the matter :—

- 1 The Collector of Salt Revenue, Bombay (*Chairman*).
- The Deputy Superintendent of Lighthouses, Bombay.
- V. G. Limaye, Esquire, B.A., LL.B., Representing the Kolaba District.
- B. R. Rane, Esquire, M.L.A., Representing the Ratnagiri District.

As desired by Government the Committee co-opted the following officials and non-officials as members for each District :—

Ahmedabad District.

- The Collector of Ahmedabad.
- The Executive Engineer, Ahmedabad Division.
- Mr. I. K. Vyas, M.L.A.
- Mr. D. M. Jani (for Dhollera only).

Kolaba District.

- The Collector of Kolaba.
- The Executive Engineer, Thana Division.
- Mr. S. V. Tilak, B.Ag.

Ratnagiri District.

The Collector of Ratnagiri.

The Executive Engineer, Ratnagiri Division.

Mr. M. Y. Bhandarkar, B.Ag.

Kanara District.

The Collector of Kanara.

The Executive Engineer, Kanara Division.

Mr. S. R. Haldipur, M.L.C.

The terms of reference were as under :—

(a) The present condition of the following ports and the navigable rivers and channels leading to them :—

(1) Revdanda, (2) Bankot, (3) Dabhol, (4) Jaigad, (5) Rajivda (Ratnagiri), (6) Jaitapur, (7) Vijaydurg, (8) Malvan, (9) Honavar, (10) Bhatkal and (11) Dhollera.

(b) The needs of each of these ports and the extent to which further development or the provision of additional facilities or improvements is necessary or desirable ;

(c) The order in which the development of each port should be taken in hand ; and

(d) Any other matter relevant to the enquiry or any improvement required in any port not specified above.

Subsequently Government decided to extend the scope of the inquiry to the ports of Bulsar, Surat and Broach, *vide* Government Resolution, Revenue Department, No. 650/33, dated the 26th April 1938. The following members were co-opted as desired by Government for the Districts :—

Officials.

- | | | |
|--|---|--|
| 1. The Collector of Surat | } | For both the ports
in Surat District. |
| 2. The Executive Engineer, Surat and
Broach Division. | | |
| 1. The Collector, Broach and Panch Mahals. | } | For Broach Port. |
| 2. The Executive Engineer, Surat and
Broach Division. | | |

Non-Officials.

1. Mr. R. P. Desai, M.L.A., for Surat Port.
2. Mr. Ghelabhai Bhimbhai Desai for Bulsar Port.
3. Mr. Dinkarrao N. Desai, M.L.A., for Broach Port.

CHAPTER 2.

MEETINGS HELD.

The Committee held 30 meetings as shown below :—

Name of place.	No. of Meetings held.	Dates.
Bombay	1	8th January 1938.
Do.	1	29th May 1938.
Karwar and Sadashivgad	1	3rd February 1938.
Tadri (Sanikatta)	1	4th February 1938.
Kumta	1	6th February 1938.
Honavar	1	6th February 1938.
Venktapur (Shirali)	1	7th February 1938.
Bhatkal	1	7th February 1938.
Dhollera	1	13th February 1938.
Dhandhuka	1	14th February 1938.
Mandwa	1	5th March 1938.
Revdanda	1	5th March 1938.
Mahad	1	14th March 1938.
Bankot	1	15th March 1938.
Dabhol	1	16th March 1938.
Jaigad	1	17th March 1938.
Ratnagiri	1	28th March 1938.
Jaitapur	1	11th April 1938.
Rajapur	1	11th April 1938.
Kharepatan	1	11th April 1938.
Vijaydurg	1	11th April 1938.
Deogad	1	12th April 1938.
Malvan	1	12th April 1938.
Achra	1	13th April 1938.
Vengurla	1	14th April 1938.
Surat	1	28th April 1938.
Broach	1	28th April 1938.
Bulsar,	1	29th April 1938.
Panvel	1	1st May 1938.
Dharamtar	1	1st May 1938.

The Committee inspected the following ports and landing places as also the navigable rivers and channels leading to them :—

*Karwar, *Sadashivgad (including Kodibag), *Belekeri, *Ankola, *Gangavli, *Tadri, *Kumta, Honavar, *Murdeshvar, *Shirali, Bhatkal, Dhollera (Magarvalli creek), Mandwa, Revdanda, Bankot, Dabhol, Jaigad, Rajivda (Ratnagiri), Jaitapur, Vijaydurg, *Deogad, *Achra, Malvan, *Vengurla, Surat, Broach, Bulsar, *Thana, *Panvel and *Dharamtar.

The ports marked with an asterisk were visited at the request of the public though they were not specifically named in the Government orders.

The Committee also sailed up the Roha, Mahad, Chiplun, Rajapur, Kharepatan, Sarjekot, Tadri and Bhatkal creeks in order to inspect the condition of the navigable channels and to enquire into the representations of the local people with regard to shoals and landing places.

CHAPTER 3.

PRESENT CONDITION OF EACH PORT AND CREEK.

Appendix II contains in short the previous history of each port. It also gives details of existing shoals and landing facilities. As a result of its investigations the condition of each port and creek noticed by the Committee on the spot was as follows:—

Dhollera.—Owing to siltation at the existing Whittle bandar shipment and landing of dutiable goods has been permitted at the mouth of the Magarvalli creek, where a new Custom House has been opened, a light installed and buoys have been taken for marking the anchorage and the channel. When the Committee visited the Magarvalli creek on 13th February 1938 at low water the channel was found to be broad and deep. From enquiries with people, who are acquainted with the conditions in the Bhal tract during the last 30 years and on perusal of the reports of experts and the records of the Collector of Salt Revenue it appears that there has always been deep water in the Magarvalli creek though the course during recent years has altered from south to north. We noticed that there has been slight erosion on the northern bank of the creek due to the change in the course of the creek, but there is no cause for alarm since slight alterations in the course of creeks and rivers are a common occurrence in the Gulf of Cambay. The fact remains that there has always been deep water in the Magarvalli creek. The condition of the creek has been the same now as was noticed by Mr. D'Arcy, Superintendent of Lighthouses, in 1925. The opinion given by that officer and Mr. Logsdail, Deputy Superintendent of Lighthouses, after his visit to this creek in 1936 and again in February last are printed in Appendix II.

Inside the creek the anchorage is quite safe. The creek is about 4 furlongs wide and about 25 feet deep at high tide. There is soft mud on both sides of the creek and a sand-bank in the middle of it. Vessels drawing not more than 18 feet of water can therefore easily get into the creek at high tide and sit on mud without any danger, the current of water is not strong and there is ample space in the harbour for two steamers to pass. The anchorage provides accommodation for several large size country craft. It is a very good harbour in which at low water vessels are left sitting on the mud and are quite safe from any cyclonic disturbances. Vessels of 10 to 20 tons can also go up the river for a couple of miles.

The Gulf is also navigable as far as Cambay when approaching from this direction and the Cambay steamers have been known to use this channel. The size of these vessels are approximately 300 tons but are of a shallow draft for the purpose of sitting on the mud if at any time it was found necessary. There is only one dangerous place called the Bore Rock between Magarvalli and Cambay.

We are informed that the deepening of the channel leading to Magarvalli is due to the bigger volume of water coming down from the Cambay channel having changed its course from the east to the west of Mal bank. We further understand from Mr. Logsdail that a big section of Rhuk bank having been washed away the channel has become deeper. Soundings taken recently show an average of 7 fathoms off Rhuk bank at a distance of one cable, whereas formerly there were only 2 fathoms at a distance of a mile.

Captain Parcou, F.R.G.S., F.R.S.A., Extra Master, Captain Gill of the B. I. S. Co., and Mr. Logsdail, who went up the channel from Bhavnagar in December 1936 found 5 fathoms at low water on the eastern side of the Malcolm channel. They noticed deeper waters in the mid-channel. As they proceeded further north the depth of water increased. Even near the Rhuk bank the depth varied from 2 to 5 fathoms at low water. They also found deep waters at the mouth of the Magarvalli creek. We understand that in September 1937 Captain Parcou safely piloted s.s. "Lalita" (about 400 tons) which went fully loaded with cargo up to the mouth of the creek. We therefore think that there should be no difficulty for steamers of about 600 tons to go as far as the mouth of the Magarvalli creek.

Broach.—The condition of the ports of Broach, Surat and Bulsar is almost identical. Broach which is on the bank of the Narbada is 30 miles in the interior from the mouth of the river. There are several large shoals and sand-banks, particularly at Samni and Kukerwada, which makes the river unnavigable except at high spring tides. The port is practically open only for about 15 days in a month and is closed to traffic during the monsoon when there are floods in the river. Vessels of 100 tons come up to Broach at high spring tides and those up to about 80 tons can easily ply up to Broach at ordinary spring tides. There is no boat traffic above Broach. The mouth of the river which is near Lohara is also silting up. We understand that since the construction of the new Railway bridge the current of water running down to the Gulf has changed its course towards Broach, which has been causing erosion on the northern bank. The depth of water at the anchorage in front of the Custom House has thus increased.

Surat.—Surat is only seven miles from the mouth of the river. There are sand-banks at a few places in the Tapti between Dumas-Hajira at the mouth and the Hope Bridge in the town. Vessels of 50 tons burthen come up the river up to Surat at the daily high tides. The river is sufficiently wide and deep near the anchorage opposite to the Castle.

Bulsar.—Bulsar is only about 3 miles from the sea. There are small sand-banks at only two places between the mouth of the river and the town. Vessels of 50 tons can enter the river at high tide on any day. Whereas those of larger tonnage can come in at spring tides only. Erosion is noticeable on the southern bank near Hanuman

Bhagda—Bulsar. To prevent further erosion seven groynes have been constructed out of the Ports Fund between the Custom House and Hanuman Bhagda.

In the Konkan we have classified the ports into groups. We propose to report the condition of the ports in each group in general as it is almost similar:—

Vengurla, Ankola, Kumta and Bhatkal.—These are important towns and were thriving ports at one time. They are however situated at the mouths of small tidal estuaries which vary from 2 to 5 miles in length and are very narrow. As they are fed solely by sea water and as they are not flushed by monsoon water from the hills they are highly silted and are navigable only at high tides and that also by small boats up to 5 tons. Large vessels anchor outside in the open sea, so do also the cargo steamers which call at Vengurla, Kumta and Bhatkal. Goods are unloaded in small or flat-bottomed boats and carried to the bandar for landing. Shipment is done in the same manner. The traffic season commences in September and ends by May.

Revdanda, Bankot, Dabhol, Jaitapur, Tadri and Honavar.—These ports are situated at the mouths of large tidal rivers flowing from the hills from a distance from 10 to 30 miles in length. The rivers are fairly wide at the mouth but become narrower towards the head. The mouths of these rivers are being gradually blocked for various reasons the principle of which are reclamation of lands on the banks of the creeks and disforestation. There are also several shoals of sand and gravel of varying sizes in these creeks. The existence of sand bars at the mouths necessitates careful navigation by masters of country craft when entering and leaving these creeks. We have dealt with these sand bars in detail in a separate chapter. Large vessels up to 50 tons can go up to the anchorage opposite the Custom House. Smaller boats up to about 25 tons can go higher up the Revdanda, Bankot and Dabhol creeks to a distance of 15 to 20 miles but in the Jaitapur, Tadri and Honavar creeks navigation by such boats is possible only at high water. Goods despatched to and from Roha in Revdanda creek, Mahad and Goregaon in the Bankot creek, Chiplun and Khed in the Dabhol creek, Rajapur in the Jaitapur creek, Uppinpattan in the Tadri creek and Gersappa in the Honavar creek are required to be transported in small flat-bottomed boats from the interior villages to the anchorage and there transhipped into sea-going vessels owing to the shallow channels and existence of shoals mostly at the foot of these towns. All the six ports are fair weather ports only though small boats ply inside the creek all the year round.

Jaigad, Vijaydurg and Kodibag (Sadashivgad).—These three ports are situated at the mouths of big rivers which have fairly deep water thereby allowing coasting steamers and large vessels to go up to the anchorage at Jaigad and Vijaydurg even during the rains. At Kodibag vessels up to 50 tons burthen can go a little higher up the river but they pick up the cargo at Kodibag only. Small vessels of 10 tons burthen can go up to 20 miles in all these three creeks. There are a few shoals

in the upper reaches of these creeks. Both Jaigad and Vijaydurg are whole-year ports being sheltered from south-western monsoon. Coasting steamers call at these ports during the rains but sea-going country craft are taken on the hard during the monsoon and do not call at these ports.

Ratnagiri, Deogad, Malvan and Karwar.—These four ports are situated on bays formed at the mouths of small creeks except Malvan. There are no bars or shoals in the bays. There is a submerged rock on the north side of the entrance to Deogad but it causes no obstruction to navigation as the mouth is wide enough for two steamers to pass simultaneously. Both Deogad and Karwar are sheltered from south-westerly and north-westerly winds and are safe harbours. Ratnagiri is exposed to south-westerly monsoon. The traffic period at Ratnagiri is restricted to the fair season, i.e. from October to May. There is a cargo steamer service to Ratnagiri in the monsoons but the steamer anchors in Mirya Bay about 4 miles north of Ratnagiri. Malvan has a good anchorage in the bay, but the entrance is dotted with rocks and the channel leading to the harbour is about 160 feet wide only. It is marked with gas buoys, which are removed in the monsoon when owing to heavy seas prevailing in this port all sea traffic is closed, and there is danger of the buoys being washed away.

Belekeri, Gangavli, Murdeshwar and Shirali.—All these are small ports at the mouth of small creeks. Though they have silted to some extent large vessels can enter Belekeri and Gangavli at high tide. At Murdeshwar and Shirali there is very little siltation in the interior and the entrance is clear.

Achra.—The entrance is narrow but navigable both at high and low tides. There are four small shoals inside the creek but they cause no obstruction to navigation as the creek is fairly wide.

Thana.—Thana or Chendani bandar is situated on the Thana creek. There are no difficulties to navigation in the Thana creek from the northern limit of Bombay up to Chendani bandar. The difficulty is experienced only in the portion of the channel lying between the Bombay-Poona Road bridge and the Railway bridge. The channel is studded with rocks and boulders and has sharp bends on either side of the Railway bridge. This necessitates very cautious steering. At low water this channel between the two bridges is almost dry. Flat-bottomed boats up to 25 tons cross this channel at high water with masts down when passing through the arches of the two bridges.

Panvel.—Panvel is a creek port situated about 8 miles from the mouth of the creek near Belapur. There is one island and seven shoals in this creek. Smaller vessels of less than 10 tons can go one hour before and after high tide up to Panvel and touch the wharf. Vessels between 10 and 40 tons can also go up to Panvel but have to anchor a couple of furlongs away from the wharf. Goods are loaded and unloaded from such vessels by carts which go through the channel when it is dry at low water. Vessels of more than 40 tons capacity are

required to anchor off Ulwa 5 miles from Panvel. In the case of vessels anchoring off Ulwa goods are loaded and unloaded by means of small padavs. Traffic is carried on all the year round.

Karanja.—Dharamtar is a sub-port in the Karanja creek. It is a steamer port serving Pen and the country roundabout. Goods intended for this country are landed at Antora and Nagothna. Owing to siltation beyond Dharamtar only small vessels of 5 to 7 tons can ply up this creek. Larger vessels anchor off Karanja where the Custom House is situated and load and unload goods by means of small craft. Traffic is carried on all the year round.

Having so far dealt with the existing features of the various ports geographically we shall now turn to their commercial side. The figures of trade are given in Appendix III. We have taken only figures from 1873-74 as that period synchronises with the final emergence of Bombay as the emporium of trade of the West Coast of India. To facilitate careful examination a statement is embodied in Appendix III showing the average annual value of trade based on four typical quinquenniums. The first quinquennium is for the period ending 1877-78, i.e. before the advent of the Railway and the Cargo steamer. The second period is ending 1894-95, i.e. after the Railways were constructed. The third period is ending 1912-13, i.e. before the Great War, and the fourth period is for the quinquennium ending 1936-37. An analysis of this statement will show that commercially the following ports have lost their former importance:—

Dhollera, Dabhol, Vengurla, Karwar, Kumta, Honavar and Bhatkal.

Among other ports Bulsar and Jaitapur record a small decrease. Surat and Revdanda have remained steady. The apparent increase in their trade is due to the depreciated value of the rupee. The remaining ports show varying increases due to several causes. The increase in the import and export trade of Broach is due to trade with Bhavnagar. Large quantities of sugar, iron, corrugated sheets and other dutiable goods imported at Bhavnagar during the last few years were sent out to Broach for being railed from there to various places in the interior. Similarly all raw products from the interior, particularly cotton, was taken by country craft from Broach to Bhavnagar and thence exported by steamers.

The abnormal increase in the imports at Bankot is due to large imports of building materials and kerosene and household goods required for a number of villages bordering on the river running 30 miles up to Mahad and Goregaon. The large increase in the case of Ratnagiri is due to the increase in the Railway freight by the M. & S.M. Railway. At Malvan cashewnuts are brought from Africa as well as from other parts of India for curing before export to America. The statistics show that the present geographical conditions have very little relationship to trade. There are various other factors which have contributed to the rise and fall in tradé.

CHAPTER 4.

SILTATION—CAUSES AND EFFECT OF—

Causes of Siltation : (a) General.—All along the Western coast of the Bombay Presidency siltation has been in progress. It has been rapid in some places and slow in others. There is a sand bar at the mouth of every creek and shoals varying in number and size inside the creeks. Even the mouth of the Panjim river has a bar though the Portuguese Government take great precautions to keep its rivers clear of silt. There are various causes which are responsible for the siltation and there are various reasons, which contribute to the formation of shoals inside the creeks. The bars and shoals have been in existence for centuries though the size has increased. They are noticeable now and are complained of as the modern type of steamers and the better class of country craft which ply along the coast draw more water than before. Moreover owing to a fall in the rates of freight vessels are fully loaded and sometimes overloaded. The security afforded by Insurance Companies has resulted in indifference to a certain extent on the part of crew. In our opinion therefore though the obstructions to navigation are not entirely new they have now become perceptible owing to the altered conditions mentioned above.

The extent of siltation at present in the various creeks is described in Appendix II.

There are diverse causes for siltation in various creeks but one or more of the following are responsible for it and the degree of siltation depends on the mischief caused in the interior, the length and width of the river and the velocity of water :—

- (a) Scanty rainfall ;
- (b) Denudation of forest areas ; disforestation ;
- (c) Reclamation of lands on creek banks for cultivation ;
- (d) Intensive cutting of mangroves ;
- (e) Construction of jetties, causeways and embankments to protect private properties ;
- (f) Construction of dams in the non-tidal reaches of the river ; and
- (g) Strong tidal and wind action.

The effect of each of these causes is described below :—

(a) *Scanty rainfall.*—This is a natural phenomena, but to a certain extent it is due to the cutting of forests on Ghats from which the rivers flow down to the sea. Owing to the cutting down of forests the rainfall has been much less than before at most of the hill stations and consequently there is not proper flushing of the rivers.

(b) *Denudation of Forest areas and Disforestations.*—The entire cutting of coups lets loose the soil which washes down the various rivers and collects near shoals or at the mouths, Wherever there has been

disforestation the soil is being continuously washed away every monsoon. The Collector of Ratnagiri reported as follows in 1908 :—

“ The silting up process has of course been going on for centuries. But it is during the last sixty years or so that its increased rapidity has been most marked, and this is due to the unfortunate fact that our administration in the early part and middle of the last century allowed the splendid Ratnagiri forests to be almost destroyed (Gazetteer pp. 32 and 33). As the hills were steadily denuded of their previous thick covering of trees, so the torrential rains of the monsoon washed down ever-increasing quantities of soil into the creeks, and the sand bars along their course and at their mouths grew ever broader and higher. This was the inevitable and only to be expected result of destruction of the protecting forests.”

Report dated the 16th December 1912 from the Extra Deputy Director of Agriculture, Konkan Division :—

“ Considerable areas of high lying lands near the banks of creeks are utilised for cultivation in the Ratnagiri District. These areas, which were originally covered with jungles are now bare of forest growth. A large portion of them has been terraced and turned into small levelled fields with bunds on all sides. When tillage operations are carried on in June and July the water that flows from the fields becomes muddy and the silty water contained in it is partly precipitated in the bunded fields and partly carried away in the current and eventually deposited into the creeks. But apart from bunded fields there are certain areas of hilly lands cultivated with inferior millets. These lands are slopy and are not bunded. When the monsoon commences the cultivator takes his pick or “ Kudal ” and goes to his slopy, hilly lands and stirs the soil in order to prepare tilth for sowing seed or transplanting seedlings. The water that flows from these areas must carry with it large quantities of silt and detritus into the creeks.”

In his report dated 5th March 1938, the Divisional Forest Officer, Western Division, Kanara, states :—

“ The minor forests assigned to privileges have deteriorated to some extent. There has been no extension of forests ; on the contrary there has been a gradual diminution as forests are disforested in favour of cultivation. Also strips of land which are granted near cultivations are cleared by the villagers.”

(c) *Reclamation of lands on creek banks.*—This has caused greater damage to creeks than disforestation. Large areas of marsh known as “ Khars ” are obtained by people at nominal prices and the purchasers put up mud bunds to protect their lands from tidal waters. These bunds are not repaired periodically and strengthened from time to time and therefore are gradually being washed away and in some places the reclaimed land is also not cultivated. All the earth let loose not only from such bunds but also from the reclaimed lands collects near

shoals and at the mouths. This view is supported from the following extracts taken from official reports :—

Report dated the 5th April 1938 from the Collector of Kolaba :—

“ It is a fact that as the protective embankments of creeks are mostly of pure mud, large quantities of silt are annually washed into the creek beds, from the reclaimed lands.”

Report dated 6th May 1938 from the Collector of Ratnagiri :—

“ In almost all cases embankments for protecting reclaimed lands are constructed of mud only as it prevents the ingress of water more effectively. Such embankments are not alone the cause for siltation of creek beds, which is also due to natural causes, viz., mud and sand washed from the hills through rivers during the rains. The cultivation on hill-slopes has much to do with this.”

We personally noticed a typical case of a washed out embankment of a large piece of reclaimed Khajan land opposite Ghodepoi in the Jaitapur creek and between Karbone and Govalkot in Dabhol creek.

(d) *Intensive Cutting of Mangroves.*—It is a wellknown fact that the ground shaded by trees and held together by their roots is less liable to the withering action of natural agents than the open ground bare of vegetation. Mangroves and Tivar have been found to be very effective in arresting siltation by holding together the soil in the creek banks. This was clearly evident in the marginally noted creeks, which did not disclose abnormal siltation in spite of denudation of forests in the tracts through which they flow. The reason is that for many miles the banks of these creeks are overgrown with mangroves and they have effectively checked siltation to a certain extent. Very fine mangroves exist on both banks of the rivers from Revdanda to Gophan in the Revdanda creek, from Bankot to Dasgaon in the Bankot creek, from Dabhol to Karbone in the Dabhol creek, from Jaigad to Kurdhunda in the Jaigad creek and from Vijaydurg to Vaghotan in the Vijaydurg creek. The channel studded by these mangroves is deep and free from silt. Where however in the very same creeks these mangroves were either destroyed or not grown that portion of the channel has silted. If therefore these mangroves had been cut and lands given out for cultivation there would have been rapid siltation and these creeks would have become unnavigable.

(e) *Construction of Jetties, Causeways and Embankments.*—The construction of jetties and causeways have also contributed to increased siltation in their vicinity. They along with the many private mud and loose stone embankments have acted as groynes and nullified the scouring action of tides. As the tides are obstructed by them at various points silt is not flushed out properly and as a result shoals have formed in their neighbourhood.

(f) *Construction of dams.*—It has been the practice with agriculturists living alongside the sweet-water areas of rivers to put up dams of

loose stones and mud across the rivers for watering their fields and cattle. These dams are put up after the monsoons. As they are not removed at the beginning of the monsoon they are swept away by floods in rains and the detritus is deposited along the navigable channel year after year. Large shoals have formed in this way in many creeks in the Ratnagiri District.

(g) *Strong tidal and wind action.*—According to Rankine “the tides in long inlets are compounded of a simple emptying and filling current,—like that of emptying and filling up a reservoir—and a series of branch tidal waves propagated up the channel from waves of the offing.” “These waves are propagated up the declivity of a stream, which they often affect at points above the level of high water at sea.” The tidal waves from the open sea propagated up a long inlet break up each of them into several branch tidal waves, as they encounter with shallow water in their upward course. The general behaviour of these branch waves is analogous to that of the mains of which they are formed, when the latter approach the shallow water of the stream. Like them “Their fronts are shorter and steeper” with their “backs longer and flatter” “and as the waves advance” only “up the channel, the rise of the tide occupies a shorter time than its fall.” The flowing tide, thus helped on in its upward course by the branch tidal waves, acquires a greater velocity than the ebbing tide and the mud and silt, carried along and deposited by the former, cannot be scoured and taken down by the latter. This explains the tendency of tides, like that of the waves, to fill up long inlets especially such as are already shallow.

The above theory of course does not apply to all the creeks in the West coast but tidal actions do contribute to siltation of the mouths wherever there is no proper flushing by monsoon waters. When we went up the Jaigad, Vijaydurg and Jaitapur creeks, we noticed that siltation first started in the upper reaches of these creeks. The silt then gradually washed down and deposited at the entrance. The increased obstruction caused at the mouth accelerated the process of siltation in the interior and the growth of shoals. Thus as stated by Shield in his compilation—“Principles and Practice of Harbour Construction” a battle between these contending forces (i.e., waves and ebb) is therefore being continually waged; but the wave power is, as a rule, more than the river current can cope with, the result being that the river channel is deflected, and a ridge forming its submerged seaward bank is heaped up by the waves, aided possibly by littoral currents and by them pushed more and more land-ward till at length it runs parallel or nearly so to the coast line. There is however no doubt that so far as the Konkan rivers are concerned their siltation has been hastened during the last century by the extensive cutting of trees on the banks and on the hills and reclamation of khajan (marshy) lands. In the case of Gujarat ports the banks and the beds of most of the rivers are muddy and unlike Konkan not supported by hills and rocks.

General Remarks.

While describing the effects of cutting forests and reclaiming marshy lands on navigable channels we do not desire to criticise the activities of the Forest and Revenue Departments, since they are necessary for the development of the country in general and for the uplift of the rural population. They cannot be stopped and the navigating public must face the resulting evil. It is humanly impossible to remove annually all the mud which flows down the various rivers. Even a dredger in each river will not be enough and the cost of maintaining a large number of dredgers will be enormous. It must eventually fall on the public and in the long run they would find rail and road routes much cheaper than the sea routes. In our opinion the policy should be to improve and maintain one or two ports for direct external trade and to use the minor ports as distributing centres for inter-portal trade and kept navigable for small country craft. For distribution of goods in the interior there are several ports which can be used for shipment and landing and where there are no possibilities of siltation, e.g., Ratnagiri, Musakaji (Jaitapur), Vijaydurg, Deogad, Vengurla, Karwar and Kumta. At these places we have already proposed the necessary facilities for shipment and landing of goods. Some of these are connected by metalled roads and others will have to be connected with the trunk roads by feeder roads. Our suggestions about these feeder roads will be found in Chapter 6.

We shall now deal with the ports individually wherever there are special causes which have led to their present conditions.

Dhollera.—The siltation in the port of Dhollera (Whittle Bandar) is principally due to the gradual siltation of the Gulf of Cambay. Bhadar is the main river in this port. Owing to the heavy floods, which took place in Gujarat in 1894 and 1927 the river Bhadar changed its course and the port at Whittle Bandar silted very fast.

Broach.—The siltation in the ports of Broach is principally due to the heavy floods to which the Narbāda is susceptible. We were told at Broach that since the construction of the New Railway Bridge the current of the river has changed its course towards north. But there has been no change in the sandbars between Broach and Lohara. It is clear from the past history given in Appendix II that the extensive length of this river is responsible for heavy siltation.

Surat.—The port of Surat is situated on the river Tapti, which is susceptible to floods. These floods bring down large quantities of silt from the interior. When the Committee met at Surat Mr. O'Sullivan, the Executive Engineer of Surat and Broach Division, told the members and witnesses that he had moved in the Tapti many miles up and noticed that there existed several groynes in the river apparently constructed by private persons. These groynes, he said, had never been properly maintained and had consequently helped to increase siltation in the river instead of regulating the current and protecting properties they were intended to do.

Bankot, Jaigad, Jaitapur and Vijaydurg.—A special cause for increasing siltation in these creeks is the constructions of jetties and bunds by private persons. These jetties which have been constructed without any knowledge of Marine Engineering have acted as groynes and have accelerated rapid siltation in their vicinity.

Vengurla.—The siltation at the mouth of and inside the estuary at Vengurla is mainly due to the construction of the branch road leading to the old Custom House. This branch road effectively blocked the free flow of tidal waters causing siltation all round.

Tadri.—A special cause for increased siltation in the port appears to be the several bunds erected by fishermen for catching fish. These bunds have prevented the free flow of the current and caused siltation. The fishermen, we believe, have acquired prescriptive rights to fish.

Kumta.—The siltation at this port is due to the construction of a low causeway right across the river a few feet away from the Custom House wharf. As wide spans have not been provided for free flow of water, sand and mud brought by the flow tide are deposited in front of the Custom House wharf resulting in siltation in the channel from the Custom House to the mouth of the creek.

Bhalkal.—In this port a special cause for siltation is the construction of bunds in the creek by private persons to protect their gardens. These bunds are laid right into the bed of the creek and have caused increased siltation.

Effect of Siltation on Trade.—We shall now describe how far the gradual or rapid siltation or the shoals have affected the local trade of the various ports. In this connection the views expressed by the Departments of Agriculture and Industries will be found interesting.

About Revdanda the Deputy Director of Agriculture, N. C. D., Nasik, states as follows :—

“ This is an important port in Kolaba as the garden produce like coconuts, betelnuts and a variety of vegetables and fruits, coming from the coastal tract within a radius of 10 miles is despatched to Bombay in country crafts. The Revdanda creek got silted up at its entrance to such an extent that since six or seven years even the country crafts of ordinary size are unable to enter it, except during high tides. This has thus been causing considerable difficulty in marketing the valuable produce mentioned above and particularly perishable produce like the vegetables which latter the inquiries show amounts to not less than two hundred baskets per day. This is indeed a considerable loss to the garden cultivators, who cannot now realise remunerative prices for their produce. This produce as well as eggs of hens which also form an important commodity of export has to be sent by a much longer road and sea-route *via* Revas Bandar. During the hot weather months certain jungle fruits like “ Karwand ” (black berries) and also country and grafted mangoes used to be despatched from this harbour in large quantities. This trade has almost ceased on account of the filling up of the mouth of the creek. The silting up

of the Revdanda creek has also caused great inconvenience to fishermen who complain that the catches of small fish which is principally used for manuring cocoanut has markedly gone down as the movement of this type of fish is restricted by the barrier of silt. This has not only affected the income of the fishermen adversely but has in its turn its repercussions on the supply of manure for cocoanuts."

The Deputy Director of Agriculture, S. C. D., Poona, states :—

"*Bankot Creek.*—The cultivators in this creek export their produce like paddy, grass, fire-wood, mangoes, etc., and due to the bars the freight increases by 25 to 30 per cent. and the cultivator proportionately realises prices less by that per cent."

"*Dabhol.*—The export of grass, firewood, paddy, supari, mangoes and myrobalans is affected and the transport charges thereby increased by 10 to 15 per cent. in this creek on an average and so the prices realised are consequently reduced by this much."

"*Jaigad.*—The cultivators send out from this creek grass, supari, firewood, myrobalans, etc., and due to the siltation the transport charges are enhanced by 15 to 20 per cent. and so the yields are reduced by that much."

"*Ratnagiri.*—The commodities exported by agriculturists are grass, firewood, mangoes, kokam and myrobalans. Due to siltation the trade was affected by 10 per cent. in this creek."

"*Jaitapur.*—The trade of "sann" fibre, kokam, mangoes, grass and firewood is of importance in this creek and the same is affected by about 15 per cent. due to siltation."

"*Vijaydurg.*—The trade of sann fibre, mangoes, myrobalans, grass and firewood is affected by about 20 per cent. due to siltation."

The District Agricultural Overseer, Kumta, writes on the Honavar creek as follows :—

"There is no landing stage at this port and the boats have to wait until the full high tide to reach the banks for loading and unloading. The river bed is also much silted. Much inconvenience is experienced by the public."

The Director of Industries writes as follows :—

"The fishermen at Revdanda, Dabhol, Jaigad, Bankot, Rajivda, Ratnagiri, Jaitapur, Sarjekot, Deobag and Honavar submit that they experience considerable difficulties at these places in taking the fish laden boats to the creeks owing to the existence of bars and shoals. The latter are the result of siltage of sand. The fishermen plead that if these creeks were dredged periodically it would be possible for them to take their fishing craft higher up the creeks than at present, and thus serve villages situated on their banks which, otherwise, in the present circumstances experience difficulties in obtaining supplies of fish."

So far as can be seen from trade statistics the ports of Surat, Jaitapur, Vengurla, Kumta and Bhatkal appear to have suffered to some extent from siltation. But the decline in trade of these ports was mainly under the head "transit trade". Local trade of any port does not appear to have suffered except where it has been diverted to the road routes, e.g. Panvel.

From the information furnished by the witnesses who appeared before us at various places and from personal inspection of the ports and creeks we have come to the conclusion that there has not been material deterioration—either geographical or commercial—in the condition of most of the ports. At certain ports though there has been geographical deterioration the trade has not suffered. The reason for geographical deterioration is mainly siltation. As regards commercial deterioration we find that imports and exports for local consumption in the littoral area served by each port have not been affected. The decline is in transit trade from and to the Ghats and the Deccan. In the Konkan the main commodity exported from Vengurla, Karwar and Kumta was cotton and from Honavar and Bhatkal pepper and sandalwood. Owing to the construction of the W. I. P. Railway the transit cotton trade of Vengurla, Karwar and Kumta has diverted to Mormugao. Similarly owing to the construction of the Mysore State Railway the transit trade in pepper and sandalwood at Honavar and Bhatkal has diverted to that Railway. Another important commodity exported from Kumta and Honavar was betelnut. This trade has, as stated before us by the merchants, suffered by keen outside competition. There is also another reason for decline in cotton exports. Larger use of locally produced cotton by the Textile mills at Sholapur, Kolhapur, Gokak and Bangalore has affected to a great extent its export by sea to Bombay from the Southern Konkan ports. On the side of imports, foreign sailing craft which used to bring various goods from Basra, Zanzibar and other places have now nearly ceased to operate on this coast for the simple reason that their place has been taken by ocean going steamships which call at Bombay and Mormugao. The goods are now distributed from Bombay and Mormugao to the coast by vessels and small cargo steamers and to the interior by rail and road. There is nothing unnatural in this phenomena. With the emergence of rail and large steamships trade got a better and reliable means of transport which eliminated the sailing vessel. With the elimination of sailing vessel, transit trade had no more use for coast ports which could be used only by such type of craft. The rise of new towns on the coast and Ghats also contributed to a reshuffling of markets. In Gujarat the trade has been captured by the Kathiawar ports. The cotton exports at Surat were absorbed by the mills at Ahmedabad and Navsari. In some cases notably in the Thana and Kolaba Districts goods are now transported by motor lorries. All these diversions of routes have ultimately benefitted trade though they might have caused decline in the trade of individual ports.

In the course of our visits we interviewed both agriculturists, fishermen as well as masters of vessels. Their general complaint was that siltation retarded navigation, but this holds no ground since in the case of coasting craft a delay of few hours due to tide and wind is of little consequence economically. In fact large number of coasting crafts have to wait at certain ports for cargo. They have often to remain at anchor either inside ports or at sea waiting for favourable winds and tides. The rates of freight have also not increased owing to siltation. In view of these facts we do not think that siltation is mainly responsible for the rise and fall in trade of any individual port.

CHAPTER 5.

SUGGESTIONS FOR —.

(A) *Dredging*.—Almost all the replies received by the Committee and the witnesses who appeared before it suggested that the silt at the mouth as well as that in the interior of creeks should be removed by dredging. As remarked by Mr. Messent late Chief Engineer of the Bombay Port Trust when he carried out a Survey of the Konkan ports in 1922 if dredging is to be effective it must be repeated once a year or supplemented by expensive training works which might or might not prove successful and for this purpose a fleet of dredgers will have to be maintained to attend to the needs of over two dozen ports and creeks. Leaving out of account the colossal silt in the Narbada and the extensive bars at the mouths of the Revdanda, Bankot, Dabhol, Rajivda and Honavar creeks it will be seen from the attached statement that the silt that will have to be dredged is on a rough estimate not less than 350,00,000 cubic yards (sand and mud). A dredger with a capacity of 150 cubic yards per hour will require about 30 years to remove the above quantity if it is worked continuously for 24 hours. The cost will not be less than 40 lakhs. The Narbada and the five creeks mentioned above will each require an independent dredger to keep the rivers navigable throughout the fair season. The approximate cost of a sucking dredger of the dimensions shown in the margin with pipe line, cutters, steam engine and independent

Length 174 feet.

Breadth 41 feet.

Depth 8½ feet.

hoppers will be Rs. 10 lakhs, *vide* letter dated 10th June 1938 from W.M. Simons & Co. (pages 66-67). The use of a dredger is only possible when there is sufficient depth of water to float it—say about 10 feet and we do not think that this will be found at any of the shoals up the creeks. Besides navigation of country craft in all creeks takes place with the tide and in places where there is insufficient water at low tide the deepening of the channel would not always benefit navigation, since except under very favourable conditions sailing in creeks against an adverse tide is impossible. The commercial and navigational importance of these minor ports also has to be taken into consideration. They were distributing centres and are gradually disappearing as such owing to the construction of Railways and feeder roads. It is true that some of these still continue and will continue for some time as distributing centres but in our opinion there is no justification for the heavy expenditure involved in purchasing and maintaining a fleet of dredgers. The expenditure must be recouped in some way and the additional burden on the coasting traffic will lead to its diversion to much safer, quicker and cheaper routes. It seems to us that in the long run the scheme will result in needless waste of public money. At the most we would suggest that a small dredger might be purchased out of the Landing and Wharfage Fees Fund and maintained partly from that Fund and partly from the Southern Group Ports Fund for the removal of sand and silt at the end of each monsoon from the anchorages near jetties and piers used by steamers and large

size boats. If the initial cost and the cost of maintenance is very high a portion of the cost should, in our opinion be borne by Government. Experience has shown that sand and silt collect near the piers and jetties during the monsoon and as they are not removed in time it becomes necessary to extend the piers and jetties. Such expenditure on extension will in our opinion be saved if the approaches are kept clear of sand and silt.

For reason already given above we do not think it feasible or necessary to clear the mouths of creeks—but if Government are inclined to make an experiment and provide funds for the experiment we would suggest that the experiment may be tried in the following ports in the order in which they are mentioned :—

1. Revdanda ;
2. Bankot ;
3. Rajivda (Ratnagiri) ;
4. Jaitapur ;
5. Rewas.

These five ports deserve consideration, because the creeks at Revdanda, Bankot and Jaitapur run up to the important towns of Roha, Mahad and Rajapur which were at one time important trade centres. Ratnagiri is a District town connected by a good road with the M. & S. M. Railway, and is growing into importance. There are however alternatives to dredging in these creeks, which we have mentioned below :—

1. *Revdanda*.—It will be seen from the description given in Appendix II that the sand bar at the mouth of the Revdanda creek is there for about six centuries or more. It appears to be a natural bar. The decline in trade cannot therefore be attributed to the bar. It might have changed here and there but on going over the bar in sailing boats we found that very little change has taken place at the bar since the survey of the river about 40 years ago. If at all any obstruction is caused by the bar it should be to coasting steamers which must call at the scheduled time. Country craft depend on tide and wind and cannot be affected by this age old bar. We have consulted the steamship Companies. They do not press for the removal of the bar. They merely ask for marking the channel at the entrance to this creek. We do not therefore think that there need be any real hardship from this bar if the channel is marked with buoys as recommended in a subsequent chapter.

2. *Bankot*.—The bar at Bankot is also an old bar. There are instances on record dating as far back as 1852 that even vessels of moderate size have met with accidents on this bar. When the old type passenger steamers of the B. S. N. Co., stopped calling at Bankot in 1905 an enquiry was started and the possibilities of dredging this bar were investigated. It was then decided that dredging will not be successful owing to the very exposed nature of the entrance to this port. Then as now the bar is navigable by vessels up to 50 tons

burthen. There has been no appreciable change in the condition of the bar during the last 30 years as there is about 9 feet of water on the bar at low tide. Even now steamers can with sufficient care enter the port except on certain days. In fact Mr. Logsdail piloted one of the steamers of the B. S. N. Co., into the port three years ago. The captains of the steamers are however reluctant to take the steamers inside. Steamers therefore call at Hareshwar in Janjira State opposite the Bankot bar. If the steamer companies will employ launches to carry the passengers from Bankot to Hareshwar and *vice versa* by arranging the timings during daytime the present inconvenience caused to passengers in walking over to Bagmandla will be saved. The navigational facilities now in existence are satisfactory as sailing vessels only call at and leave this port during day light. In the event of steam vessels calling at this port at night the necessity for navigation lights and a gas buoy at the entrance of the bar might be considered.

3. *Rajivda (Ratnagiri)*.—Though it does not appear that there was large accumulation of sand at the mouth of this creek in the past a sand bar has developed recently which is extending rapidly. The training of this creek, though small is not possible owing to peculiar situation of the Ratnagiri Bay which controls the currents of water at the mouth of the creek. Dredging is the only method by which this bar can be removed. When we visited Rajivda a master of one of the local country craft suggested that a groyne should be put up off the north bank to divert the current with a view to clearing the recent accumulation of sand at the entrance on the south of the creek. We are not inclined to support this suggestion as from experience in other creeks groynes have become a hindrance to navigation. In our opinion if a jetty is built at the foot of the Lighthouse in the Ratnagiri Bay the necessity for clearing the mouth of this creek will disappear.

4. *Jaitapur*.—The sand bar off Yeshwantgad in this port has not increased appreciably during the last ten years. The proposal made by the public of Jaitapur to dredge this portion is merely with a view to permit the steamships to go further up the river and disembark passengers at Jaitapur. We doubt very much if the ferry steamers would ever go further into the river than Moosakaji as there is very little turning space after crossing the bar. On the other hand there is a safe anchorage at Moosakaji and there is also a road from Moosakaji to Rajapur. This needs improvements unless the District Authorities propose to have a new road from Tulsunda to Jaitapur, and Rajapur on the southern bank. For the reasons given above we do not see any necessity for dredging this section of the creek as the country craft find no difficulty in going up and down the river on suitable tides.

5. *Rewas*.—The siltation near the Rewas pier is increasing and it is alleged by the people of Rewas and Mandwa that the Bombay Port Trust dredgers are emptied at the mouth of the Dharamtar

creek. If this is a fact and if the activities of the Bombay Port Trust cannot be checked the pier at Rewas even after its extension will be unserviceable to the number of passengers who travel between Bombay and Rewas. This is the port for the new Suburbs of Bombay, viz., Kihim, Alibag, Thull, Avas, Sasone and Mandwa. We would suggest that the limits of the Port of Bombay should be extended so as to include Rewas and Mandwa. So the Port Trust will maintain the approaches to Rewas free from siltation. We are of opinion that the transfer of Rewas and Mandwa to Bombay Port Trust limits will benefit the Port of Bombay and remove the inconvenience and hardship caused to the public.

If dredging is decided upon an expert might be asked to examine the mouth of one of these creeks in order to ascertain the quality and quantity of silt to be removed, the time required, the cost of dredging the silt and whether the result will be permanent or only temporary. We suggest investigation by an expert before launching an expensive scheme since the expert opinion obtained in the past—especially in the case of the Bankot and the Narbada—has been that heavy expenditure on dredging is neither necessary nor warranted by the present needs of the ports. Engineering Science has, however, progressed during recent years and schemes which were considered impracticable in the past might possibly be carried out now. Should the expert opinion be favourable and a scheme can be formulated which would be within the means at the disposal of the Ports and the L. W. F. Funds dredging may be tried in the ports mentioned above.

We have not included Dabhol in the above list as the Dabhol bar is as old as the river. There is a sufficiently deep channel at the entrance during the fair season and the collection of sand at the mouth of the navigable channel in the monsoon is washed away after the rains. No inconvenience is therefore caused to shipping. There are also three guiding lights in this port installed in consultation with the R. I. N. These give accurate bearings to masters of vessels. We do not consider it necessary to incur any expenditure on removal of a portion of the sand bar or on putting up additional lights or buoys. As we have proposed a road from Karbone to Govalkot and to make Karbone the terminus of traffic it is also not necessary to remove the silt in front of the wharf at Govalkot. We have also not included the Honavar bar since cargo steamers call during the fair season and anchor outside the bar and it causes no obstruction to country craft. Moreover this is a shifting bar and if any attempt is made to remove the present bar it is sure to form again at some other place near the entrance.

(B) *Improvements at Dhollera.*—Besides dredging, if possible, we are unable to recommend for reasons given in the previous chapter any grandiose schemes for the improvement of most of the minor ports in this Presidency except at Magarwalli (Dhollera). There is no port in the north Gujarat and though the Gulf of Cambay is quite close all goods intended for the Ahmedabad and Kaira Districts have to be

taken all the way by rail from Bombay. If there was a convenient port in north Gujarat the freight charges can be reduced. Dhollera will not only supply the needs of north Gujarat but also of Central India and Rajputana. Dhollera (Magarwalli) possesses at present no landing facility, there is scarcity of water supply and there is no road from Ahmedabad to the bandar. Mr. Jani a co-opted member has made the following suggestions :—

“There is a small creek at present where an old barge is lying. In my opinion this creek will be a suitable and protected small dock for berthing country boats. In the start I think it should be made 100 feet wide and 200 feet long with a sufficient depth. It should be not at right angle but must be dug as directed in the sketch so that when the proposed sluice valve is opened the forced mud will go in the main creek and washed away by the in-coming tide waters towards the tail end of the creek on the West side. Similarly the point A line should be kept shorter so that the washed out mud from the main creek may go direct towards the tail end. Here also the line at A must be given a little outside gradient. A sluice valve worked by screws may be constructed at C which will take in-coming tide waters and then closed at full tide. Thus the canal now made by the road earth-work will be full of water and after the tide waters are out and when the creek is empty the sluice valve should be opened so that the rush of water from the canal will come out with a forceful current and wash out the mud. I think this will keep this small berthing place clear and deep. The canal at G must have a bottle neck to increase the force of water. The side walls on both sides of this small creek must be made of wooden piles and planks. And also the mouth corners must have the same on both sides in the main creek having rounded corners. On both sides of the walls on land outside there must be strong *khuntas* for binding ropes of boats. Also lights, marking posts and beacons.

There should be a high level landing platform on the A side of about 500 × 500 feet and 3 feet in height above the highest tide levels. One warehouse and one ordinary go-down may be made of iron sheets. There should be some hand cranes and one power crane and water supply. This platform may be connected with a branch road from the main road now under construction.

The tank marked I may be made a timber pond. This pond should have a small canal marked D F having a sluice valve at D and a small bridge Nala at E so that the pond may be washed out whenever desired. The pond may have an outlet at I. The open land at H may be utilised for go-downs of merchants. The level can be raised ”.

The opinion of Mr. Logsdail, Deputy Superintendent of Lighthouses, on this subject is transcribed below :—

“The proposals made by Mr. Jani for Dhollera Port are, from a lay-out point of view, quite good ; but I am in doubt regarding three points,

One is the question of using timber for strengthening and holding back the creek banks. We have to take into consideration that teredoes will play havoc in a year or so and constant renewals will be necessary. Secondly, timber to the bank sides will have a tendency, unless very securely embedded and fastened, to cant towards the water when the strong ebb tides recede. This will be due to the mud banks becoming sodden thereby increasing the weight on the timbers, and percolation of the mud through the timber joints will have a tendency to force the timber outwards together with the suction caused by the cast velocity of the receding tide.

It is noticed from his proposals that he wishes to increase the velocity of the out-going water which necessitates a very strong support for the banks' sides.

I am of the opinion that the landing and discharging of cargo should be done with the aid of a barge moored close up to the bank at the end of the road having a suitable crane fitted and the vessel discharging or loading to lay off side of her. The crane should be of the type to swing over a radius of more than 180°. A small wooden platform can be attached to the barge and the bank where cargo can be placed and the coolies would be able to handle the cargo from the platform to the conveyance, that is, to transport it. This proposal will save us the anxiety of a wharf and in the event of wishing, in the near future, to alter the position of the road or site for the working of cargo, it will be immaterial as the barge will be of a portable nature and can be removed where desired taking its wooden platform with it."

On carefully considering both these schemes we are inclined to support Mr. Logsdail's scheme since the landing place cannot at present be determined as it must conform to the requirements of the trade which are not known. The floating crane can be shifted to any other place in the creek after the probable changes in tidal currents are watched for a few years. A permanent wharf or a platform might become un-serviceable and the money spent might be wasted. We further think that for the supply of drinking water there is a great need for a tank near the new bandar. If that is not possible the existing tanks at Gheda or Rahatalao may be extended and a pipe line laid up to the bandar. We also consider it desirable to provide a road from Dhandhuka to Ahmedabad as suggested in chapter 6. We have interviewed a representative of the Standard Oil Co., and some mill-owners of Ahmedabad. They all emphatically say that Dhollera has a bright future only if it is connected by road with Ahmedabad or if a branch railway line is constructed from Dhandhuka to Magarwalli—a distance of about 30 miles. There are already three marking buoys and two lights (temporary) now in existence and in the event of deep sea or ocean going steamers calling at this place in the near future the need for better lights may be considered.

The people of Dhollera and Dhandhuka have also asked for a separate landing place for timber and to take measures for stopping flood water from entering the bandar area. Until Magarwalli attracts sufficient

trade it is inadvisable to spend large amounts on facilities for trade in any particular commodity. For the present therefore we would suggest that a slip of wooden pillars may be provided at Magarwalli for handling timber. Measures for regulating flood water are no doubt necessary both in the interest of the bandar area and the newly constructed road. Such measures will consist of stopping flood water and of draining off such water when it spreads on the bandar area. In 1936 a mud embankment about 2 miles long was constructed at a cost of Rs. 5,000. If it is repaired and strengthened where necessary it will serve the purpose of stopping flood water. For draining flood water the canal made by the P. W. D. by the side of the new road can be used as a drain. These works can be carried out at a small cost.

(C) *Removal and Marking of Shoals.*—It was urged by some witnesses that if steamer piers and roads were constructed the lost trade would come back to their ports. However desirable such a consummation may be from an individualistic point of view it is not practicable for obvious reasons. In fact development of a number of small ports close to each other for inter-provincial and international trade is to be deprecated both on economic and administrative grounds. We think therefore that except Dhollera there is no scope for the immediate development of any other coast port. There may occur partial revival of trade here and there but there are no chances of re-capturing the lost trade. It is for these reasons that we do not think that even if all the creeks are dredged and the ports are furnished with all up-to-date facilities they will regain the lost trade. It is of course true that owing to siltation navigation in some ports and creeks has become difficult but such navigation is now solely restricted to interport and creek traffic and we have suggested remedies therefor. It is also true that many coasting vessels have now been thrown out of employment and the country craft industry in general is in a moribund state. This is due to the transfer of transit trade to rail and road routes and the gap having been left unfilled. In Madras most of the minor ports are still doing well and as far as we are able to ascertain it is due to development in the coastal belt of indigenous industries such as tile factories, manufactures of cocoanut palm, oil factories, etc., which supply the necessary freight to coastal craft and have necessitated improved facilities at the ports. There is no possibility of development of such industries in the Ratnagiri or Kanara districts.

However we do think that some relief is called for particularly in respect of small crafts plying on the western coast. The measures to be adopted must depend upon the existing trade and potential importance of each port. Some of the sand bars at the mouth can be marked by beacons or buoys to warn the mariners. Inside the creeks the shoals can be removed by manual labour wherever it is possible in order to widen the narrow channels or deepen shallow places. If the shoals are large and cannot be removed they should be marked by wooden posts as has been done already in some of the creeks.

In the following creeks there are small shoals mentioned against each and they should be removed by manual labour :—

(a) *Panvel*.—The silt to be removed is in front of the wharf at Panvel $210 \times 25 \times 2$ feet. This should be removed by manual labour.

(b) *Jaiwad*.—There are three shoals in the channel from Fungus to Sangameshwar as described below :—

Name.	Quality.	Length.
(1) Near Ozarkhol	Shingle ..	20 feet.
(2) Belekarnicha par	Do. ..	50 ..
(3) Near Sangameshwar called Bhothaticha par.	Do. ..	330 ..

These may be removed by manual labour.

(c) *Jaitapur*.—The undermentioned shoals should be removed by manual labour :—

Name.	Quality.	Length.
(1) Near Vilya	Clay mud ..	1 furlong.
(2) Near Rai	Do. ..	200 feet.
(3) Near Goval	Do. ..	100 ..
(4) Near Dongar	Do. ..	200 ..
(5) Kumbaracha	Do. ..	$\frac{1}{2}$ furlong.
(6) Near Panhala	Do. ..	50 feet.
(7) Near Sheda	Do. ..	20 ..
(8) Near Abhyankar	Do. ..	75 ..
(9) Near Dhopeswar	Do. ..	50 ..
(10) Near Rajapur and Pimpalkondi ..	Do. ..	$\frac{1}{2}$ mile.

(d) *Vijaydurg*.—The undermentioned shoals should be removed by manual labour :—

Name.	Quality.	Length.
(1) Near Uple	Sand and mud ..	$\frac{1}{2}$ furlong.
(2) Piracha Par	Do. ..	100 feet.
(3) Prindavan	Do. ..	50 ..
(4) Kunkavne	Do. ..	50 ..

(e) *Vengurla*.—There are small rocks on the north bank of the estuary at Vengurla. They can be removed by stone breakers.

(f) *Tadri*.—In all there are six shoals of sand and mud. Two are near Kagal village, one near Manaki and one near Harkade. Formerly all the goods from above ghat used to be taken to Kumta where there still exist large godowns and a well built wharf. Owing to the levy of terminal tax by the Kumta Municipality and in order to save godown charges at Kumta, traders are sending their goods to Tadri by this creek route. We understand that on construction of a causeway over the creek at Divgi, which is under contemplation, trade might again revert to the former route, via. Kumta. We would suggest therefore that the effects of this causeway on the trade might be watched before taking steps either to remove or mark the shoals.

As regards the suggestion for removal of silt near the jetty at Tadri we found from enquiries on the spot that vessels of about 50 tons burthen can still berth alongside the jetty. It is therefore not necessary to consider the suggestion as vessels of larger tonnage rarely call at this port.

In the following creeks the shoals being either extensive or rocky should be marked with wooden stakes :—

(1) *Surat*.—

- (a) Near Umra
- (b) Near Magdalla.
- (c) Near Gaviar.
- (d) Near Dumas.
- (e) Near Hajira
- (f) Near Mora.

(2) *Bulsar*.—Four sand banks between Kosamba and Bulsar.

(3) *Thana*.—The people of Thana ask for straightening the channel between the two bridges and removal of rocks in the channel near the

Railway bridge. In our opinion this is not possible since the rock, are quite close to the Railway bridge and cannot be blasted. A channel cannot be cut through the rocks by manual labour. The old Development Department tried to improve the channel but eventually had to fall back on masonry beacons which were also washed away in the monsoon. We would therefore suggest that the bends on either side of the bridge should be marked by ordinary posts in concrete foundation and the loose stones in the navigable channel removed by manual labour.

(4) *Panvel*.—There are rocks off Divala village in the Panvel creek. They should be marked with wooden stakes.

(5) *Revanda*.—The creek is very wide up to Gophan, but there are rocks at two places which should be marked with stakes ; similarly the five rocks in the channel from Gophan to Roha which remains submerged at high tide should also be marked with wooden stakes.

(6) *Bankot*.—There are shoals at the following places :—

- (1) Laganjuva ; (2) Kumbbla-Sapa ; (3) Muthavli ; (4) Vovur ;
- (5) Mahad ; (6) Tolda.

Nos. 3 to 5 are between Dasgaon and Mahad a distance of five miles. This siltation has been caused by the construction of a bund by the Mahad Municipality at the end of the monsoon for collecting water. This bund is at the head of the river and is washed away in the monsoon. As there is a good road between Dasgaon and Mahad and as vessels can still approach Mahad at high tides the channel beyond Dasgaon needs no improvements. Goods can be brought for shipment as well as they can be landed at Dasgaon where there is already a jetty which might be provided with steps. This suggestion has been included in our recommendations in chapter 7. The shoals at Nos. (1) and (2) above are the only important shoals which cause inconvenience to navigators. They should be marked with wooden stakes. The shoal at No. 6 is in the Goregaon creek. As we have suggested elsewhere in chapter 7, the construction of a jetty at Sapa with a branch road for Goregaon traffic it is not necessary to mark the shoal.

(7) *Dabhol*.—In Dabhol creek siltation is between Karbone and Govalkot and between Govalkot and Chiplun. As there is a good road between Govalkot and Chiplun the siltation in this portion of the creek is immaterial. The shoals between Karbone and Govalkot are extensive and cannot be removed by manual labour. Large vessels and steam launches can still go to Govalkot at high tide. Looking however to the importance of trade and passenger traffic in the creek, we think that Govalkot must be made accessible to traffic at any time. We have elsewhere suggested construction of a feeder road from Karbone to Govalkot about 5 miles. The local people supported the proposal. It is however necessary to mark

with wooden stakes the following rocky shoals in the creek leading from Karbone to Khed :

- (1) At Umbergaon,
- (2) At Nandgaon,
- (3) At Chambharvadi.

(8) *Malvan*.—As the mouths of the Sarjekot and Deobag creeks in this port are narrow and surrounded by rocks we suggest erection of two beacons at Sarjekot and one at Deobag to mark the entrance.

(9) *Honavar*.—In the Honavar creek there are three large shoals at Mavinkurve, Idgunji and Kodani between Honavar and Gersappa. Their removal by manual labour is impossible. Besides vessels of moderate size can sail as far as Gersappa at high tide. We therefore support the proposal which we understand is before the Public Works Department, that a causeway be constructed at Mavinkurve where the first shoal exists. If this is turned down the shoals should be marked with wooden stakes.

The site near the mouth (inside) of this creek causes no inconvenience as the entrance is open and the anchorage is wide enough. We do not think it necessary to remove it or mark it.

We shall refer to special measures required at Malvan and Bhatkal:—

(1) *Malvan*.—No doubt the rocks at the entrance to this port are dangerous but the navigation facilities have been greatly improved during the last five years. Two gas buoys mark the perch and the south patch and a transit light has been erected on the shore to enable ships to take correct bearings. Nevertheless the suggestion to blast the Perch Rock which is a danger to navigation in this port is being considered by the officers of the Salt Department. We understand that tenders for its removal, have been called for. We support the proposal if there is no fear of damaging the existing channel.

(2) *Bhatkal*.—The mouth of this creek is now almost entirely blocked. Removal of this silt is impossible. Mr. Logsdail suggests training of this creek and his opinion is transcribed below:—

“ In recent years the entrance of this river has greatly silted but I am of the opinion that the formation lends itself favourably for bottling, that is to say, holding back the water on a high tide and releasing it at low water thereby increasing the velocity of the outgoing tide to such an extent that it will carry the silt to sea. This can be done at this port provided the tidal outflow is directed by erecting several wooden and sandbags groynes. I have very closely watched this place for the last five years and am of the opinion that this experiment will prove satisfactory. I am so confident of the experiment that I am prepared to undertake the work.”

Mr. Logsdail's scheme is not very expensive and is worth trying. It was proposed by one of the witnesses to construct a jetty on the north headland outside of the river; but this place appears to be in an

unsheltered position, and no doubt, the present jetty could be extended in a south-westerly direction if the silt removing scheme proves a success.

(3) *Broach*.—The question of erosion and siltation in the Narbada has been extensively dealt with by the Narbada Bridge Committee. The magnitude of siltation and allied questions in this river and the Tapti (Surat) are so large that we feel that as laymen we should not hazard any opinion thereon. So far as the siltation at the landing place is concerned the Salt Department Authorities have been taking such measures as would keep the bandar in working condition. A toe-wall with pitching has been constructed at Broach bandar and a large amount of about Rs. 11,000 has been recently spent on repairing the bandar road. The people of Broach ask for (1) resurvey of the river and removal of silt and (2) buoying of the navigable channel.

Item (1).—The river was surveyed in 1909 by an officer of the Marine Survey of India and at the suggestion of that Department the idea of dredging the river and removing the bars and shoals was dropped as it was not considered feasible and as it was reported that the cost would be enormous. Further investigations made by the Public Works Department also proved that it was not possible to remove siltation in this river and to keep the channel steady. We understand that the conditions have not changed for the worse during the last 25 years. Trade has on the other hand increased. Unless Government are prepared to remove the silt at any cost and maintain a dredger to keep the channel navigable a resurvey is in our opinion not necessary. Vessels up to 100 tons do come up to Broach at present but only at high spring tides. The country craft trade all along the western coast is carried on in vessels of 50 to 100 tons. As they have to depend on tide and wind time plays an unimportant part. Removal of large shoals and sand bars at an enormous cost to enable such vessels to come at any tide is, in our opinion, not advisable or justifiable. There are very few vessels of over 100 tons and we do not therefore support the suggestion that the river should be made navigable for vessels of 200 tons.

Item (2).—We are informed by the local Sarkarkun and by the Deputy Superintendent of Lighthouses that owing to the bottom of the Narbada being practically a mass of quicksands, the constantly shifting nature of the channel and the strong current in places where the buoys have to be placed they would drag moorings and instead of being an assistance to navigation would be a source of constant anxiety. This fact is also admitted by masters of vessels.

(4) *Karanja*.—It is not possible to remove silt from the Karanja creek. It is shallow above Mankola and it seems to be doomed. It is however an important waterway at present containing as it does the Revas and Dharamtar steamer ports. The only solution suggested is to construct a bridge at Dharamtar and make Revas the terminus of steamer and boat traffic. It will also bring the District offices at Alibag within easy reach of the public who live on the north side of the Dharamtar creek. The Collector of Kolaba states that

a bridge across Dharamtar creek is a matter of urgent necessity and earlier the work is taken up the better. It will remove all the difficulties at present experienced by the public. We strongly support the suggestion.

(5) *Jaigad*.—The people living in this creek ask for deepening the channel in front of the Kareli Bund and in front of the Custom House at Jaigad. The channel from the mouth up to the Custom House is sufficiently wide and deep. The anchorage is also wide enough to accommodate three or four steamers. In our opinion the sandbanks cause no obstruction or inconvenience. So far the steamships calling at this port have not experienced any difficulty in turning their vessels between the Custom House and the Mora sand bar as the area there is 1,700 feet across. The Steamship Companies appear to be satisfied in this connection but the masters of country craft who cannot read navigation charts would appreciate a beacon marking the edge of the sand bar. As regards the suggestion to deepen the channel between Pirdavne and Fungus we do not think any deepening is necessary since the channel is already sufficiently deep. Even if it is deepened it will fill up again in the monsoon.

(6) *Rajivda (Ratnagiri)*.—The people living in the Rajivda creek ask for the removal of shoals at Someshwar, Chinchkhari and Nachne. Some of the prominent witnesses examined by us did not think it necessary as the traffic crossing these shoals was in small tonies and insignificant. Nothing is therefore required to be done.

(7) *Deogad*.—Two suggestions have been made in respect of this port viz., (1) removal of the rock at the entrance and (2) removal of siltation in the Deogad Bay.

Item (1).—The rock is situated in the northern corner of the entrance of this port. The entrance is very wide and the steamship Cos. have never complained about this rock. It was represented at Deogad by one of the witnesses that this rock was a danger to navigation in the monsoons; but this is not a fact since there is no traffic in this port in the monsoons. In our opinion the rock does not constitute a danger and need not be removed.

Item (2).—The town of Deogad being at the head of the bay siltation nearer the town is inevitable; but it does not interfere with navigation or trade.

(8) *Achra*.—The people of Achra ask for the removal of rock and silt at the mouth and shoals in the interior. Achra is a small port which serves half a dozen villages. Vessels can come at high tide. Very few vessels above 10 tons call at this port. For fishing boats the entrance is always navigable. The shoals are due to the cutting of mangroves and to indiscriminate reclamation of khajan lands which have been left for years uncultivated and uncared for. In our view the trade and importance of the port does not justify any measures for its improvement. If the movement for a bridge over the Kolamb creek near Malvan materialises and the "Jungal" system

is introduced on the Kalavli creek, Achra may not hold out long as a port. It will be served by road from Malvan and Kankavli.

(9) *Vengurla*.—Removal of siltation at the mouth of the estuary. As a suitable landing place for cargo and passenger has been built at the head bandar and there is under consideration a scheme for the extension of accommodation at the head bandar we do not see the necessity for clearing the silt at the entrance of the creek which is only used by shallow draught vessels and they are not greatly inconvenienced. The landing place for cargo has recently been supplied with a crane and parking ground for cars, buses and in fact the traffic of this port has now shifted to that side of the harbour.

(10) *Belekeri*.—Deepening the channel of the creek from Belekeri to Hattikeri by about 3 to 4 feet. At present vessels of about 7 tons can go on tide as far as Hattikeri for shipping small quantity of timber and fuel which is the only trade at the port. If the channel is deepened as suggested vessels of 10 tons at the most might be able to go to Hattikeri. The removal of rocks instead of improving the channel is likely to cause siltation. The timber and fuel is brought in small boats to Belekeri, kept there for some time and then exported in larger boats. The proposed improvement will not therefore benefit the trade in any way.

(11) *Ankola*.—At Ankola the removal of shoals with a view to enable boats to get to the Custom House near the town is physically impossible. As an alternative the public suggested that the Custom House should be removed to Keni, i.e., on the shore opposite to Ankola and the present foot-bridge on the Keni-Ankola road should be so strengthened and widened as to be useful to vehicular traffic. This is a sensible suggestion as it will automatically solve the question of removing silt in the Ankola estuary. We strongly support this suggestion as on local enquiry and inspection we found that it is physically impossible to remove the silt in the Ankola creek. Some landing facilities for the local trade are essentially necessary and these can be provided for at Keni.

(12) *Gangawli*.—Clearing the mouth of the creek. There is no request from the general public. Only a solitary timer merchant suggested the clearing of the mouth. As large vessels of about 50 to 70 tons can enter the port at high tide and as the trade in timber which is the only trade at this port has no prospects of development owing to the closure of Forest Depots nearby we do not support the request.

(13) *Kumta*.—The people of Kumta ask for the deepening of the channel from the mouth to the Custom House at Kumta. As remarked elsewhere in this chapter the main cause of siltation is the causeway in the Kumta-Honavar road. So long as the causeway remains it is useless to remove the silt as the channel will fill up in the succeeding monsoon. We have elsewhere suggested in chapter 7 the construction of a jetty on the seashore.

(D) *Precautions to be taken for preventing siltation in future.*—When once the creeks are deepened by removing shoals the question of keeping them free from silt becomes important. For this we suggest the following measures :—

(i) Plantation of Mangroves and Tivars on both sides of the creek ;

(ii) Absolute prohibition against cutting of any Mangroves, Tivars or “Lavala” in any creek ;

(iii) Imposition of a condition that all lands already reclaimed or given for reclamation in future must be protected on the creek side by strong embankments of an approved type which should be maintained in good condition. All mud embankments should be stone pitched on creek side.

(iv) Compulsory removal before the break of the monsoon of all stone and mud dams put into the channel of any river within a distance of 30 miles from the mouth ;

(v) Whenever any jetties are constructed in creeks they should be so constructed at the water end as to allow free flow of tidal water and in the case of causeways spans of sufficient width and height should be provided.

A suggestion was made to the Committee by one of the witnesses at Vengurla that washing of mercury in a particular place tends to deepen it. The experiment might be tried at one or two small shoals as it is not an expensive one.

(E) *Other hindrances to trade.*—There is a general grievance at the ports where there are Municipalities that the trade at these ports had crippled owing to the levy of terminal tax by the Municipalities on goods merely passing through the Municipal limits. At Bulsar the traders complained that such tax was recovered on all goods manifested for Bulsar even if they were landed and shipped outside Municipal limits, e.g., Lilapur and Bhadeli. Such a tax is a hindrance to the development of trade at ports possessing a good anchorage and other landing facilities. We suggest that the Municipalities concerned should be prevailed upon to abolish the terminal tax altogether or to refund the tax on goods taken out of Municipal limits within a certain period.

Statement showing the approximate area in cubic feet of shoals and rocks in the various ports and creeks.

Name of port.	Bar.				Shoals.				Rock.				Remarks.
	Length.	Breadth.	Depth.	Area.	Length.	Breadth.	Depth.	Area.	Length.	Breadth.	Depth.	Area.	
	Ft.	Ft.	Ft.	C. ft.	Ft.	Ft.	Ft.	C. ft.	Ft.	Ft.	Ft.	C. ft.	
Surat ..	10,560	100	10	10,560,000	20,130	100	10	20,130,000	..	..	..	..
Bulsar	600	400	10	2,400,000	..	..	..	..
Panvel	1,400	250	10	3,500,000	710	90	10	639,000	
Karanja (Dharamtar).	335	100	10	335,000	..	..	..	..
Revdanda	260	100	10	260,000	250	10	10	25,000	Bar is 2 miles long and broad.
Bankot	1,402	348	10	5,250,000	65	16	10	10,400	Bar is 2 miles long and $\frac{1}{4}$ mile broad.
Dabhol	2,350	100	10	2,350,000	900	10	10	90,000	Do.
Jaigad	7,896	100	10	7,896,000	20	10	10	2,000	
Ratnagiri	210	100	10	210,000	..	..	..	..	Bar is 2 miles long and $\frac{1}{4}$ mile broad at the mouth of the Rajivda creek.

Jaitapur	..	..	..	..	30,725	100	10	30,725,000	..	..	..	..
Vijaydurg	..	..	..	..	1,190	100	10	1,190,000	..	..	..	..
Deogad	..	..	..	..	2,640	100	10	2,640,000	..	..	..	..
Aohra	..	..	..	..	325	100	10	325,000	10	10	10	1,000
Malvan (Sarjekot)	..	..	..	..	6,600	100	10	6,600,000	..	..	..	..
Malvan (Karli)	..	..	..	..	9,240	100	10	9,240,000	..	..	..	..
Vengurla	..	..	..	..	375	100	10	375,000	50	10	10	5,000
Tadri	..	..	..	..	800	100	10	800,000	..	..	..	..
Honavar	..	..	..	..	810	100	10	810,000	..	..	..	..
Bhatkal	..	2,640	100	10	2,640,000	..	..	..	..	..	..	..
				13,200,000				95,036,000				
				772,400								

The bar is 2 miles long and 1 mile broad.

Total :—Sand and Mud .. 108,236,000 Cubic feet.
 Rock .. 772,400 Cubic feet.

CHAPTER 6.

SUGGESTIONS FOR DEVELOPMENT OF VEHICULAR ROADS.

In the course of our enquiries we found that the public in general preferred roads wherever they were available to creek routes since they are safer, quicker, more reliable and certain than water routes.

Times have changed and one does not now mind spending a few annas extra for his own comfort. Take for example the competition between rail and bus services. Similarly wherever bus services are available on the coast people prefer those to travelling by country boats. Even for transport of goods if suitable roads were available people would take their goods in lorries rather than by boats since on payment of a little extra charge they are sure of getting their goods promptly and within the specified time. From an economic point of view also construction and maintenance of feeder roads would be cheaper than the removal of siltation and maintenance of navigable channels. In the case of roads a clear cut scheme and cost can be visualised and adhered to but in the case of waterways there is always the element of risk and consequent waste of funds. We are therefore, of the opinion that wherever it is possible roads should be provided and developed. The outlay on such development would be compensated from the increased receipts under Petrol Fund whereas no return can be expected from the amount spent in removal of silt. On the contrary, the result will certainly not be a permanent one. Therefore even if the creeks are improved as suggested by us a second-line of communication will always be a great boon to the public in general and the traders in particular in the Ratnagiri and Kanara Districts. We, therefore, suggest that steps should be taken to construct feeder roads at the following places :—

- (a) From Karbone to Govalkot,
- (b) From Tulsundha to Jaitapur-Rajapur, and
- (c) From Ankola to Keni.

The construction and improvement respectively of the roads at items (a) to (c) above will remove the existing inconvenience to creek traffic as well as the complaint about siltation. As far as we can see unless dredging is successful both technically as well as financially, which we doubt, there must come a time when it will be necessary to construct these roads.

We further suggest that the Sakharpa-Sangameshwar road be widened and strengthened and opened for motor lorry traffic so that goods from Up-ghat areas can be sent to the coast for transport to Bombay or Malabar by coasting vessels. We would also suggest that the existing roads from Deogad to Nipani and Malvan to Phonda may be opened for motor lorries by strengthening the necessary culverts. We were told that motor lorries were allowed to run on the Ratnagiri-Kolhapur road and therefore the port of Ratnagiri had attracted the trade of the Ghat Districts even of places which were nearer to Malvan and Deogad than Ratnagiri. These three roads will remove the long felt grievance

of the public. At present some of the Ghat localities which are nearer to the coast than to the rail road find it costly to send their goods in bullock carts for export via the coast. They can't use the railway as it is more distant than the coast. This fact was prominently brought to our notice by Rao Bahadur L. V. Parulekar, President, Ratnagiri Municipality, while giving evidence on the development of the port of Ratnagiri where Ghat traffic has increased very much during the last 4 years owing to goods being carried to and fro by motor lorries. We think, therefore, that the localities mentioned above should be provided with roads sufficiently strong for heavy motor vehicle traffic so that they can with benefit use the sea-route, which was and is the natural outlet for their produce. We do not think that such road development will unfairly compete with the Railway for the simple reason that no producer or trader will divert his goods to the sea-route (i.e., coasting vessel) which is always risky in preference to rail-route unless the latter is decidedly expensive.

Now that Government have decided to develop the new port of Dhollera in the Magarvalli creek, which is the only natural outlet for the produce of North Gujarat, it is but fair that it should be connected by road with the town of Ahmedabad. We therefore strongly recommend the construction of a road from Ahmedabad to Dhandhuka or a railway line from Dhandhuka to Magarvalli. This connection will materially help in the revival of the trade of Dhollera and must be treated as an adjunct to the improvements in the navigable channel.

We noticed that the absence of suitable ferry boats in certain creeks in the Ratnagiri District for the quick transport of motors and bullock carts caused considerable delay and inconvenience. In fact in many creeks goods have to be unloaded and reloaded on the opposite shore in other carts. We suggest that ferries "(Jungles)" similar to those in the Kanara District should be provided in the following creeks, wherever connecting roads exist on either side :—

- (a) Revdanda Creek,
- (b) Dabhol Creek,
- (c) Sarjekot Creek,
- (d) Kalamb Creek,
- (e) Deobag Creek.

CHAPTER 7.

SUGGESTIONS AND RECOMMENDATIONS FOR LANDING AND OTHER FACILITIES.

This chapter deals with the landing and other minor requirements of each port and the extent to which they are necessary or desirable. No doubt most of these ports require additional facilities and minor improvements and these are detailed below. We have not been able to recommend some of the suggestions either because they were found impracticable by us or because the proposers themselves admitted their impracticability when oral evidence was taken. For the sake of facility the suggestions made by the public are given on the left side and our views and recommendations have been noted on the right side.

Suggestions.

Recommendations.

- | | |
|--|--|
| <p><i>Broach.</i>—(a) Construction of a godown near the bandar road for storing goods brought for shipment or for removal into the town.</p> | <p>At present goods have to be landed and shipped as quickly as possible in order to enable the vessels to sail before end of the spring tide. It is often not possible to procure enough conveyances to remove the goods to the town or to bring the goods for shipment, and they have to be left on the vacant ground by the side of the bandar road. As this area is covered with water at high tide the goods at times get damaged. We are therefore of opinion that an open high level shed, covered at the top, with a gradual slope from road level to the base of the shed should be provided for near Bechraji Ovara.</p> |
| <p>(b) Construction of a road from bandar to railway station.</p> | <p>The Collector of Broach suggested that the existing road from the bandar passing through the town to the railway station should be widened and improved for the development of the trade of Broach. In our opinion the widening of this road like many other narrow roads in the town would improve the sanitation of Broach, but it is not essentially</p> |

Suggestions.

Recommendations.

- necessary for the development of the port. It is for the District Authorities and the Municipality to take necessary steps for widening this road.
- Surat.*—(a) Construction of groynes at suitable points. These groynes have been asked for to prevent erosion on the Surat side of the river. The erosion however does not lead to siltation in the river nor does it affect the jetties. They might on the contrary divert the course of water to the other bank and cause siltation near the jetty.
- (b) Addition to the existing jetty of a floating jetty (Thapda) to accommodate about 6 vessels. At present about 10 to 12 vessels load and unload daily in the busy season. The jetty which is under construction can accommodate only 6 vessels at a time. The wooden jetties are in a dilapidated condition and useless. One of them needs renewal in order to provide accommodation for 6 more vessels. In view of the strong current of water in the river and danger from floods a jetty on floats (i.e., pontoons) which could be removed in the rains is recommended.
- (c) A separate wooden slipway for shipment of timber. The bank being precipitous great hardship is experienced by labourers in loading timber. A slip with a correct gradient to ensure timber sliding down at all states of the tide will remove the inconvenience.
- (d) Repairs to the Chapat bandar road. This road is maintained out of the Ports Fund and is repaired every year. The mud which accumulates on the road during the rains should be removed soon after the monsoon and the road put in proper order.

Suggestions.	Recommendations.
(e) Removal or marking of uprooted trees hidden in the creek-bed.	Recommended. This suggestion may be brought to the notice of the Conservator of the Port.
<i>Bulsar.</i> —(a) A jetty or other suitable landing facility at Bulsar.	The landing place or the wharf cannot be used at low tide for shipment and landing of goods and carts have to pass through mud to get to the vessels' side in the stream. We recommend that the kachha slip should be metalled or asphalted and the mud which will collect on the surface during the rains should be cleared every year.
(b) Filling the pit in the road going through the creek.	Recommended. The work is small.
(c) Removal of the Kosamba light to a new site and its improvement.	Recommended. Owing to a change in the course of water at the mouth of the river the light at Kosamba does not serve as a guide to masters of vessels. They suggest that it should be removed to the Bhagal side. The Port Authorities may be asked to consult their nautical adviser and remove the light to a more suitable site.
<i>Panvel (a).</i> —Repairs to the cart-track from the wharf to the anchorage at Panvel.	Owing to insufficient water near the wharf at Panvel bigger vessels anchor about 2 furlongs away from the wharf. Goods are conveyed to and fro in bullock carts. The track in the creek should therefore be put in order and repaired as required.
(b) Replacing the cage off the Belapur jetty for the guidance of masters of vessels.	We were told that there used to be a beacon with a cage top for marking a dangerous rock in the channel leading to Belapur. The tindals want this cage to be placed again in position. We support the request.

Suggestions.

Karanja (Dharamtar).—Existing facilities of landing goods on the Public Works Department jetties at Dharamtar should be continued as also the small approach road on the Alibag side should be maintained.

Mandwa.—Construction of a jetty at Takadevi point and connecting it with the Mandwa Road.

Revdanda.—(a) Provision of 5 buoys and 2 transit beacon marks at the entrance and a light at Korlai especially for fishing vessels.

Recommendations.

It has been represented that the Public Works Department subordinates object to the shipment and landing of goods on the stone jetties on either side of this creek at Dharamtar. These jetties are used generally by ferry passengers and for landing of goods transported by the ferry. The shipment and landing of other goods will not cause any inconvenience to ferry passengers provided the goods are not left on the jetties for any length of time. We therefore recommend the use of the jetties for the shipment and landing of goods. We also recommend that on the construction of the new three stage jetty on Alibag side the old jetty and the small approach road leading to it should not be abandoned as they are useful for the goods traffic. The silt on either side of the two jetties should be periodically removed by manual labour.

The Mandwa fore-shore is exposed and owing to shallow waters boats cannot come close to the shore. A strong jetty will be necessary. We would suggest that a floating jetty at a small cost may be provided during the fair season.

This question was discussed with the steamer Co.s' masters, who agreed that one buoy on the south patch of the bar was all that was necessary and a suitable navigation light to guide navigation. The question of

Suggestions.

Recommendations.

- a second buoy may be considered if difficulty is found in future. For the guidance of country craft a beacon should be provided to mark the edge of the sand bank on the north side of the entrance to the creek.
- (b) Construction of a jetty with an approach road at Revdanda for goods and passengers. The construction of a jetty at Revdanda is already under the consideration of the L. & W. F. Fund Committee. We recommend that the suggestion may be brought to the notice of that Committee. The jetty should be connected with the existing road.
- (c) Construction of stone embankments for loading and unloading goods at four sub-ports. The public press for these loose stone embankments abutting on the creek as the present natural landing places at four sub-ports have silted and landing and shipping at low tide entails wading through mud and slush. We found however that the landing places are situated on land owned by private persons and would therefore benefit only a few individuals. There being no feeder roads in this tract it is impossible to provide jetties which would be useful to the public in general instead of to one or two individuals. We would therefore recommend that the jetties asked for may be provided for if the Local Board provides katcha roads and paths to the various fields in the vicinity.
- (d) Construction of a jetty at Korlai sub-port for use of fishing vessels. The village of Korlai with a frontage of rocks forms the southern boundary of the mouth of the Revdanda creek. It is mostly populated by fishermen. As

Suggestions.

Recommendations.

the portion of the anchorage at Korlai has silted fishermen are put to hardship in transporting their catch from their boats to the village from where it has either to be distributed promptly for sale in the neighbourhood or dried. We recommend therefore the construction of a small jetty at Korlai.

Bankot.—(a) Dredging the bar at the mouth or marking the entrance with additional buoys.

As regards the first part of the suggestion we have dealt with it in Chapter 5 on "Suggestions." As regards placing more buoys at the entrance they would be useful only if steamers were to enter the creek. For ordinary country craft up to 50 tons the channel is always navigable and sufficiently wide. And the present navigation facilities are adequate for country craft vessels. The steamship companies are reluctant to make Bankot as a port of call even if better navigation facilities are provided and the public desire the steamers to call not for the convenience of passengers but for the export of mangoes.

(b) Extension of the jetty at Bankot by about 10 feet.

Recommended. The present jetty is not approachable at low tide and the small extension is necessary.

(c) Construction of small jetties at Veshvi, Chipola, Nigdi, Panderi, Sunderi, Peva, Umershet, Varathi, Telanga and Jui.

These are required for creek traffic both goods and passengers. Recommended subject to the condition that half the cost of each jetty should be paid for by the local people or the Local Board wherever there is ferry traffic.

Suggestions.

(d) Jetty at Goregaon.

Dabhol.—*(a)* Extension of the steamer wharf at Dabhol and deepening the channel in front of the wharf wall.

(b) Addition of a jetty or a flight of steps to the wharf at Dabhol for use of passengers by the local ferry.

(c) Crane on the wharf at Dabhol for lifting cattle.

Recommendations.

Goregaon is only 7 miles from Dasgaon and connected with it by a road. As there is very little water in the creek at Goregaon a jetty there will be useless. On the other hand if a jetty is constructed at Sapa with a connecting road up to Dasgaon about 3 miles—both the Mahad as well as Goregaon traders will be inconvenienced. We recommend therefore a jetty at Sapa and the District Authorities should construct the connecting road.

Owing to the introduction of the modern type of passenger steamers on the Dabhol line the frontage is found insufficient for two steamers of the two rival companies to berth alongside the wharf at one and the same time. The depth of water in front of the wall is also found insufficient at low water days for these steamers as their draught is large. We recommend therefore that a portion of the wharf, about 15 feet wide should be extended.

In the absence of adequate facilities passengers travelling by the local ferry plying between Dabhol and the opposite bank are required to land on the sandy beach and have often to wade through water. We think that a flight of steps be provided at the western end of the extension of the wharf proposed above.

As the number of cattle is insignificant and as they can be easily landed on the sandy beach we do not recommend the proposal.

Suggestions.	Recommendations.
(d) Construction of jetties at Pangari (Dabhil), Pangari (Haveli), Boribandar, Gangrai, Khed and Chiplun.	These are required for creek traffic both goods and passengers. Recommended subject to the condition that a portion of the cost is borne by the local people who are interested in the local traffic, or by the Local Board wherever there is ferry traffic.
(e) Lights at corners where the channel is zigzag.	We do not recommend this as the channel is very wide.
(f) Road from Karbone to Chiplun.	We have recommended in the chapter on "Development of Vehicular Roads" that Karbone should be made the terminus and the road from Govalkot should be extended to Karbone.
(g) Road from Dabhol to Chiplun parallel to the creek.	As there is already a road parallel to the creek from Veldur (opposite Dabhol) to Chiplun and as the creek route from Dabhol to Karbone is always navigable we do not consider the proposed road necessary.
(h) Improvements of the Govalkot-Chiplun road i.e. the causeway on this road near the fish market should be improved, raised and made pacca.	This is a matter for the Public Works Department to decide and we do not recommend the proposal.
(i) If Karbone to Govalkot channel cannot be improved lighted buoys or lights may be provided to mark the channel at Sangaon and Dhamni.	As we have recommended that Karbone should be joined with Govalkot by a road and made the terminus of all creek traffic it is not necessary to mark with lights the channel at Sangaon and Dhamni until the road connection is provided for wooden stakes should be put up at Sangaon and Dhamni.
(j) Extension of the jetties at Karul, Chiveli and Karbone.	Recommended as the existing jetties cannot be used at low water.

Suggestions.

Jaigad.—(a) Extension of the jetty at Jaigad by about 10 feet and widening its front wall.

(b) Construction of jetties at Kurdhunda, Fungus, Sangameshwar and Makhjan and improvement of the jetty at Dhamankhol.

(c) Provision of latrine, Dharmashalla (waiting shed) water and light at every sub-port.

Recommendations.

This extension is asked for to enable coasting steamers to come alongside. The suggestion may be sent to the L. & W. F. Fund Committee for consideration. We are informed that steamship companies do not like to have steamers alongside the jetties at the intermediate ports as much time is lost.

We recommend only a jetty at Kurdhunda subject to the condition that half the cost of each jetty is paid for by the local people. At Fungus the steamer company has provided a landing place and at Sangameshwar there is an old wharf. Makhjan is unimportant and steam launch does not go there. Dhamankhol is at the mouth of the creek and is the landing place during the monsoon. There is already a landing place, which could if necessary be improved. Passenger traffic in the monsoon is insignificant.

We do not see any justification for recommending these. These facilities have not been provided for at other sub-ports and were not asked for when we visited those places. They are not essentially necessary. There are practically at all important sub-ports Local Board Dharmashallas and waiting sheds put up by the steamer Companies in front of their offices. Water is plentiful near about. A latrine at a creek side village is more harmful than useful. There is always waste land with

Suggestions.

Recommendations.

- adequate privacy at the disposal of the few passengers at such ports. Even if latrines were constructed there will be difficulty of getting sweepers and the cost will be out of proportion to the advantages gained. Lights are unnecessary as launches call during the day time.
- (d) Opening of the Sangameshwar-Sakharpe road to one ton lorry traffic. Though this is a matter for the District Authorities' consideration we have dealt with the subject in the chapter on "Development of Vehicular Roads".
- (e) A separate jetty at Sangameshwar for the fish trade, since fish is not allowed to be landed on existing wharf. It has been ascertained from the District Local Board, Ratnagiri, that the existing wharf at Sangameshwar is open to all including fishermen. A separate jetty for the fish trade is therefore unnecessary.
- Ratnagiri.*—(a) A landing jetty with an approach road and crane thereon at Rajivda. No doubt Rajivda provides a safe anchorage during the fair season, but in view of the difficulty of improving the entrance to the creek as explained in chapter 5 it will not be possible for bigger boats to go to Rajivda in course of time. The increase in trade is only temporary owing to an increase in the freight charges by the Madras and Southern Maratha Railway. When motor lorries are allowed to ply on other roads in this district Ratnagiri will cease to be a distributing centre. Instead of constructing a jetty at Rajivda we would suggest that a jetty should be constructed at the foot of the lighthouse hill on the site recommended

Suggestions.

Recommendations.

by the Morland Committee, and it should be connected with the existing road which ends at the beach. This jetty will not only be useful for landing of goods, but also for passengers who cannot be landed at present on the passenger jetty on certain days every month. The extension of the passenger jetty is not recommended as it is already too long and is not meant for cart traffic. Moreover its extension would probably cause more siltation in the Rajivda creek and the extension will be far out into the sea for safe landing. As the proposed scheme of constructing a new jetty at the foot of the hill will require some time for its execution temporary inexpensive facilities should be provided at Rajivda. An approach road and a small floating jetty are all that is necessary. The floating jetty can be transferred elsewhere when not required at Rajivda.

- (b) Construction of a pier at the foot of the lighthouse hill in the Ratnagiri Bay with an approach road for the use of passengers and goods. —Please see our remarks against (a).

Jaitapur.—(a) Improvement of the road from Musakaji to Rajapur with a jetty or pier at Musakaji. The road from Musakaji to Rajapur should be improved by the Local Board, but if it is decided by the District Authorities to construct a road from Tulsunda to Rajapur via Jaitapur passengers will be landed at Tulsunda and they will not use the Musakaji-Rajapur road. The question of providing a jetty at Musakaji

Suggestions.

Recommendations.

Vijaydurg.—(a) Jetty at Kharepatan.

or at Tulsunda is being considered by the Landing and Wharfage Fees Fund Committee.

The suggestion has been made on the presumption that shoals are removed. If the shoals are removed we recommend that a jetty may be constructed at Kharepatan.

b) Jetty for goods at Vijaydurg ..

There is already a ramp for landing goods at Vijaydurg and there is also a wharf known as Fad bandar in front of the Custom House for the shipment and landing of goods. The Committee was informed that out of the imports at Vijaydurg only $\frac{1}{4}$ th were landed at Vijaydurg and the rest were taken to the creek. This means that only a small quantity of goods is annually landed at Vijaydurg. For this small trade an additional jetty is unnecessary. As for passenger traffic the Landing and Wharfage Fees Fund Committee is already considering the question of building a jetty.

Deogad.—(a) Steamer pier at Deogad point or at Anandvadi, (opposite Deogad point).

We are informed that the question is already under the consideration of the Landing and Wharfage Fees Fund Committee and that possible sites are being examined. In our opinion the suggestion made by one of the witnesses that the pier should be constructed at Anandvadi is not a sound one since the site is exposed and is also unsuitable not only for the local people but also for the passengers going to and coming from the interior. We would suggest, that a pier should be constructed

Suggestions.

Recommendations.

- on the rocks near the Custom House as there is deeper water there than at the site formerly selected which is liable to silt up. A pier on this site will be useful for passengers as well as goods traffic.
- (b) Improvement of the Deogad-Nipani Road. Deogad possesses a safe anchorage and is a distributing centre for several parts of the S. M. C. If road communication is improved this should be a popular port in the Ratnagiri District.
- Malvan.*—(a) Widening the existing passenger jetty at Malvan. The present jetty about 8 feet wide is too narrow to accommodate the present day steamer passenger traffic. We recommend therefore that the jetty should be widened.
- (b) Installation of a fixed light at the site of the gas buoy. This question also appears to have been considered in the past. It was recently considered by the Government of Bombay and the Government of India, who opined that the existing lighting arrangement in the ports is adequate from the navigation point of view. If the perch rock is blasted away there will be no need for this light and in the event of blasting being impracticable the present lighting arrangements may continue as they are found to be adequate.
- (c) Bigger buoys to be placed in the inner harbour. It was pointed out by one of the witnesses who is the owner of vessels as well as a merchant that the present buoys being small get drifted in stormy weather and thus constitute a danger to navigation. He suggested therefore that if

Suggestions.

Recommendations.

- bigger buoys are placed in the harbour they are less likely to shift from their moorings. Smaller buoys were placed to prevent them from drifting as the large buoys had on occasions dragged their moorings. These small buoys now in existence are sufficiently large enough to be seen for harbour navigation purposes.
- d) Landing jetties at Sarjekot, Hadi, Kalavli and Nerurpar. These are landing places in the Sarjekot creek. There is a good amount of local traffic and we therefore suggest construction of small jetties provided half the cost is borne by the local people or the Local Board wherever there is ferry traffic.
- e) Improvement of Malvan-Kolhapur road. This has been dealt with in the chapter on "Development of Roads"
- f) Laying of buoys at Malvan on cocoanut day of the Hindu Calendar. Weather conditions do not always permit these buoys being laid on the day regularly but careful study of weather conditions is made at the time of laying these buoys with a view to giving every convenience to mariners.
- g) Lighting of the anchorage buoy. As steamers enter this port at night it is desirable to light the anchorage buoy where, we understand, the steamer companies show at present a hurricalight. We recommend that a small AGA light 100 m.m. should be installed on a buoy at this position. This is not an expensive installation as it is the smallest type of light used for this purpose.

Suggestions.

Recommendations.

Vengurla.—(a) Additional reclamation at the Head Bandar.

It seems that the silt cannot be removed and the estuary kept open except at a prohibitive cost. As an alternative sufficient area for goods traffic should be provided for at the Head Bandar by reclaiming additional land or blasting the rocks.

(b) Extension of landing steps

The existing steps are not approachable by passenger boats on a few days. We would suggest that the breakwater should be extended by about 25 feet and a flight of steps provided for inside the breakwater. These will be useful when two steamers arrive or depart simultaneously. The breakwater should also be widened and the passenger shed removed to the breakwater. This would relieve the space occupied by the shed for the landing of goods.

(c) A shed on the Head Bandar wharf for protection of goods from Sun and Rain.

We recommend that this suggestion may be brought to the notice of the Customs Department for favourable consideration.

Karwar.—(a) Dismantlement of the wooden portion of the screw pile pier at Karwar and addition of a flight of steps in continuation of the masonry portion and removal of the crane to the wharf wall.

This suggestion was made by the Committee itself and agreed by the persons who appeared before them. The suggestion is recommended as the wooden portion of the existing pier has become old and rotten and its renewal is neither economical nor justified by the exigencies of trade. We understand that the Collector of Salt Revenue has already taken action and has called for plans and estimates.

Suggestions.

- (b) Construction of a waiting shed for passengers at Karwar.

Recommendations.

Recommended. In the absence of a waiting shed passengers either lie in the open or have to find accommodation in the Steamship Company's office as cargo steamers run very irregularly in April and May. A shed is necessary and we understand that the Collector of Salt Revenue has already obtained a plan and an estimate for the work.

- Sadashivgad.*—(a) A landing jetty for goods at Sadashivgad.

Recommended. From personal enquiries on the spot we were satisfied that the existing Public Works Department jetty at Sadashivgad is always crowded with passengers and vehicles waiting for transport and that no room is available for shipment and landing of goods. Widening of this jetty will cause constant trouble and lead to frequent complaints from the public. We are therefore of opinion that a separate small jetty be constructed on the outcrop of rocks on the west side of the Public Works Department jetty.

- (b) Construction of a jetty to the east of the existing Public Works Department jetty at Kodibag or if this is not possible construction of a road from the existing pier at Kodibag to the Karwar-Kodibag road.

The Custom House in the port of Sadashivgad is situated at Kodibag, to the west of the Forest depot. There is a screw pile pier for the shipment and landing of goods in front of the Custom House. This is in a dilapidated state. At present vessels present papers at the Custom House and after weighment of goods and payment of duty proceed to the Public Works Department jetty for landing goods. But the traders have to wait long there as the Public Works Depart-

Suggestions.

Ankola.—Removal of the Custom House and landing place to Keni (on the other side of the Ankola creek on the seashore) and widening and strengthening the existing foot-bridge on the Keni-Ankola road so as to allow carts to ply.

Recommendations.

ment jetty is always crowded with passengers and vehicles waiting for transport to the other side. A separate jetty for shipment and landing of goods is necessary. We do not recommend widening of the Public Works Department jetty for reasons given against Sadashivgad above and as the increase in the width might cause siltation and render the entire jetty unserviceable. We therefore suggest that a suitable jetty or pier be constructed on the site of the dilapidated screw pile pier and that it should be joined to the main Karwar-Kodibag road by a branch road running along the boundary of the Forest Depot. The Collector of Salt Revenue has, we understand, obtained the consent of the Forest Department and has called for an estimate for the proposed pier and road.

We were not much impressed with the proposal to deepen the Ankola creek from the mouth to the town—a distance of about 5 miles. Siltation in this creek has far advanced and nature must be allowed to take its own course. The public therefore agreed that instead of deepening the Ankola creek the Custom House should be shifted to Keni which is almost on the open sea board and that to facilitate the transport of the goods from and to the town the existing foot-bridge should be widened and strengthened. As Ankola is now the terminus of many Up-ghat routes, e.g.

Sug gestions.

Tadri.—Installation of an additional light for enabling steamers to take bearings while entering the port.

Kumta.—(a) Deepening the channel up to the Custom House wharf and constructing a jetty at the foot of the Kumta Lighthouse hill

Recommendations.

to Hubli, Dharwar, Byadgi etc. it is a very convenient distributing centre and is entitled to the facilities asked for by the public.

It appears that the present light at Belekhan is not visible to vessels approaching from the north until they have rounded the danger. It is desirable to transfer the light to the north headland of Belekhan so that vessels approaching from both directions can take bearings before approaching the danger. It will be suitable for anchoring purposes as well.

The question of deepening the channel has been dealt with in the chapter on "Suggestion". We found that the siltation of the Kumta port is partly attributable to the causeway on the Kumta-Honavar Road which runs close on the north side of the Kumta Custom House. At present small boats of about 5 tons have to be employed for transporting goods in country craft and Cargo steamers which remain outside the bar at the mouth. It is not at all possible to keep the channel open for large boats. At the same time the trade of Kumta demands reasonable facilities. We recommend therefore that a jetty may be constructed at the foot of the Lighthouse hill and it should be connected by an approach road with the Kumta bandar road. The President of the Kumta Municipality observed that the Municipality would consider the proposal favourably.

Suggestions.

Recommendations.

- (b) Installation of an additional light for enabling steamers to take bearings while entering the port.
- Honavar.*—(a) Replacing the existing light at the bandar by a powerful one.
- (b) Construction of a jetty of cement concrete pillars with a wooden platform at Honavar.
- (c) Construction of a landing jetty at Gersappa.
- (d) Maintenance by Government of a launch at Honavar for towing vessels from the entrance to the anchorage.
- Murdeshwar.*—A landing jetty
- At present steamers anchor far out, and a second light for cross bearing purposes would enable them to come closer in calmer waters thus facilitating shipping and landing of passengers and cargo in boats.
- Recommended. A floodlight of 200 C. P. for working cargo at the landing place. A portable light on the tripod specially built for floodlight purposes.
- At present goods are occasionally landed on and shipped from the Public Works Department jetty which is in fact the end of the road and is not available for goods traffic as such. There is always a rush of ferry traffic on this jetty. We therefore consider that separate jetty is necessary for the landing of goods. A suitable site near the Custom House should be selected.
- As we understand that there is sufficient trade at Gersappa and a large number of boats licensed to carry passengers go there we recommend a small jetty at Gersappa.
- There are many practical difficulties in accepting the suggestion and they were explained to the public of Honavar, who appeared before the Committee. They were told that if there is really any demand for such a launch it should be met either by a steamship Co. or by private enterprise.
- We visited this port at the request of some of the local merchants but found that the

Suggestions.

Recommendations.

port was an unimportant one and required no additional facilities. The public asked for a landing place for passengers and they were informed that as steamers did not call at the port their request was premature.

Shirali.—Construction of a jetty at Koknir near Venkatapur.

The public first asked for the removal of shoal at Koknir and construction of a jetty at Venkatapur. After discussion they accepted the Committee's suggestion that there should be a jetty at Koknir and the shoals left untouched. We recommend the suggestion with the rider that when a causeway on Honavar-Bhatkal road which runs through Venkatapur is constructed the road should be so aligned as to fringe on the proposed jetty. This will save the expenditure on a separate approach road. This suggestion should be immediately brought to the notice of the Public Works Department.

Bhatkal.—Construction of a jetty at the foot of the Bhatkal Light-house hill with a connecting road.

As stated before the proposed jetty will be in an unsheltered position. We therefore recommend that the experiment of training the channel suggested by Mr. Logsdail might be tried under his supervision and if it is successful the existing jetty should be extended in a south-easterly direction. It is true that at present passengers have to wade through knee deep water to reach the shore and there is no convenient place for shipment and landing of goods.

CHAPTER 8.

SUMMARY OF RECOMMENDATIONS.

o summarise, our recommendations are as follows :—

1. Dredging the mouths of the following creeks if expert opinion is favourable and if the cost of purchasing and maintaining one or more dredgers is not prohibitive :—

Revdanda, Bankot, Rajivda (Ratnagiri), Jaitapur and Rewas.

2. Improvements at the new Magarvalli bandar at Dhollera.

3. Removal of shoals, rocks or obstructions by manual labour in the following creeks. They are arranged in the order of importance :—

(a) Surat, (b) Panvel, (c) Jaigad, (d) Jaitapur, (e) Vijaydurg, (f) Vengurla, (g) Tadri.

4. Marking of shoals or rocks by means of stakes. As this can be done at a small cost there is no need to arrange them in the order of urgency. If the suggestion is approved it can be effected as early as possible :—

(1) Surat, (2) Bulsar, (3) Thana, (4) Panvel, (5) Revdanda, (6) Bankot, (7) Dabhol, (8) Jaigad, (9) Malvan (Sarjekot and Deobag) and (10) Honavar.

5. Training of the river at Bhatkal and blasting the perch rock at Malwan.

6. Construction of jetties and landing places or extension of existing jetties and wharves at :—

Surat.

Bulsar.

Revdanda

Bankot

Dabhol

Jaigad

Ratnagiri.

Jaitapur (Moosakaji or Tulsunda).

Vijaydurg (Kharepatan).

Deogad.

Malvan, including sub-ports.

Karwar-Sadashivgad-Kodibag.

Kumta.

Honavar-Gersappa.

Shirali-Venkatapur.

Bhatkal.

} Including sub-ports.

7. (a) Construction of a covered high level shed for storage of goods at Broach ;

(b) Filling up of the pit in the road going through the creek at Bulsar ;

(c) Removal of the light from Kosamba to Bhagal in Bulsar port ;

(d) Repairs to the cart track from the wharf to the anchorage at Panvel ;

(e) Replacing the beacon with top cage at Belapur in Panvel creek ;

(f) Retention of Public Works Department jetties and approach road at Dharamtar for shipment and landing of goods after the construction of the three stage jetties ;

(g) Provision of a buoy at the entrance to the Revdanda creek and a light at Korlai ;

(h) Reclamation of land at Vengurla head bandar ;

(i) Removal of the light at Tadri ;

(j) Additional light at Kumta ;

(k) Substitution of a more powerful light at Honavar.

8. Construction of the following roads :—

(a) a road from Karbone to Govalkot in Dabhol creek ;

(b) a road from Tulsundha to Jaitapur and Rajapur ;

(c) Improvement of Deogad-Nipani Road ;

(d) Improvement of Malvan-Phonda Ghat Road ;

(e) Widening and strengthening of the foot-bridge on Keni-Ankola road.

Items 3 and 4 are not costly and can be taken in hand at once if approved. Similarly we suggest that the experiment at 5 (training of Bhatkal channel) may be taken up soon. With regard to jetties proposed at 6 it may be stated that those at the main ports may be put up out of the L. & W. Fees Fund and the works can be taken up simultaneously as soon as designs and estimates are ready. The construction of minor jetties must depend upon contribution from the public or the Local Board, which is a test as to the real necessity. There is therefore no need to arrange them in the order of urgency.

The works mentioned under 7, should be taken up as funds permit. (a) to (c) are to be carried out out of the Northern Group Ports Fund and the rest from the Southern Group Ports Fund.

With regard to the roads at 8 we consider (a) and (e) urgent.

CHAPTER 9.

SUGGESTIONS FOR FINANCING THE SCHEME.

A statement is attached showing the approximate cost of the works specifically recommended by us. It is a rough estimate and does not include cost of major schemes, e.g., works at Dhollera, Steamer piers at Ratnagiri and other places and cost of removing siltation. For financing the various schemes we do not suggest increasing the rate of port dues since the charge will be inequitable. Most of the works are of local interest and must be financed by local people. An increase in the rate of port dues would only be justifiable to meet the cost of a dredger, if it is decided to purchase or hire one since it will be used at most of the ports and the coasting craft in general will get the benefit. There are certain works which come within the purview of the Landing and Wharfrage Fee Fund since they are required mainly for the convenience of steamer passengers.

For providing special facilities for shipment and landing of goods or for removing shoals and sandbars or for reclaiming additional land, e.g., at Vengurla or surveying a port we suggest that Government should levy a cess at varying rates at the various ports and this cess should cease as soon as the capital cost is realised.

For removal of silt by manual labour : We do not think that free labour will be forthcoming though we are given to understand that at least in one instance in the Bramhanbaria Sub-Division of the Tippery District in Bengal the local people came forward to give free labour for deepening and diverting the channel of a river. As the removal of shoals in the creeks will primarily benefit the Agriculturists and the fishermen, they should provide free labour but we do not think considering the conditions of these class of people in the Ratnagiri District, where such creeks abound that they have the leisure or the will to emulate the example of the Bramhanbaria public. We think however that they should at least come forward to supply the necessary labour at a nominal wage. The work is simple—digging and carrying away the silt—and does not require any more skill than is required in the daily work of agriculturists and boatmen. Such a spirit of self-help can be aroused in them by propaganda through the local non-official Committees. The Revenue Department authorities who come in daily contact with these classes can also take a hand in such propaganda. It should form part of the rural uplift scheme. For the actual execution of the work we suggest that the Executive Engineer of each Division should draw up a scheme for removing the shoals so as to make a sufficiently deep and wide channel in consultation with the Port Authorities. When the scheme is approved by Government and its cost is fixed the local villagers and merchants near each shoal should be asked by the Collector of the district to provide the necessary labour for a lump figure to be fixed by him. The Public Works Department Officers, who will be responsible for carrying the work under their supervision would be only too glad to give professional advice free of charge. The actual cost should be shared by the Local

Government and the Ports Fund. We think that the entire cost of such works should not be thrown on the Ports Fund since the majority of the boats, which will benefit by these improvements are under 10 tons and therefore do not contribute in any way to the Ports Fund. These boats are owned by agriculturists and fishermen and they will benefit by the proposed improvements.

In creeks, which run far in the interior and in which there is a fair amount of country craft traffic, e.g., Revdanda, Bankot, Dabhol, Jaitapur, Vijaydurg, Sarjekot and Devbag local residents asked for small jetties for the shipment and landing of goods as also for the use of passengers travelling by launches and ferry boats. Their request to some extent is reasonable as we notice that at several places passengers had to wade through mud and water and goods had to be carried on head loads. There are, however, practical difficulties in providing public jetties at some places. Unless they are connected by feeder roads or unless private land-owners agree to give a right of way through the land to those jetties, they are likely to be useful to a very limited extent. Only those near whose land the jetty is constructed will be able to use it. Again it may also be stated that if it is possible at certain tides many people will load and unload goods near their own residences or lands instead of going some distance to the nearest jetty. Thus the very persons who have asked for the jetty may not use it. It is also unfair to burden the Ports Fund with the cost of jetties in creeks, which are ordinarily frequented by boats under 10 tons, which do not pay port dues. In order to relieve the Ports Fund of such illegitimate burden and in order to check unreasonable demands from local people we propose that wherever such jetties are asked for it should be distinctly stipulated that half the cost should be contributed by local people either in cash or by supplying labour and material or by the Local Board, and that the jetties when ready should be maintained by the District Local Board or local village Panchayats. A suitable cess should also be recovered on goods landed on or shipped at these jetties. We take this opportunity of bringing to the notice of Government that in certain creeks, e.g., Sakhar in Kolaba District when goods have to be landed on private lands to be transported by existing public roads they are subjected to the payment of certain fees by the land owners though no facility of any sort is provided for by them. We therefore suggest that such landing places should be taken over by Government and landing facilities provided for on the lines recommended by us.

Summary of recommendations for purposes of costs.

Name of Port.	Landing Places.				Approach Road.		Lights.		Buoys.		Beacons.		Miscellaneous.	Remarks.
	Pacca.		Kacha.		No.	Approximate cost.	No.	Approximate cost.	No.	Approximate cost.	No.	Approximate cost.		
	No.	Approximate cost.	No.	Approximate cost.										
		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.		
Dhollera ..	..	..	..	..	..	..	..	..	..	..	..	..	A compact scheme.	
Broach ..	..	..	..	..	..	..	..	..	..	..	..	..
Surat ..	1	..	..	..	..	..	..	..	..	..	6	600	Shed open high level One timber slipway Rs. 2,000.	
Bulsar ..	..	..	..	..	..	..	1	6,000	..	..	4	400	*Metalling the kacha slip.	
Thana ..	..	..	..	..	..	..	..	..	..	..	4	400	Removal of 200 boulders.	
Fanvel ..	..	..	..	..	1*	..	..	..	..	..	1†	100	One cage on old foundation 350.	* Cart-track. † Channel.
Dharamtar ..	..	..	..	..	..	..	..	..	..	..	..	..
Revdanda ..	2*	..	4	800	1	..	1	6,000	1	1,500	7	700	....	*One at Korlal.
Bankot ..	1*	..	10	2,000	1	..	..	..	..	..	2	200	....	*One at Goregaon.

Dabhol ..	..	..	0	1,200	1*	..	..	..	..	..	3	300	....	*Karbonate to Gevalkot.
Jaigad ..	..	..	1	200	..	..	..	..	..	..	..	..	....
Ratnagiri ..	1	..	..	..	1	..	..	..	..	..	..	..	....
Jaitapur ..	..	..	..	..	..	..	..	..	..	..	..	..	....	Road from Tulunda to Jaitapur and Rajapur.
Vijayadurg ..	..	..	1	200	..	..	..	..	..	..	..	..	....
Deogad ..	1	..	..	..	1	..	..	..	..	..	..	..	....
Malvan ..	..	..	4	800	..	..	..	1	3,000	3	1,800	1,800	....	Blasting of Ferch rock 22,000.
Karwar ..	..	..	..	..	..	..	..	..	..	..	..	..	....	One waiting shed.
Sadashivgad ..	..	..	..	..	1*	..	..	..	..	..	..	..	....	*At Kodibag.
Ankola ..	..	..	..	..	..	..	..	..	..	..	..	..	....	Road from Ankola to Kenl.
Tadri ..	..	..	..	..	..	1	7,000	..	..	..	..	..	....
Kumta ..	1	..	..	..	..	1	7,000	..	..	..	..	..	....
Honavar ..	2	..	..	..	..	1	175	..	..	3	300	300	....
Shirali ..	1	..	..	..	..	..	..	..	..	..	..	..	....
Bhatkal ..	1	..	..	..	..	..	..	..	..	..	..	..	....	There is also a scheme for training the river.

Note.—Cost of major works cannot be given without proper estimation.

CHAPTER 10.

CONCLUDING REMARKS.

A statement showing the cost of the Committee will be found in Appendix IV. Rough Sketches of the ports and navigable channels leading to them have been placed last.

In conclusion we have great pleasure in bringing to the notice of Government the valuable help and suggestions received from co-opted members—both official and non-official. Mr. Ishwarlal Vyas of Ahmedabad District, Mr. Tilak of the Kolaba District and Mr. Bhandarkar of the Ratnagiri District travelled with us throughout their respective districts and brought to our notice the grievances of the people and suggested what facilities were essentially necessary. Messrs. Machlachlan and Willis, Collectors of Ahmedabad and Kolaba visited ports in their respective districts with us and took keen interest in the welfare of their districts. We are also indebted to Mr. Bedekar, Executive Engineer, Kanara, for his thoughtful and practical suggestions and for furnishing us with detailed information about the schemes suggested by the public. Mr. D. V. Moray, Assistant Collector of Salt Revenue, Ratnagiri Range travelled throughout his Range with us. Owing to his intimate knowledge of his charge his advice and suggestions were very valuable to us. We are also very grateful to the Bombay Steam Navigation Co. Ltd., and the Indian Co-operative Steam Navigation and Trading Co. Ltd., for promptly supplying the information required and for placing at our disposal at Revdanda, Bankot, Dabhol and Jaitapur the services of their experienced officers to show us the obstructions in the navigable channels. The burden of doing all spade work and preparing the ground for our enquiries fell on the officers of the Salt Department. The copious notes prepared by the local Sarkarkuns showing the trade statistics, present conditions of the ports and the improvements that were necessary and possible were of immense help to us. They lightened our task considerably. Without their help we would not have been able to complete our tour expeditiously and without much inconvenience. We request, therefore, that our cordial thanks may be conveyed to each and every member of the Salt Department in the Ratnagiri and Kanara Ranges.

We cannot conclude without a word of appreciation for our Secretary, Mr. D. P. Desai, who at considerable inconvenience undertook this task.

His intimate knowledge of the coast and experience of the working of the various branches of the Salt Department were of great use to us. He worked throughout with considerable zeal and industry and we strongly recommend that his services be brought to the notice of the Head of his Department.

MENEKLAL, L.

Collector of Salt Revenue, Bombay.

(Chairman).

A. LOGSDAIL,

Deputy Superintendent of
Lighthouses, Bombay.

(Member).

V. G. LIMAYE,

Member.

B R. RANE,

Member.

WM. SIMONS AND COMPANY LIMITED.

10th June 1938.

Reference Md/S.

The Secretary, Ports Committee, New Custom House, Bombay,
India.

Dear Sir,

With reference to the meeting our Mr. Wm. J. Mackenzie Brown had with your goodself and Mr. Logsdail relative to the acquisition by your Committee of a general utility Drag and Cutter Suction Hopper Dredger, we have now had an opportunity of carefully considering your requirements and give you below price and particulars of a Dredger of this type, which we think might meet your requirements.

We should perhaps say, however, that it will not be practicable on a draft of not exceeding 6 feet to adhere to the suggested length given to Mr. Brown when in Bombay.

We have pleasure in offering to construct and deliver at Bombay, exclusive of customs or other duties a Drag and Cutter Suction Hopper Dredger generally as described below :—

Dimensions.

Length between perpendiculars ..	174'0"
Breadth moulded	41'0"
Depth moulded	8'6"
Draft with 350 tons spoil in hopper and usual stores on board	6'0"
Speed on trials.....about ..	9 knots per hour.

The vessel to be constructed of Siemens Martin Steel with scantlings to Lloyd's A. 1 Class.

The vessel to work by trawling and alternatively by cutter suction, and to load the hopper, or discharge through say about 1,000 feet of floating pipe line as may be required.

The hopper to be emptied by the dredging pump drawing through hopper suction keelson and discharging overboard.

The Dredger to be fitted with two sets of Compound Expansion Steam Engines for propelling the vessel, and one set of compound Expansion Dredging Engines couple direct to a Single Dredging Pump.

Two cylindrical multitubular Boilers arranged for a working pressure of 140 lbs. per square inch and for burning oil fuel under forced draught.

All the necessary auxiliaries and Engine Room equipment to be provided.

X428.231. N37E
R

The Dredging Gear to consist of a suction frame arranged for either trawling or cutter dredging working in an open stern well and capable of dredging to a depth of 20 feet below light water level.

All the necessary mooring winches and hoist winch for suction frame to be provided, and a complete outfit of anchors and moorings, ropes, boats, etc., to be provided as customary.

Our price for a vessel as described above, tried on Clyde and delivered at Bombay, exclusive of Custom Duties, is :—

£. 57,000-0-0. (Fiftyseven Thousand Pounds) approximately payable by cash instalments during construction as may be arranged.

Our additional price for supplying and delivering F. O. B. Glasgow 40 Sections of Floating Pipe Line each section comprising :—

One Discharge pipe 32'9" long 16" bore, 3/16" thick, fitted with a ball and socket joint (ball at one end and socket at other), carried on two mild steel tubular pontoons 28'9" long × 33" bore × $\frac{1}{8}$ " thick. Each alternate set of pontoons to be provided with double purchase hand winch at centre.

Price per section£. 250-0-0 F. O. B. Glasgow.

(Two Hundred and Fifty Pounds).

The pipes and floaters would be shipped in about 10 feet lengths.

All timberwork required for the platforms, etc., to be provided at destination by the Owners at their own expense, and of course, the cost of re-assembling and completing the pipe line at destination would be for and on account of the Owners.

Exclusive of the men on the Pipe Line, we should think a crew of say 20 would be sufficient for the Dredger.

Esteeming your commands,

We are,

Yours faithfully,

For WM. Simons & Co. Ltd.

(Signed)

Managing Director.

PART II

APPENDIX I.

Communique and Questionnaire together with a list of persons to whom sent, from whom replies received and who attended and gave evidence before the committee.

APPENDIX II

Short Description of Ports and Navigable Channels, etc.

DHOLLERA.

History.—The following account appears in the Bombay Gazetteer:—

“On the 6th June 1802 when Dhollera was ceded to the British Government its natural advantages were great. Its creek was deep and broad enough for native vessels of from 75 to 100 tons (300 to 400 khandis). It was the most convenient outlet of a country which produced more wheat than its people could reap, and which has since become one of the chief cotton fields in India. Up to this time trade had been driven by the lawless feuds of the Girasia lords, and by the jealous tactics of the Raval of Bhavnagar, whose position enabled him to command the creek. But it was confidently predicted that in the strong hands of the Company a port would speedily arise which would supplant Bhavnagar, as Bhavnagar had supplanted Gogha. The fates however, were at first unkind. The Bhavnagar Chief opened a rival port on the adjacent creek of Sundrai, and by means of low scale of duties succeeded in attracting the chief share of the harvests of Dhandhuka and Ranpur. In spite of hostile influences the company's strong rule insured the gradual progress of the infant settlement. In 1810 their commercial agent at Surat began to buy and ship at Dhollera port of his annual cotton investment, and in 1813 the increase of trade was most satisfactory.”

Dhollera bandar has changed its site on several occasions since it came into the possession of the British Government. The first bandar was opened in 1806 at a place named “Gobla” near Rah Talao, in a creek quite distinct from the present one which did not exist then. The Rah Talao creek having entirely silted up the bandar of Bavliari was opened in 1823 but owing to lack of adequate water supply and its long distance from Dhollera it was abandoned and the bandar was transferred to Ambe in 1833, which was the main stream of the Bhader river. At Ambe the bandar continued for 12 years when it was again transferred to a site at Khoon in 1846 owing to the channel of the river having been diverted by an inundation that is said to have occurred about that time. Whittle (Chilbandar) was opened from 11th January 1886 as the channel at Khoon silted up. Chilbandar also silted in a course of time and became inaccessible by about 1907. A new bandar called New Whittle bandar was therefore opened in December 1910 this time in the Vadhrivli creek. Siltation overtook the new bandar also and by about 1922 the place became inaccessible for the greater portion of the season. Vessels of less than 50 tons could enter only at high tides and they had to be shoved and kedged for getting in or out. The channel having narrowed considerably vessels were in constant danger of being stranded till the next high tides. The position worsened so much in 1934 that vessels of less than 50 tons could enter or leave the port only twice in a month at high tides.

In 1934 the question of opening another bandar was taken up and after investigation on spot it was found that a suitable site existed at the mouth of the Magarwalli creek. Accordingly a bandar was opened at the mouth of Magarwalli creek in 1936. This creek has its mouth “Mobara” quite close to the main course of the Gulf of Cambay and it is sufficiently deep to admit vessels of any tonnage at the time of tides every day and night, not only this but the creek being very wide and deep steamers of ordinary size can come into the creek at high waters and they can lay in safety at low waters on mud which exists on the side of the creek. The whole creek forms a natural harbour dry at low waters and is navigable at high waters to a distance of more than 2½ miles in the creek.

There is a small sand bar just at the entrance of the creek on one side but it is not in any way dangerous to the safe navigation in this creek.

Creek and Sub-ports.—The limits of the port of Dholera extend from the Sabarmati river in the north to the Bavaliari creek in the south with the following creeks in between :—

Vadhrivli, Khoon, Chil, Bhadar and Magarwalli.

Navigable Channels.—The following opinions have been expressed by experts about the condition of the Magarwalli creek.

Mr. D'Arcy, Superintendent of Lighthouses, stated in 1925 :—

“ I find this site from the sea approach point ideally situated as a place for the landing and shipping of goods. It is well protected from the E. & N. E., i.e. from the only direction it is likely that bad weather and heavy seas may be expected. There is plenty of room both for moving and berthing even the largest class of country craft and the bottom is good for vessels taking the ground. Plenty of water runs into the creek and it could be used at all tides (both neaps and springs) and on even the neaps at one hour's flood by even the largest of country craft. I had careful soundings taken both in the creek and its approaches and got from 14 feet at the entrance to 10 feet at least three quarters of mile inside at only one to two hours flood. This site is situated about 2 miles south of where the dangerous sandbanks start on the way to the new Whittle bandar thus it is 10 to 12 miles south of there. Its situation obviated the necessity for vessels having to go near those dangerous banks and at the same time reduces the distance to be sailed by them and should I think result in a reduction of freight and possibly also insurance as owing to its being barely a mile from “ *tehti pani* ” the risk in transit is greatly reduced. One thing is certain, i.e. the silt is not affecting the proposed site. I see very little appreciable change in it for say the last 18 to 20 years. If anything I would say it has improved. The banks are fairly well shelved and solid so there is no risk of high straight up and down banks washing away and causing it to silt also as far as I can gather it appears to me to be the natural out-let for the drainage of the whole country round and about, and as it is not connected up in any way with any river is another I think very sound reason to assume that siltation is not likely through fresh flood water in the monsoon. This may fairly well be deduced owing to the manner in which it has stood the test of time. On comparing the site with the map of 1868-69 no appreciable change can be observed.”

Mr. Logsdail, Deputy Superintendent of Lighthouses, Bombay, wrote in October 1936 :—

“ Regarding this port's facilities for shipping I consider it equal or even better than Bhavnagar as there is 5 fathoms of water at dead low tide. A matter of one mile off the creek entrance, and when we consider a 23 feet rise of tide, there is ample water for fairly large steamers to anchor off this creek and small ships such as Bombay Steam Navigation Co.'s cargo vessels and the Cambay Steamships may go right into the creek and discharge their cargo alongside the proposed jetty. These small steamships after entering the creek at high tide will sit on the mud when the tides recede as there is 2' to 3' of water in the creek at dead low water. This is immaterial as the nature of the creek bed at the proposed site of the jetty is soft mud. These vessels when they call at the port of Bhavnagar and go alongside the jetty they are compelled to sit in the mud with no water at all.”

Captain R. Parcou, F.R.G.S., F.R.S.A., Extra Master, who investigated the channels in December 1936, wrote as follows :—

Magarkhadi Creek.—At this point we turned the launch again to the northward but closing in gradually towards the shore up to the approach of the Magarkhadi creek. Here, that is, about $\frac{1}{2}$ mile from the shore and $2\frac{1}{2}$ miles from the Malcolm channel, we obtained $1\frac{1}{2}$ fathoms or dry bank at low water.

The Anchorage.—From this position we proceeded to the proposed new Dholera anchorage of Magarkhadi creek, where soundings were taken and the bed showed $8\frac{1}{2}$ fathoms mud bottom, which reduced to low water would be $4\frac{1}{2}$ fathoms. In my opinion this anchorage is quite safe with good holding ground for vessels not drawing over 28 feet. The tidal currents were not strong during our stay of about an hour on that spot, being neap tide. Probably we may experience the currents a bit strong during spring tides.

Proposed new Dholera Anchorage.—On the 13th and 14th December I carried out another investigation over the anchoring ground; and I found at about half to a mile S. W. of the present proposed anchorage deeper water; that is six to seven fathoms at low water. Vessels of heavy draft can easily anchor in safety here. I would however advise a proper mooring to be laid there for use of vessels whenever necessary. This anchorage would be about 3 to $3\frac{1}{2}$ miles S. B. E. from New Dholera port entrance.

The above soundings and courses steered from the southern entrance of channel bank to the New Dholera anchorage prove that the navigation through Malcolm channel is quite safe, from Bhavnagar to New Dholera anchorage. This creek affords great shelter to vessels at anchor or alongside the wharf at high water, as currents are hardly perceptible inside the creek at that time. The creek being very wide I estimate the width to be about four furlongs which is more than sufficient for handling steamers coming inside the creek at high water. Soft mud exists on both sides of the creek where steamers can lay in safety at low water. There is a sand-bank forming in the middle of the creek where also vessels can lay in safety at low water. In my opinion vessels not drawing over 18 feet can enter the creek at high water. The whole creek forms a natural harbour dry at low water and is navigable at high water to a distance of about 3 miles inland. In many places along this line there are good spots for small vessels to work cargo with great facility."

Mr. Logsdail's report dated 11th March 1938 :—

"I am of the opinion that this erosion is due to the high spring tide which comes up level to the top of the bank and when the tide recedes, which it does very quickly at this place, it causes a tidal flow along the edge of the bank the velocity of which is faster about 6 feet down than what it is at the surface, thereby scouring a groove or hollow in the bank and the top section falls. This is a very common occurrence in this Gulf and has been noticed particularly around Bhavnagar."

Imports and Exports.—The port of Dholera was once a flourishing British Indian port on the Kathiawar coast. Possessed of natural advantages and situated within convenient distance of the chief centres of production, and industrial activity in Kathiawar, north Gujarat and Rajputana it enjoyed for long the monopoly of the sea borne trade of these territories and its total trade in the early sixties of the last century aggregated nearly Rs. 4½ crores of which as much as 4 crores was accounted for by exports. The following principal articles of import and export have been copied from the Salt Department Administration Report for 1873-74.

Import.—Cocoanuts, dates, sugar, cloth and timber.

Export.—Cotton and coriander seed.

The present imports and exports are :—

Imports.—Teakwood, bamboos, cocoanuts, dates, cotton seeds, rice (Rangoon), molasses and iron bars.

Exports.—Cotton, rai seeds, wheat and grains.

Statistics of Trade.—Vide appendix III.

Existing Facilities.—(1) *Jetties*—Nil.

(2) *Navigational Aids.*—Two lights and two buoys.

(3) *Storm Signals*—Nil.

Roads.—There is a tolerably good road from Dholera to the Railway Station at Dhandhuka, a distance of 18 miles. The Government of India has allotted Rs. 3,30,000 for the construction of a new road from the Magarkhadi bandar to Rah Talao and the District Local Board are repairing the road from Rah Talao to Dholera.

Railway.—Railway distances in miles from various Kathiawar ports to Ahmedabad and Mehsana, the two gates for Gujarat and Northern India are shown below :—

No.	Name of port.	Railway distance to Ahmedabad. (miles).	Railway distance to Mehsana. (miles).
1	Port Okha	311	311
2	Porbandar	294	312
3	Veraval	283	283
4	Port Bedi	213	213
5	Navlakhi	177	177
6	Bhavnagar	167	185
7	Dholera (via Dhandhuka Railway Station)	107	150

Income.—The average annual income of the port under "Port dues" is Rs. 380.

General.—Proceedings for acquisition of land for the development of the new Bandar are being pursued by the Revenue Department Authorities. Proposal for building a jetty with a crane is also under consideration of the Salt Department Authorities. A steamer company named New Dhollera Shipping and Trading Co., has started calling its steamers at the new bandar at the mouth of the Magarwalli creek.

BROACH.

History.—The port of Broach is situated on the bank of the Narbada river. Lat. $21^{\circ}42'$ N. and Long. $73^{\circ}2'$ E.

The following history of the port appears in the report of Mr. W. Sowerby, L. F. Engineer, Surat and Broach, dated 17th February 1870.

MEMORANDUM ON THE NURBUDDA RIVER.

The Nurbudda is one of the eight rivers which empty themselves into the Gulf of Cambay. The length of it, including branches and winding is about 750 miles, and the drainage area which it passes through, is 37,500 square miles.

The annual floods bring down a great quantity of silt in suspension, most of this is carried away out to sea by the tides and deposited along the Western Coast of India; but there is a partial deposit along the lower course of the River, as shown by the quantity of sand that has been gradually warped up in this way, and which is at present only occasionally covered during extraordinary high tides.

But at the same time this silting up takes place, there is another process going on, and it is this, namely, as the silting up extends, the channels of the River are narrowed, and consequently, by the greater scour they are deepened, and so these Bets or Islands which are seen on the South side of the Nurbudda, appear to have risen up out of the bed of the River, above the height of the usual tidal rise.

There are other influences at work also which may require explanation, for when the channel of the River is narrowed, if the same quantity of tidal water came up the Gulf, then it would still overflow the Bets or Islands, but the gradually narrowing of the entrance to the Gulf also checks this, and drives the water in some other direction.

In this case of the Gulf of Cambay, it is driven westward into the Gulf of Cutch, where there are no large Rivers to create silting, it has given rise to an opinion that the land in that locality is slowly sinking.

The effect then of this gradual silting up as regards the Nurbudda has been to deepen the Mid channel, giving it a greater capacity for navigable purposes, though as has been stated, the actual tidal flow has been diminished.

The same has however not taken place in the River Taptee because the downward scour is checked by the low headland at Vaux's Tomb, and an eddy and silting up created at the mouth of the River.

The set of the tide into the Nurbudda is as direct as it well can be and the tidal rise at the entrance is from 25 to 30 feet at springs (the rise of tide noticed at the entrance on November 20th "New Moon" was 30 feet).

The extreme width of the Nurbudda Estuary is about $13\frac{1}{2}$ miles (nautical) while at 16 miles up the River above Mehgam, it is only about $1\frac{1}{2}$ miles wide. The Estuary thus covers an area of 120 square miles more or less, and this forms an immense bell-shaped mouth of the River.

The great portion of this large area is even at present quite dry except at very extraordinary and unusual tides, perhaps once or twice in 12 months and much of it has been then only a film of water over it; this is sufficient however to render it unfit for cultivation.

There are two channels across this Estuary—one to the south towards Hansot, which is dry at low water. The other channel to the north past Ambehata (Dehej) is never dry and this is the true sailing channel.

There is no bar properly speaking at the mouth of this northern channel, nor does the Admiralty Chart by Captain Ethersey made 25 years ago (1845) show any bar, there are three sand patches shown on that chart, with a clear channel of fully $1\frac{1}{2}$ miles wide.

The fact of a long sand spit running from the land on the north to the southward for a distance of from 4 to $4\frac{1}{2}$ miles, has given rise to this idea of a bar at the mouth of the river which does not exist.

The channel between the entrance of the river and Ambheta has however shifted fully $1\frac{1}{2}$ miles to the westward since Ethersey's Chart was made, so that after leaving Ambheta in passing down the River, the channel instead of running in a south-westerly direction down to the sea, continues in a westerly course till it is opposite a place called Lahara, and thence it runs due south. There has also been a considerable scour on the Gulf-side of the said spit, indenting into it to a distance of upwards of half a mile so that the spit is now only about $1\frac{1}{4}$ miles wide, instead of what it was formerly when the chart was made, four and a half miles; this spit has however increased in length and the extreme point is about half a mile more to the southward.

There is a probability that in the course of time the River will force its way out in a line directly westward across the spit into the Gulf, where there is however great depth of water, being 8, 10, 15 and 16 fathoms within a short distance of the shore.

Between the outer entrance of the River and Ambheta there is a small false channel about one mile from the extreme point of the spit; this channel is very narrow, and barely perceptible; it is in fact, the space between the former spit and a patch existing in 1845, which is still unclosed up.

The width of the channel at the entrance is more than a mile, and the depth of soundings at the outside of the River where a buoy has been placed is 7 fathoms at low water springs; there being formerly only 3 fathoms at this spot. The latitude of this buoy is $21^{\circ}24'30''$ N. and Longitude $72^{\circ}30'20''$ E., and where an inner buoy has been placed about $1\frac{1}{2}$ miles from the outer buoy, the soundings are 4 fathoms, there being formerly only 2 fathoms and these deep soundings continue up to Ambheta.

Soundings show very clearly and decidedly that the channel of the river has not deteriorated, but has actually been much improved from natural causes only, and this improvement continues up to within about 4 miles of Broach, beyond which point it has been deteriorated, probably by the construction of the Railway Bridge, which, though offering but comparatively little obstruction a scour has doubtless been caused by it, and resulted in the throwing up of formidable sand banks at various points opposite to and about $1\frac{1}{2}$ miles below Broach. There is still a fair channel on the south side of the River, navigable for small craft at high tide but large vessels cannot pass this barrier.

The course of the River Narbudda exemplifies the theory of oscillation very beautifully. Commencing at Broach the deepest channel is on the north side of the river, below this it passes across to the southern side and runs for some distance along by a high bank, until there is a creek or inlet opening to the south; it is opposite to this creek where the water is shoal, and beyond this large vessels cannot pass. It then oscillates to the opposite or north bank to a point about $4\frac{1}{2}$ miles below Broach near a village called Dusa or Dusara. Here the River is divided into two channels. The main or north channel is greatly confined by a Bet or Island (the south channel being comparatively shallow or dry) the River continues along the side of this high bank for about 5 miles having a gentle curve to the southward. The depths at low water springs being from 18 to 25 feet. These depths are close in shore, within about 50 feet of it, and along this reach an immense number of vessels might be moored to load and discharge cargo. Well water borne, if drawing 15 or 16 feet of water. These soundings continue to a point opposite a place called Sumnee on the northern bank, and then the channel oscillates again to the opposite side, where there is an inlet or creek leading past the Hansote Bunder; this is called the southern channel, but it is dry at low water.

From opposite Samni, where there is a shoal running out from the northern bank, the channel again crosses towards Mehgaum where there is another creek called the Bhookes or Badre creek. Owing to the Hansote channel there is comparatively shoal water here, but never less than 6 feet, in the channel where a buoy has been placed. There is a tidal rise of from 6 feet 6 inches at dead neaps to 17 feet 6 inches at springs, giving an average of 18 feet of water and 24 feet at spring tides, sufficient to allow vessels drawing 15 feet of water passing up except at extreme neap tides continue about 4 to 6 tides (3 days).

The River continues along the northern side with a fair channel past Kuladrah to a point near Vengnee where there is a high and well defined bank, and where there is deep water and a tidal rise of from 8 feet 4 inches extreme neaps to 19 feet 6 inches at the spring tide, the extreme neaps being very exceptional and lasting only 4 to 6 tides (3 days).

From Vengnee the River oscillates across to the southern side. The width there being $1\frac{1}{2}$ miles; on the south is the Karsela Bet, with a well defined high bank, and deep water all along the bank, the channel being quite clear. There is shoal water however near the first point of the Bet where a buoy has been placed in 8 feet of water dead

low water; but the great tidal rise renders this point no obstruction whatever to the navigation. This channel continues along the south side till it is opposite to a place called Soovale when it again oscillates to the north striking the bank about 2 miles from Ambheta. There is here again a slight shoaling, but forming no obstruction to the navigation the tides being very great.

Off Ambheta there is from 24 feet of water at dead low water spring so that the largest vessels might lie here safely at all times of the tide well water borne.

There has been a prevailing idea that the channel of the River changes greatly every year. On comparing its present condition however, with the Admiralty Chart published in 1845, so far as it goes, which is up to a point about Mehgaum, the channel has not materially changed, unless it be for the better during the last 25 years.

But exceptions must be made for the part near the entrance where there is a very decided change, but here it is also, as has been shown, much for the better.

There is no doubt that minor changes annually take place in the River during the monsoons, but it is probable these changes are only in the upper part of it, near to and beyond Broach, for the tremendous scour of the tide, must very soon remove any obstructions within its influence.

The River continues its oscillatory character right down to its embouchure for it crosses to the south from beyond Ambheta, and makes a final attempt again to bend to the opposite side when it falls into the sea.

The tidal observations given in the appendix shows that the tide flows on an average 3 hours, while it ebbs 9 hours, this varies slightly at different parts of the river as will be seen by the tidal Registers annexed, but in the upper portion of the River during springs tides, the quantity of water in it is greater at low water than during the neap tides, the next flood coming up before the former one has had time to flow down. A careful study of the tidal observations will confirm this, for at the spring tides at Broach there is always a greater rise than at the subsequent fall, as for instance:—

<i>Rise.</i>	<i>Fall.</i>
9 feet 2 inches.	8 feet 1 inch.
5 „ 11 inches.	4 „ 6 inches.
9 „ 9 inches.	8 „ 8 inches, and so on.

Then again at neaps:—

<i>Rise.</i>	<i>Fall.</i>
2 feet 2 inches.	2 feet 10 inches.
3 „ 9 inches.	5 „ 1 inch.
2 „ 4 inches.	3 „ 1 inch, and so on.

The night and day tides are also constantly liable to variation in a similar manner all up the River.

It was stated at the outset that at the mouth of the River was a tidal rise of from 25 to 30 feet; 30 feet was the observed height on the 20th of November 1869, this rise in about 3 hours is at the rate of 10 feet per hour or 1 foot in 6 minutes, being 2 inches per minute; when such a tide rushes into the Bay, the current is of course very considerable, and vessels are very liable to drift but there is never at any time anything like a head of water or bore, as in the Hoogly and some other Rivers; this is owing to the great area of the Estuary which forms a sort of beaching basin over which the great body of water is dispersed, before it enters the narrower part of the River above Mehgaum.

During the monsoon season the commotion at the entrance of the River is very great, especially at the burst, and also at the time when the river is flooded with freshes. The waves at the mouth of the River then rise to a great height only equalled at places such as off the L. Agullas, Cape Guardafui, and similarly exposed points. At such a time none but large well built sea going vessels are fit to enter the River and even they would be better away. Once inside the channel however near the first inner buoy $1\frac{1}{4}$ to 2 miles up the river they would be comparatively safe, except during heavy gales and even then they would be safe off Ambheta.

The navigation of the Nurbudda at all other seasons of the year is perfectly easy to any ordinary vessel with a skilful commander. Steamers would generally be able to make the deep reach 4 or 5 miles below Broach in one tide and always in two without any difficulty. Sailing vessels might require two or even three tides to reach the same point.

The navigation of the river must always however be more or less tidal, that is to say advantage must be taken of the tides and long narrow shallow vessels could never make any regular trips irrespective of the tides, because not answering their helms very quickly, they are liable to "snag" or run aground on the sand banks below Broach and near Mehgaum, not for want of a sufficient depth of water but because the sand banks more or less overlap each other and vessels must answer their helms pretty sharply to round the points. Sailing vessels also in tacking are liable to run aground for the same reason. Well built vessels, however, running aground would sustain no serious damage as the bottom is beautifully even as shown by the soundings and is chiefly fine sand with occasionally a soft mud near the sides.

A skilful captain would always know where to lie safely for the return tide in case he was too late to go up with one flood. The first point being the reach off Ambheta, the second off Venguce and the last above Sumnee; in any of these places there is good anchorage in deep water at all times of the tide for vessels of 15 to 18 feet draught of water.

The channel of the River might be materially improved by closing up the creeks or channels on the southern side just below Broach, and the one leading up to Hansot, but any works of this kind must be of a very gradual character allowing nature to perform as much of the operations as possible merely enticing the channel to keep a northern course.

A large portion of land might be reclaimed by closing up those creeks but if this were done suddenly, the cost and risk would be considerable, though the end might be quite worth the means.

The two or three shallow parts might also be improved by dredging on the plan so successfully adopted on the Yara and other similar Rivers, namely by working the dredger at ebb tides only and simply allowing the sand to drop into the steam, which would carry it away, stirring it up in fact at ebb tide.

The necessity for this is not, however, very great at present and need only be carried on when there is a large trade to justify the expense, and vessels requiring a greater depth of water than 18 feet have to pass up the River. To attempt to remove these banks in order to allow vessels to run at dead low water would involve a considerable outlay to very little purpose so far as the trade at present is concerned.

Note on training of the Narbada River for navigation was written on 1st July 1911 by Mr. Ali Akbar, Superintending Engineer, Northern Division.

Object of the report.—Navigation in the Narbada River has been going on from time immemorial, but a feeling has existed since many years that the river is silting up, and is becoming shallower, checking navigation; to investigate which probably the preparation of a chart of the river by Lt. Anderson was undertaken prior to 1870.

Proposals for dredging the river so as to keep open a clear navigable channel in the river bed have been put forward from time to time; but there is a consensus of opinion among experts that the cost of dredging would not only be prohibitive, but that the result would be of a temporary nature, quite incommensurate with the very heavy expenditure which it would involve, the river being very heavily silt and sand laden.

The general opinion has been in favour of effecting improvements by means of groynes, etc., which are likely to prove cheaper and give more permanent results. The first trial was made in 1903-05 at Kukervada which did not prove successful as described later on in the report. At present, there are 3 shoals, viz., at Kukervada, Samni, and Mehgam, which principally obstruct navigation, the worst being opposite Kukervada. It is therefore proposed to construct well designed and carefully placed groynes at this shoal as an experimental measure, and watch results.

Changes in the river.—The changes that the river Narbada has undergone from Broach, along its downstream course can be conveniently referred to three well marked periods, viz.:—

- (i) Before the construction of the B. B. & C. I. Railway Bridge at Broach;
- (ii) After the construction of the Railway Bridge;
- (iii) After the construction of the groyne in connection with the Railway Bridge up to the present time.

River before the construction of the Bridge.—The conditions of the river before the construction of the Railway Bridge is indicated by the chart of the Narbada River by Lt. Anderson (Fig. 1) (vide Appendix VI, Plan I).

Two important points brought out by this chart are :—

(a) That the stream at Broach was flowing in two branches the bigger being along the northern bank, i.e., on Broach side, and the smaller along the southern bank, with an island in between the two streams;

(b) That the river between Kukervada and Dashan had shoals and the channel was less defined than at other places.

River after the construction of the Bridge.—The changes brought about by the construction of the Railway Bridge can be seen from a comparison of Lt. Anderson's chart with the Trigonometrical Survey Map of 1870 (Figs. 1 and 2) Plan I.

The important change introduced at Broach due to the southern approach of the Railway Bridge, was the blocking up of the southern channel shown in Lt. Anderson's chart as well as a large area of low lying "bet" land. In consequence of this, the northern channel became deeper and wider, and powerful scour and erosion, below and near the bridge set in and led to the deterioration of the river, for some distance below Broach, as was observed by Mr. Wm. Sowerby, C. E., in his report, dated 17th February 1870. The scouring action was lessened by the Railway authorities by increasing the waterway under the Bridge, by the addition of 3 spans at the southern end of the Bridge in about the year 1883.

River after construction of Railway Groyne.—The set at the southern bank and approach of the bridge having however continued though with a lessened force, even after the increase of the waterway, the Railway authorities remedied it by the subsequent addition of training works in the form of a strong groyne above the bridge in 1903 as mentioned in the penultimate paragraph of Mr. White's letter No. 1200, dated 23rd February 1903, to the Chief Engineer. The river as a result of this, had to conform itself to a new condition which can be appreciated by comparing figures 2, 3 and 4 (plan I). The river in brief had to adjust itself into sharper and consequently a large number of bends before it emptied itself into the Gulf of Cambay. At present, the river has a fairly well defined deep channel, except at the bends such as Kukervada Samni and Mehegam and Alia bets, of these the shoal at Kukervada is the shallowest and a source of the greatest trouble to navigation.

First attempts to improve the river at Kukervada.—With a view to effect improvement at Kukervada, a survey was carried out in 1903, as sanctioned in Government Memorandum No. 1096, dated 22nd December 1902, and as a result of this survey a groyne was constructed on the southern bank in 1905 with the object of diverting the current on to the shoal in the middle. The southern bank opposite Kukervada is, however, quite low and soft and made up of silt; so, in the very first monsoon the bank behind the land end of the groyne was washed away for about 40 feet and parts of the groyne from both ends were also carried away. In the next year the land end of the groyne was re-constructed and extended 65 feet (25 feet into the then existing bank) and the damaged portion repaired. The washed away 240 feet at the water end was not however re-constructed. The groyne has not been in charge of this Department for maintenance and is at present separated from the bank by 141 feet showing that the land there was further washed away in subsequent years. Some of the piles at that end are also about to fall down, and 40 feet of the groyne is in a tottering condition. The whole groyne is at present hollow (the filling having been washed away) and is standing only as a skeleton of its original. It has done no useful work and it does not appear at present desirable to spend further money on its repairs.

Fresh proposals.—The survey in 1903 was done under my direction, as Executive Engineer, Surat and Broach District, but I was transferred and had no occasion for formulating my proposals; lately, however after a talk with H. E. the Governor, and under his orders, I have again examined the river at Kukervada and can assert with some confidence that if a regular system of groyne, and longitudinal training works carried out with a view of concentrating the low (not the flood) discharge of the river into one channel, this channel could be made navigable, and the complaint of the Broach people would be removed.

It is, however, a very large question and before undertaking any extensive scheme of training works, I would, with due deference, propose that an experiment may be tried at Kukervada, where the shoal is most obstructive and if a clear channel is successfully established, more works could be carried out with better experience and therefore on more improved methods.

We have no practical experience of training such large rivers and the works carried out on the Mississippi River (Notes by Dawson) may therefore be taken as guide. With all the experience of special Engineers and trained staff, and very large expenditure on the Mississippi river it is often found difficult to judge what the effect of certain training works would be; we must therefore make a small beginning and watch results.

Kukervada shoals.—The shoal at Kukervada has been re-surveyed, and it is found that there are two channels at low water both of which are shallow, and the northern one has a blind head. In my opinion, the groyne constructed in 1905 was at the wrong bank which being low and soft was scoured behind the groyne. I have therefore proposed three groynes at A, B, C (Plan No. I) at the northern bank (which is well above the highest flood level) thereby blocking up the northern channel and diverting the force of the water towards the southern channel and silted "bet" in between. The groynes will hasten the formation of the silt on the convex bank into the shape that silt deposits naturally take on such banks.

I propose to keep the groynes about 3 feet above the low water level so that high flood discharges are not interfered with.

Cost of the project.—The cost of the proposed 3 groynes would be roughly Rs. 52,000.

General remarks.—If the above proposals are generally approved, detailed estimates and plans will be submitted for the orders of Government.

Plans I showing the course of the river at different periods and II showing the positions of the proposed groynes accompany this report (*vide* Appendix VI).

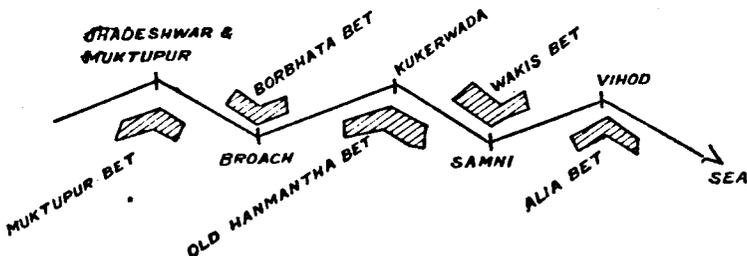
Mr. N. N. Ayangar's report on the proposal to improve the Narbada river for navigation between the sea and Broach, dated the 12th May 1911.

I. *A study of the river, as a whole between Jhadeswar and Lohara point—(a) Six main points.*—The course of the river, as shown in the topo sheet of the year 1870 from a little on the upstream side of Broach to the Gulf of Cambay, is given in Fig. (a) (tracing). The important points to be noted in this course, as shown in Fig. I, are:—

- (1) The river having a shallow bend towards the north at Kukervada ;
- (2) Then a bend in the opposite direction at Samni ;
- (3) Then a reverse bend near the site of Alia bet opposite Vihod ;

(4) Tracing the course further back from Kukervada, the river current is flowing touching the fort walls of Broach, i.e. opposite to the bank of Kukervada. There is not a very marked bend here, which is apparently prevented from forming, by the strong fort wall of Broach, but the current had a set on the fort wall ;

Fig. I.

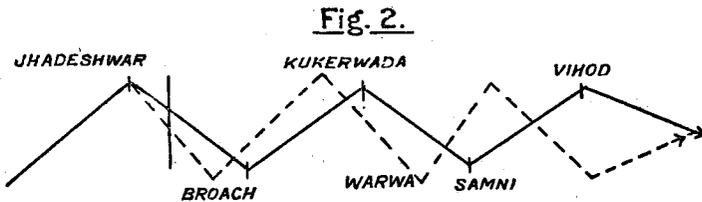


(5) Then a bend opposite Mukhtumpur and Jhadeswar ;

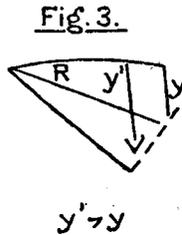
(6) The big Dhantaria bet, opposite Warwa, between Kukervada and Samni, is at a point of contrary flexure where the current is indecisive and hence does not inter into the system.

The bends at Jhadeswar, Kukervada, Samni and Vihod have silt deposits at or near the convex banks, with a clearer, broader and more forceful current along the concave banks. These silt deposits are, respectively, Mukhtumpur, Borbhata, old Hanmantha, Wakis and Alia bets, as shown in Fig. I.

(b) *Effect of a twist.*—The protective works carried out in connection with the Narbada river Railway Bridge, had the effect of sending the current from opposite Mukhtumpur bank at a sharper angle towards Broach, as shown in Fig. 2 :—



The result of this has been to produce a more direct and a stronger set of the current (see Fig. 3) on the strong fort wall of Broach simply reflected and transmitted the effects further down along throughout the whole course of the downstream side, tending to make the course of the river take sharper curves, and consequently have a large number of bends, before reaching the sea. Thus a new adjustment of the course all along was necessitated right down to the mouth of the river, modified, as far as possible, by the old channels.



Almost all the changes, in the course of the river, shown in Plan No. I, old tracing, and sheet A. Figs. 1, (b), and (c) (new sheets) can be traced to the above.

adjoining the Samni-Kasula now forms the convex bank of the present current has been entirely silted up, and a tongue of land is being protruded from the Samni-Kasula at the present convex bank.

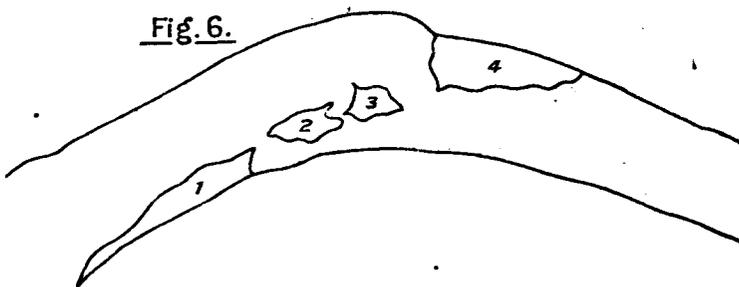
(f) *Effects at Alia bet.*—On account of the contrary sharp bend now established at Samni, the river further on, has, at present, a greater tendency to take to the northern channel at the Alia bet opposite Mehegam. This is also confirmed by the fact that a portion of the Alia bet opposite Mehegam has been pared away to afford a bigger channel for the larger flow, and a new sharp convex bank is being formed opposite Kaladra with a definite channel. From the above it appears probable that the southern channel at Alia bet would gradually deteriorate in course of time, and the northern channel become the future main channel. The river further on takes a fairly winding course in the Alia bet northern channel and empties itself into the Gulf of Cambay. It may be noted here that the new sand spits opposite Lohara and the bar at the mouth, is most probably due to more sand being now brought down the river along this channel, as a major portion of the current is diverted into this channel at Samni.

(g) *Conclusion of above.*—The river then can be said to have been thrown into a new form by the protective works beyond Broach. The changes shown in Plan No. I are the consequent attempt of the river, to get into a condition of equilibrium, in accordance with the slightly new direction of current started at the bridge, forming banks, suitable both for monsoon and dry weather discharges as are required by natural laws, governing river dynamics. Though the directions of the currents have now come to a condition of stability and the main banks as are required for the large monsoon floods have already been formed the banks, especially the convex ones, required for the comparatively weak dry weather and ebb tide discharges, are still in the very slow process of formation. There is perhaps a little more retardation due to the inrush of the flood tide than would otherwise have been the case, if this had been the non-tidal portion of the river. The ebb tide diffuses itself at such places, causing the present trouble to navigation.

A general improvement can be effected through taking the above facts into account, by concentrating the low water discharge, by a combined system of groynes and longitudinal training works into a channel, located along the concave banks, and just as wide as the river is at places where there is deep channel (for example, opposite Broach, Warwa, etc.), and gradually working the narrowed low water channel out in a trumpet shape, into a wide opening at the mouth of the river, to ensure the rapid influx of the all important flood tides, from the sea, which endows such a value to this tidal part of the river. This idea is very roughly indicated in Fig. (g) sheet C, tracing.

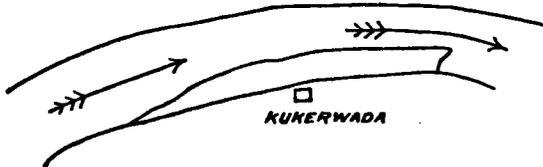
As this is obviously a heavy estimate costing not less than ten lakhs very roughly and as the shallow water trouble for navigation is now confined mostly to places where the convex banks are still in the transition stage of formation, as at Mehegam, Samni, and Kukerwada, it would be sufficient, for the present, to confine the attention to accelerate and help the natural process of formation of the low water convex banks, at these places, by means of groynes. The trouble, at present, being worst at Kukerwada, this may advantageously be taken in hand immediately, and if successful as can be reasonably hoped for may be extended to Samni and Mehegam only keeping the leading fact in view that, to ensure success any works carried out locally at Kukerwada at present should be such as can form an integral part dovetailing harmoniously into the whole.

2. *Examination of the River at Kukerwada in detail.*—Plan I (old) shows the position of shoals at Kukerwada in 1903 as in Fig. 6.



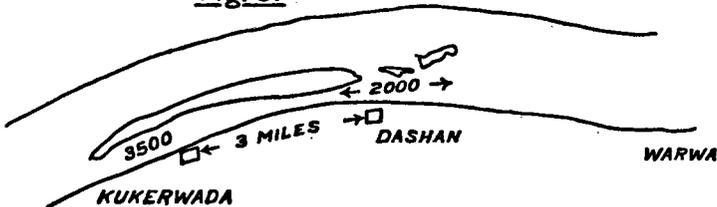
The river here having the concave bank on the opposite side of Kukerwada village, one would expect the channel to be clear there, having a deposit of silt, on the northern bank, as shown in Fig. 7.

Fig. 7.



Contrary to expectation and natural laws, one finds shoals right across the channel, through which the Fig. 6 dry weather and ebb tide discharge diffused itself. This can be explained only by the fact that though the banks were soon formed here to suit the nonsoon discharge, after the deflection of the current from Broach the low water discharge banks were still in the slow process of formation. But one could almost anticipate that, in course of time, the low water channel would right itself, as required by Fig. 7, by the deposition of silt on the convex bank and the concentration of the ebb current on the southern bank. The survey carried out just now in May 1911 shows the channel as in Fig. 8.

Fig. 8.



The sand spit No. 4 of Fig. 6 is removed away and a good current channel has been established along concave bank, the silt being gradually heaped, as near as possible, to the convex bank, from Kukerwada right up to Dashan. This silting process, at the convex bank, not having been still completed (May 1911), the silt has not come above the mean ebb tide level at Kukerwada and Dashan. The ebb tide diffusing itself more at Kukerwada and less at Dashan, the trouble is greater at Kukerwada and less at Dashan. At Kukerwada a large quantity of water of ebb tide over a length of about 500 feet diffuses over the shoal, towards the convex bank, to the detriment of the main concave channel. This diffused water on the Kukerwada side, is concentrated into a deep straight narrow channel about 1,000 feet wide, along the convex bank which, however being blind at its head, is not available for through navigation, about the place where the rails are shown in plan old tracing sheet of detailed survey at Kukerwada.

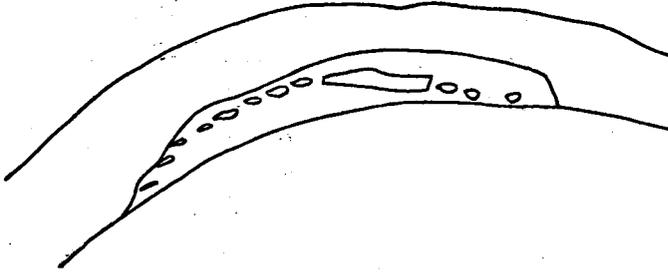
3. *The ways of improving.*—All that, therefore, appears necessary at Kukerwada to tackle this northern channel at its head and tail by—

- (1) preventing the water flowing into it by means of a groyne just long enough to,

(2) narrow the concave current to the width that the river has, on the down side, at Warwada where there is one good deep channel, and

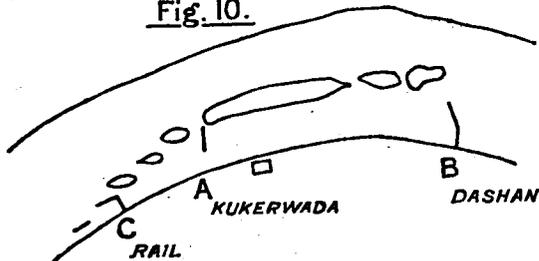
(3) by hastening the formation of silt on the convex bank into the natural shown in Fig. 9.

Fig. 9.



To gain that end Fig. 10 shows the positions of the proposed three groynes A, B of which A and B are both important.

Fig. 10.



A. 900 feet long serves to deflect the secondary current into the main channel

B. 1,200 feet long is necessary to—

(1) Concentrate the partly diffused water opposite Dashan also into the channel;

(2) Prevent the flood tide, which prefers to take the straighter secondary course, from retarding the silting work done by A between A and B;

(3) Accelerate the silting up of the secondary channel, by checking its flow tail.

C. 500 feet long is not very important, but serves to help A by gradually diverting water, before it reaches A and extending the silt a little further up.

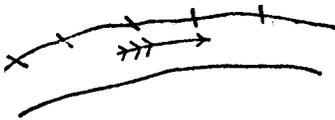
4. *The Heights of the Groynes.*—The groynes are proposed to be low, as it is the most advisable to interfere as little as possible, with the flood tide, which takes this straight course, during its inflow, being, as it were in a great hurry to fill up the river, as far as possible, due to the enormous push it gets from the tide at the mouth. Any attempt to raise the flood tide beyond what is absolutely necessary would involve the risk of but about the deterioration of the channel of the river, on the up-stream side by less

f water, and on the down-stream side by silting up. These groyne ought, therefore, to allow as much of flood-tide as possible, to pass freely over them into the river from all directions but direct the latter half of the ebb tide into the requisite channel only. The height of the groyne is thought to keep 3 feet above low water level. Because the range of the neap tide at Kukerwada is about 6 feet (*vide* sheet of the tide gaugings), as much of the silt deposition occurs at the latter half of the ebb tide, it is at this time that the current requires concentration into one main channel, to maintain sufficient velocity.

5. *The length of the Groynes.*—The length of these groyne are arrived at by plotting the width of the river beyond Dashan, where there is only one good deep channel, right up to Kukerwada, commencing from the concave bank. The remaining width between this line and the concave bank is the length that is more than what is sufficient for the dry weather and ebb tide discharge, which requires closing up, to get a deep navigable channel, on the other side. These proposals are shown on the plan and section on new tracing sheets marked E & F).

6. *Precaution to protect the Soft Bank.*—As the ebb current will be concentrated on the concave branch opposite Kukerwada, what may turn out a possible source of future trouble is the soft nature of that bank, which may get eroded, and widen the channel and consequently keep it shallow. If any such tendency becomes apparent after the construction of these groyne on the Kukerwada side, the edge of this bank will have to be hardened by a system of very short groyne, about 100 feet long of which about 50 feet to 70 feet go into the bank, the remaining 50 feet to 30 feet projecting into the channel as shown in Fig. 11 or by one protective groyne at the position shown in Fig. 12 which prevent the current from taking a deflection Fig. 13.

Fig. 11.



Figs. 12 and 13.

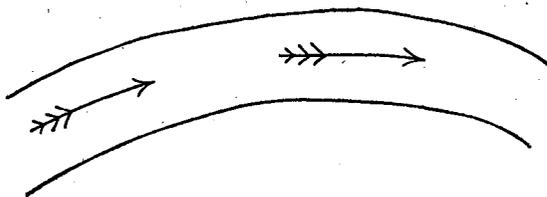


7. *Cost of the Schemes.*—The total length of the groyne as shown on plan is 2,600 feet. At Rs. 20 per R. feet the cost of the scheme comes to Rs. 52,000.

8. *Materials to be used in the Groyne.*—As it was observed on the last occasion in Mr. Bose's report of 25th October 1905 that brush wood and such lighter materials than later, if used in the body of the groyne, have a tendency to pull out the groyne, when they get submerged. As sand gravel and lime kankar are available at the site, it would appear better to consolidate mortar of say 3 of sand to 1 of lime into gunny bags on the shore and pack them in between rows of piles so as to form a substantial and solid work.

9. *Old Groyne*.—The position of the old groyne was almost at a point where the flood water, during monsoons, is strongest and became

Fig. 14.



an obstacle to the monsoon floods. Under such circumstances three things could possibly occur:—

- (1) Diversion of the current to the middle, and the removal of the shoals;
- (2) or the groyne be washed away;
- (3) or the bank be washed away, the current going round the groyne.

As the strong directive force of the current at Kukervada is generated beyond Broach one individual groyne would be insufficient to divert the current from its stronghold viz. the concave bank. The monsoon floods have therefore made their way, partly by washing away the groyne and partly the soft stuff, of which this bank made here.

A large portion of the groyne including the in-filling light material, having been washed away in the first floods, there has been little effect, on the channel by this, as is seen from Mr. Bose's report No. 6886, dated the 15th December 1905.

Precaution.—Lastly, if the present proposals of having groynes on Kukervada side are carried out, it would seem necessary to introduce some reasonable restrictions, carrying out protective or other works, on the upstream side, so that the usefulness of these training works may not be impaired, which would happen, if either the river allowed to revert to its original condition, or if a further deflection is caused in the current. The river having now settled down into a state of equilibrium, it must be maintained in that condition, for the success of these proposals.

History of the schemes for improvement of the navigable channel of the Narbada River as the prevention of erosion caused to the fort wall and landing place at Broach owing to the Bell Bund erected by the B.E. & C.I. Railway for the protection of the railway bridge by the Superintending Engineer, Northern Circle's report, dated the 9th February 1928.

1. *History*.—During the last 30 years the question of improving the existing navigational facilities of the Port of Broach came up for serious consideration on two occasions, viz. 1902-06 and 1909-14. Due to the Great World War and the anxieties created by it the question lagged behind but on normal conditions being restored, it was revived in an address to His Excellency the Governor when he visited Broach in the year 1911 and again the matter was revived at His Excellency's visit to Broach in 1926.

2. In September 1902 merchants, country-craft owners and other residents of Broach headed by Khan Bahadur A. M. Dalal in a petition to the Collector of Broach requested him to lay their grievances before the Government of Bombay to get the navigational channel of the Narbada river cleared, wharfage and landing facilities at the port of Broach increased and improved upon, etc.

3. Mr. Logan, the then Collector, wrote to Mr. Lely, the Commissioner, Northern Division, and a Government Resolution, Revenue Department, No. 8419 of 29th November 1902, was issued directing the P.W.D. officers to investigate, as soon as possible, the question of removing the bars at Kukervada, Samni and Lohara and asking the Commissioner of Customs to have buoys or stakes put up in the stream.

4. Subsequently Government in a Government Resolution, Revenue Department, No. 4083 of 24th June 1903, with a consensus of opinion of the various Customs Officers, declared that the marking of the deep navigable channel by buoys or stakes was neither feasible nor advisable.

5. The then Superintending Engineer, Northern Division, Mr. White, in his letter No. 1200 of 23rd February 1903, looking to the condition of the navigable channel of the Narbada as shown in a chart prepared in 1870 by Lieutenant Anderson, a Marine Surveyor, stated that on his inspection of the stream he observed that neither had the obstacles in the stream changed nor had they increased in the course of the last 33 years (1870-1903) and stated "But in my opinion no dredging of the existing channel is feasible except at a prohibitive cost and even then, I do not think the dredged out channels would ever keep open, so that to maintain them would mean a heavy recurring charge far beyond the means of the port". Mr. White also advised that no action should be taken till the result of the training works to the Narbada bridge, being then put up by the Railway Company, were fully observed.

6. Mr. Ali Akbar, Executive Engineer of Surat and Broach Division, in his No. D. 25 of 30th April 1903, gave data regarding the periods of delays caused to the native craft by the shoals at Kukervada and Samni and as a remedy suggested putting up a few low groynes, as an experimental measure. Mr. F. C. Taraporewala in forwarding to Government Mr. Ali Akbar's report under Superintending Engineer, Northern Division's No. 3334 of 29th May 1903, concurred with Mr. White that dredging was out of the question and suggested the cutting up of a small channel (40 feet to 50 feet wide and about a foot deep) at a cost of Rs. 10,000 and putting up a groyne estimated to cost Rs. 5,000 at Kukervada.

7. Accordingly Government in Government Resolution, Public Works Department, No. C. W. 487 of 19th February 1904, issued orders for putting up a groyne at Kukervada, which however was partly washed away by the next flood (1905) and on the Executive Engineer's demand for funds for special repairs to the groyne the Commissioner of Customs in his No. 7411 of 19th December 1905 remarked:—

"In the Commissioner's opinion demands for expenditure on these works are likely to be endless and it would be quite possible to throw the whole of the receipts and balances of the Northern Group Port Fund into the Narbada without producing the slightest improvement. Before further expenditure is incurred there should be greater certainty than exists at present that it will be beneficial."

8. Thus the issue of the Government Resolution, Revenue Department, No. 1113 of 6th February 1906, closed the first period of investigation and efforts at improving the navigation in the Narbada.

9. After a lapse of 3 years, the question was again taken up by Mr. Drew as Commissioner of Customs in his letter No. 2790 of 30th April 1909 printed in the preamble to Government Resolution, Revenue Department, No. 1167 of 4th February 1911, requesting that a Marine Survey of the Narbada be made by an expert of the Royal Indian Marine and this ended in a report No. 793 of 9th October 1910 by the Surveyor in charge Marine Survey of India. Lieutenant Taylor carried out the survey under instructions from the Surveyor. The remarks of the Marine Surveyor were as under:—

"Paragraph 7.—As regards the idea of dredging the river and making it navigable even for moderate sized craft at all tides I do not consider that idea feasible owing to the many bars and sand-banks, some having barely one foot of water over at low water."

"Paragraph 8.—Lieutenant Taylor has that opinion and I entirely agree with him."

"Paragraph 9.—If such a course was contemplated, the cost would be enormous and in a river so intricate and so full of sand-banks, the result could never be permanent."

"Paragraph 10.—The stream at ebb and flood gains a strength of between 4 and 5 knots an hour inside the river and 5 to 6 knots outside, and the rise and fall ranges

from 27 feet at the entrance to about 12 feet up at Broach; this strong current and large rise and fall greatly reduces any success that might result from dredging."

10. In their Government Resolution, Revenue Department, No. 1167 of 4th February 1911, Government circulated the above opinion of the Marine Experts to all concerned.

11. In the meantime, Mr. Hansoti, Executive Engineer, and Mr. Ayyangar, Assistant Engineer, were investigating the effect of the Bell bund at the Railway bridge, on the navigation of the stream downstream of the bridge and their conclusions are embodied in the Executive Engineer's No. D. 166 of 4th June 1911 and Mr. Ayyangar's report of 12th May 1911 accompanying the former.

12. No doubt, the Bell bund has been instrumental in deflecting the main current towards the north or the town bank and the axis of the stream downstream had to adjust itself to the altered condition. This necessitated changes in the bends of the stream, up to about 15 miles below the bridge, since the established regime of the stream was disturbed. It however remains to be proved that the Bell bund has been the cause of the formation of obstacles below it or increased appreciably the difficulty of navigation in the Narbada. Certainly it has forced the river to re-adjust some of its bars or obstacles, but whether to the detriment or advantage of navigation is a moot point.

13. Mr. Ali Akbar's (Superintending Engineer) preliminary report on training the Narbada prepared under the personal orders of His Excellency the Governor, and embodying the investigations of Messrs. Hansoti and Ayyangar, was submitted to Government under his No. 4088 of 1st July 1911 suggesting putting up of 3 groynes (estimated to cost Rs. 52,000) at Kukervada, but the Collector of Salt Revenue "not feeling able to support any further suggestions for experiments as the trade of the port did not justify any large expenditure" which opinion was concurred in by the Commissioner of Customs the papers were recorded, please *vide* Government Resolution, Public Works Department, No. C.W. 8519 of 20th August 1913.

14. *Conclusion.*—The above history shows that the question of improving the navigation in the Narbada has fairly exhaustively been investigated in the past and given up as (a) the experts were all of the opinion that dredging of the channel was out of the question, (b) no cheap measures within means of the port, and likely to be effective, were possible, (c) the Port authorities have no funds to finance any heroic measures, nor does the trade justify such an outlay.

15. Having glanced through its past history, which is unaffected by the present river conditions, the recent references, viz. the Collector's No. M.S.C. 50 of 29th August 1927 and the Municipal Committee's report, dated 24th February 1927, may now be briefly disposed of. The latter appears to have been written either in ignorance of the past efforts made to improve the navigation of the stream or in ignorance of the nature of the problem as could be judged from the following observations met with therein:—

(a) Municipal Committee's report, paragraph 12, page 35 *ante*—

"the pilots and sailors inform us that if these bars (shoals at Kukervada, Sami and Mehegam) are dredged and lowered by 12 feet to 15 feet.....
then for several years to come.....country craft drawing 10 feet of water.....
could sail up and down the river easily"—Against this the experts have opined that the dredged channel may not remain open for more than a year.

(b) Paragraph 14.—"There are no serious impediments in the channel of the river from its mouth up to Zano except the three bars and we are of opinion that a scheme which opens up a waterway 40 miles long at a very moderate cost deserves to be tried and not condemned." Against this, the experts have opined that—"it would be quite possible to throw the whole of the receipts and balances of the Northern Group Port Fund into the Narbada, without producing the slightest improvement."

(c) Paragraph 15.—"The value of the trade *viâ* the river to Government in terms of Import Duty and Port Dues is on the average a lakh and quarter annually. Formerly the income from these sources was at a much higher figure."

Probably the Committee suggest that the income of the Port from the above two sources reached the figure of a couple of lakhs some 15 to 20 years ago. This is not

warranted by actual figures, *vide* the preamble of Government Resolution, Public Works Department, No. C.W. 8519 of 20th August 1913 :—

Years.	Customs Duty.	Port Dues.	Total.
	Rs.	Rs.	Rs.
1908-09	49,283	8,880	58,163
1909-10	41,227	9,376	50,603
1910-11	50,273	8,371	58,644
1911-12	39,030	9,493	48,523
Total for 4 years ..	1,79,813	36,120	2,15,933
Average per annum for the period 1908-12 ..	44,953	9,030	53,983

16. Since the issue of Government orders in 1913, a new factor has come into play. The river port of Broach lying 30 miles inland from the Gulf of Cambay (which is also silting up slowly and steadily) can only be kept open at all times of the year, to craft having a draught of 8 feet and above at a prohibitive cost, whereas the port of Dehej seems to be more favourably situated and in the near future when it will be linked up by the proposed Samni-Dehej Railway now under construction, it will be very useful in increasing the transport facilities of the Broach District.

17. As regards the effect of the deflected current on the fort walls of Broach, this deflection has not been an unmixed evil, for before the Bell bund was put up the stream used to wander in the vast expanse of the river-bed at times leaving the bathing and watering ghats of the Broach town high and dry away from the flowing water and the people had to wade, through sand and mud, before they reach the water edge. Whereas after its construction the water is flowing close to all these ghats with the result that the inhabitants of Broach have the river water brought at the foot of the fort wall all round the year.

18. The scouring effects of the current on the fort wall are not so pronounced as to demand any immediate action. Moreover the variation of water level being 27 feet and the river being tidal at the place, groynes would have very little effect in protecting the north or the town bank.

The effects of the scour on the fort wall are not so pronounced as to need any immediate action nor do the present conditions of the river warrant any departure from the conclusions arrived at by the experts.

It will be seen from the reports printed above that the sand-bars have been in existence for over 100 years and are not of recent origin. The channel has often changed its course but no appreciable deterioration has taken place during the last 40 years.

At present vessels of 100 tons can cross the entrance and go from the mouth to the Custom House at Broach and vessels of 50 tons burthen can go up to Jagadir about 7 miles in the east on high tide. At low tide vessels up to 80 tons and 30 tons can go up to the Custom House and Jagadir respectively.

It will be seen from the particulars given in the Bombay Gazetteer that till 1840 Broach was almost without trade, its chief export nearly unsaleable. In 1850 the value of its sea exports began to increase and this increase was maintained till 1864. It began to decline again owing to the construction of the B. B. & C. I. Railway. The trade of Broach has always been with other ports in India.

Imports and Exports—Imports.—Cocoanuts, wet dates, rice, sugar, iron bars, sheet nails, teak-wood, mango wood planks and other sundry articles.

Exports.—Cotton bales, cotton seeds, toor dal, langdall, bamboos, rafters and sundry articles.

Statistics of Trade.—Separate statement attached.

Existing Facilities.—(1) *Jetties.*—There is a toe-wall and bandar road at Broach. There is also a wooden jetty maintained by the Local Board for use of ferry passengers.

(2) *Navigational Aids.*—There is a light-house at Lohara at the mouth of the Narbada river.

(3) *Storm Signals.*—Nil.

Annual Income.—The average annual income from port dues is Rs. 4,500 and that under Landing and Wharfage Fees is Rs. 5.

Roads.—In addition to Broach the principal market places are Ankleshwar, Hansote and Wagra. The first two are on the south bank of the river and are linked to Broach by the creek route. Wagra is linked to Broach by the road from Dehej and by rail from Navi and Broach. There are no roads parallel to the river in the west. In the east at some places they run parallel to the river.

Forests.—There is no forest on the river banks in British Indian territory. There is some forest in Rajpipla State territory.

General.—Broach is a station on the main B. B. & C. I. Railway line. There are about 80 small fishing tonies at Broach.

SURAT.

History.—The port of Surat is situated on the southern bank of the Tapti river Lat. 21°12' N and Long. 72°52' E. It is by water about fourteen and by land about ten miles distant from sea. It lies at a bend of the river where its course swerves suddenly from south-east to south-west. The chief feature in Surat is its castle planned and built between 1540 and 1546 by a Turkish soldier. The English came to the city in 1759 and established Trade factories. The other European powers, i.e., Portuguese, Dutch and French also started business at Surat. Since the accession of this town by the British in 1800, trade has been steadily passing to Bombay. In 1818 trade was active but this year of speculation was followed by a period of great depression. Between 1825 to 1837 trade continued slowly to decline and the city from year to year by little and little grew poorer. In 1837 two great calamities—a fire in the hot season and a flood towards the close of the rains—destroyed the greater part of the city reducing almost all classes of its inhabitants to a state of poverty.

But during the next two years (1838-1840) the fortunes of Surat began to mend, From 1840 its trade improved and increased steadily from year to year till 1858, when its position as the centre of railway operations in Gujarat gave Surat a sudden increase of wealth and importance. Large sums of money found their way into the city and before the reaction had set in the American war had broken out and the rapid rise in the value of its produce again made Surat a rich city. Since 1869 trade has declined and with the loss of employment the price of labour has fallen.

Creek and sub-ports.—The river Tapti or more correctly Tapi has a course including windings of about 450 miles a drainage area of about 30,000 miles and carries to the sea a volume of water estimated to vary from an hourly discharge of 120,000,000 cubic yards during seasons of extreme flood to 25,000 cubic yards towards the close of the dry weather months. The 450 miles of the Tapti's course westwards from the high lands of Central India to the sea may be divided into four chief sections; the first, of 150 miles, from its source in the great Satpura plateau through parts of the Central Provinces and Berar till a few miles below the town of Burhanpur it enters the plain of Khandesh; the second, of 180 miles, its passage across Khandesh; the third, where the waters of the river through fifty miles of hill and rock force their way down to the low lands of Gujarat; and the fourth seventy miles, more, across the alluvial plain of Surat.

On leaving the Dangs forests the Tapti enters on its last stage, the passage of 50 miles in a direct line, or including windings, of 70 miles across the Surat plain to the sea. For the first 40 miles the river with some windings runs, on the whole, to the north-west; below that for 10 miles it turns to the south-west and then suddenly striking to the north and winding first westwards and again back towards the south-east at the city of Surat about 12 miles from its mouth it again sweeps to the south-west. Below Surat the course of the river continues westward till, as they near the sea, its waters take a final bend to the south. These seventy miles of the Tapti's course are naturally divided into two parts above and below the limit of the tidal wave. Of these the upper or fresh water section includes about 40 miles and the lower or tidal section but little more than 30. Though they gradually merge into each other, the character of these two sections is

in several respects distinct. In the upper part the river passes through the less cultivated tracts in the east of the Surat plain. And it is only when the village of Waghecha is passed 22 miles west of the point where it enters the district, that the last spur of the Rajpipla hill is left behind. At this part of its course the river flows between banks from 500 to 1,000 yards apart formed of thirty to forty feet of tough, yellowish clay, interspersed with layers of limestone and capped with a deposit of from two to four feet of black soil.

During almost the whole of its course of 32 miles as a tidal river the Tapti passes through the rich highly cultivated plain that forms the central part of the District of Surat. Only for a few miles before it falls into the sea are the lands through which the river passes barren and liable to be submerged by the tides. Below Palri the course of the river stretches for about 8 miles towards the south-west; then near the village of Waracha, where the tides daily ebb and flow, it winds westwards for about two miles. Here, a little above the village of Amroli, the limit of ordinary navigation it strikes for three miles sharply to the north-west till, at Wariav, the lowest ford in the course of the river it bends for three miles more to the south-west; then winding again to the south-east it runs for four miles in a line almost parallel to its former course to the city of Surat where it again strikes suddenly towards the south-west. So sharp is this curve in the river's course that though by water Surat is more than ten miles from Amroli, by land the distance is but little more than two. Below Surat the river stretches to the south-west till about 4 miles from its mouth it turns to the left and gradually widening, flows southward into the sea. During this section of its course the banks have little of the steep and rough character they bear further up the stream. Below the limit of the tide, as the current becomes weaker, the land on either side of the river is less heaped up till, within 7 miles of Palri, so little is it raised above the level of the stream that for about 2 miles between the villages of Waracha and Fulpara, in times of flood the river, overtopping the left bank and in great body of water rushing westwards has more than once flooded the city of Surat. Further down the stream, at the more abrupt turnings, as on the right bank at Rander, and at Surat, about two miles further down on the left bank the outer edge is heaped up by the force of the current into a high stiff cliff. But below Rander the right bank soon drops again and continues low and shelving fifteen miles to the sea. So, too, within a few miles of Surat the left bank that, for a mile or two, was raised from twenty to thirty feet above the stream has again sunk so low that at high tide the water overlapping the bank, passes beyond, covering a large area of land.

The following are the sub-ports :—

Magdalla, Bhimpor and Rander.

Navigable Channels.—The following description appears in the *Bombay Gazetteer* :—

“ At present (1876) the navigation of the Tapti is confined to the last twenty miles of its course. Before the days of railways it was at one time thought that the Tapti might be made the highway for the carriage of the produce of Khandesh and the Central Provinces to the sea. With this object in 1852 a survey of the Tapti was made. This survey extended over a distance of 232 miles from the city of Surat to near the east of Khandesh at the junction of the Waghur and Tapti rivers. Beyond the eastern limit of Khandesh during the first 150 miles of its course the bed of the Tapti is too rough to permit of its navigation by boats.”

“ The following details show the present (1876) state of the channel of the Tapti between the sea and the city of Surat. The anchorage ground for large ships in Surat Road, at the mouth of the Tapti is in 42 to 48 feet at low water. Though the Surat roads are a safe place of anchorage from October to the beginning of April, it is considered dangerous for ships drawing much water to remain in the road after middle of April. For in this month and early in May smart southerly winds frequently blow during the springs, particularly in the night, with the flood-tide. At the road, the tides run rapidly especially the ebb, about 5½ miles (5 knots) an hour; further in near the bar, they do not run with so much velocity. At the bar the height of the tide varies from 12 to 22 feet at neaps to 27 feet at the highest springs. The average rise here is about 15 feet; but further up the river, about 4 miles west of Surat the rise of the tide is not more than 10 feet. The entrance over the bar into the Surat river is continually changing. By the shifting of the sand new channels are opened and old ones shut up. Formerly the Dumse channel was the deepest and was generally used by ships. The direction of this passage was along the east side of a sandbank towards the village of Dumas on the left bank of the river. This channel is now filled and is only navigable at half tide. The proper entrance can only be pointed out by a native pilot. Although the estuary of the river is here not less than 4 miles across, the passage is narrow, and at low water spring tides between the dry sands

near the bar, there is not depth sufficient for a small boat. To those passing outwards these banks of dry sand have a dreary aspect rising from 12 to 14 feet on either side of the narrow channel. During the latter part of the ebb the water rushing violently through the narrow channels carries boats with it at great speed. These passages are very shallow, and boats, always liable to touch the bottom, would upset if the sailors were not ready to leap out and support them. The distance from the bar to the city of Surat is about 12 miles and by the winding of the channel about 15 miles. For nearly two-thirds of this distance there is a continued chain of sand-banks, many of them dry at half tide, with very small depths at low water in the channel between them. The two chief sand-banks are near Magdala, about 4 miles and Umra about 10 miles from the mouth of the river. Above Umra and near the city the river is more contracted with deeper water. Opposite the fort of Surat there is at all times of the tide a depth of water of not less than 10 feet. Though boats sometimes pass up to Rander, three miles, and on to the Railway bridge at Amroli, eleven miles above Surat that city is at present the ordinary limit of navigation. The shipping which now (1876) visit Surat are native craft of from 18 to 36 tons (50 to 100 khandis) burthen and one light draft steamer that plies from Surat to Gogo and Bhavnagar on the western shore of the Gulf of Cambay. These boats, steamships and sailing vessels alike ply only during the fair weather season; in the months of June, July and August there is nothing but purely local traffic on the Tapti and very little else in the month of September. Unless when fortunate in tide and wind, sailing vessels of any size often take from two to three days to pass as far up as Surat. The steamships varying from 100 to 200 tons burthen and drawing from 5 to 6 feet cannot pass up and down the river at less than half tides."

"Though at present so many obstacles exist in the way of navigation a comparison of the description of the river given in former years would seem to show that the character of its bed has changed being little since the days when Surat was one of the chief centres of commerce in Western India. In 1863 the 'Pioneer' Steamship, 400 tons burthen, attempted, when lying off Magdalla, four miles from the mouth of the river to take in a cargo of cotton. When about half loaded she took the ground and became a wreck. The engineer, who examined the river in 1854 came to the conclusion that the bed had filled in considerably and that the action of the current was not of sufficient power to scour out the channel. In 1855 ships of from 144 to 180 tons passed up as far as Surat. At that time there was over the bar at all times of the tide a depth of 15 feet of water. Between the mouth of the river and Surat were several shoals and sand-banks that could be passed only at high tides. At neaps, even when the tide was full on the banks at Umra and Magdalla there were not more than six and a half feet of water. In 1850 it was thought that with no very great outlay the passages might be made practicable as far as Surat during the greater part of the day. The Waracha cut, by draining off some of the current, was supposed to have increased the tendency of the river to silt. In 1846, at the mouth of the river, across a whole breadth of from 5 to 7 miles were only two channels occupying together not more than a mile or a mile and a half. Boats getting on the sand banks were often lost. In the beginning of the present century (1813) the navigation of the Tapti is said to have been very difficult in consequence of the sand frequently shifting, by which new channels are formed and old one shut up. Nearly by two-thirds of the distance from the bar to Surat was a continued chain of banks, having but narrow channels between them."

"A hundred years ago (November 1774) on the bar at the mouth of the river, the depth of water varied from 3 feet at low tide to 18 feet at springs. Ships of considerable size could then pass over the bar; but further up in the river were other banks, of which that near the village of Umra, half a league below Surat, was the shoalest. Above Surat the river was described as becoming shallower and shallower so that at low water, at present, it was fordable at the village of Wariav. Except when in want of repairs, ships engaged in the European trade remained at anchor on the roads, the merchants taking their goods to Surat either by land or in small boats. Though Ovington (1688) states that the goods were brought up to Surat in Hoys Yachts and country boats with great convenience and expedition; "another traveller, a few years earlier (1666) had found that even in a small boat the passage up the river took from 10 a.m. to 8 p.m. and in 1638 Mandelslo found the river so shallow that it could (scarce carry a bark of 70 or 80 tons). Sir, T. Herbert (1626) went from his ship at Suwali roads to Surat in a "chariot drawn by two buffaloes". This traveller speaks of the Tapti with some contempt "as good neither for drink nor for navigation serving for nothing save to mundify the idolatrous Banian". In 1609 though the channel was said to be fair the river was able to bear vessels of only 50 tons. In 1530 when Antonio de Sylveira came against Surat, he found the mouth of the river so full of

sand, that the larger ships of war did not attempt the passage and the troops were sent up the river in small vessels. Even in the small boats the commander failed to reach Surat in one day. On the other hand, during the whole of this period, at certain seasons of the year it was possible to bring large ships of 1,000 tons and upwards as far up the river as the city of Surat.

Mr. J. P. D'Arcy, Superintendent of Lights, Bombay, who was appointed by the Government of Bombay to make a survey of the ports in Gujarat in 1925 reported on Surat as under :—

Surat.—The siltation in and about entrance of the Tapti and right up to and above the Hope Bridge has been abnormal. For as long as I have known this river (about 20 years) it could not be entered excepting on the flood-tide. When I first knew it a Coast Guard Boat drawing from 5 to 6 feet could enter it on about half an hour's flood. Now a vessel drawing that water has to wait for at least 2 to 2½ hours' flood on the springs and from 3 to 3½ hours' on the neaps and on the lesser of the two daily tides in the neaps it is practically impossible to enter at all excepting right on the top of high water. The banks throughout the river have increased enormously and what is of greater import even than this is that in several places they are in the nature of quicksands so it can easily be understood how dangerous they are.

The large bank above the Hope Bridge and the end of which some five years ago was about ½ to ⅓ a mile above the bridge has now extended to the bridge and under it and if it continues at this rate I estimate that at the outside in another 3 years the bunder will be completely blocked up. By the end of this bank five years ago and on the Surat side of it there used to be a fairly good channel fit for much as drawing a couple of feet to pass up and down the river. Where this channel was, is now fields under cultivation. The lower level of the jetty and which I remember quite well laying afloat alongside of, has now completely disappeared in the silt. Off Navdi bandar where I often anchored my boat in 7 to 8 fathoms there is now barely 8 feet and again where I used to moor my boat in 8 feet of water at low water and where she always laid afloat just off the slip of the old Salt Dockyard is now river-bank. Even off the new Salt Dockyard at Athwa where there used to be 5 fathoms of water there is now only 5 to 6 feet. This enormous change in this river I can vouch for from my personal observations for the short period I have known it, this however appears trifling compared with what I have heard about it as it was some 60 years ago. Mr. Cursetji Subavalla, one of our old Coast Guard Inspectors informed me that he remembers quite well when he was a boy (Mr. Cursetji is now 72) that there used to be a floating landing stage where the present jetty is and that the Haji Cassum steamers used to lay alongside of it. I know for a fact that steamers must have used the river as I have myself many times taken soundings round the wreck of one of them just below Magdalla when locating positions for laying the buoys. As a matter of fact I had to erect juggies (wooden pole beacons) on this very wreck one year when the fresh water floods in the river washed away so much sand from her that she showed signs of what might be called coming up again but which was as a matter of fact the sand being secured away from her. There must be at least 20 feet of sand over her now. I have travelled up and down this river scores of times but I have never experienced such difficulties in doing so as I have this trip and I have marked a wonderful change in it even from last year."

At present vessels of the capacity of 50 tons can cross the entrance and those of 50 tons and 20 tons can ply in the creek on high and low tides respectively. Vessels of 50 tons can go on low tide only from Surat to Magdalla. The navigable portion extends from the mouth to Bander.

A statement showing shoals is attached hereto.

Imports and Exports—Imports.—Sugar, iron pipes, rice, scantlings, timber, ghee, fruits, Mangalore tiles, stones, chillies and groceries.

Exports.—Firewood, vegetables, cotton bales, seeds and other miscellaneous commodities from the creek villages.

Statistics of Trade.—Separate statement attached.

Existing Facilities—(1) Jetties.—There are two wooden jetties at Surat and one R. C. C. Jetty is under construction.

(2) *Navigational Aids.*—There is a Aga Flash light called Tapti light at Hajira at the entrance of the river.

(3) *Storm signals.*—Nil.

Annual Income.—The average annual income under Ports Fund is Rs. 3,200 and that under Landing and Wharfrage Fees Fund is Rs. 300.

Forests.—There is no forest area on either banks of the Navigable portion of the river Tapti.

Roads.—There is one main road leading from Surat to Bhimpore-Dumas on South bank and one from Suwali to Surat on the north bank of the river. Besides there is one main road leading to Sachin and Navsari in the south, one to Bardoli and Mandvi in the east and one to Olpad and Sayan leading up to Ankleshwar in the north.

General.—Surat is a station on the B. B. & C. I. Railway main line. There are no fishing vessels except small boats fishing in the creek only.

Statement showing shoals in the Tapti River.

Where situated.	Approximate distance	Whether of sand or rock.	Approximate length of the shoal.
1. Opposite to the village of Umra.	$\frac{1}{2}$ mile from Umra ..	Sand ..	200 yards.
2. Between Umra and Magdalla.	1 mile from shoal No. 1.	Sand and hard earth.	2 miles.
3. Do. ..	250 yards to the west of shoal No. 2.	Sand ..	150 yards.
4. Opposite to Magdalla village.	1 mile from Magdalla.	Do. ..	200 ..
5. Opposite to Gaviar village.	$\frac{1}{2}$ mile from the shore at Gaviar.	Sand and hard earth.	2 miles.
6. Between Gaviar and Dumas.	3 miles from shoal No. 5.	Sand ..	$\frac{1}{2}$ mile.
7. Opposite to Dumas village.	250 yards away from the Dumas Chowpey.	Do. ..	1 ..
8. At the mouth of the River.	2 miles from Dumas to the north.	Do. ..	2 miles.
9. Opposite to Hajira between Mora and Kavas.	1 mile from Hajira ..	Do. ..	1 mile.

Tidal waters on the above Shoals.

No. of shoal.	High Spring.		Mean Spring.		Neap Tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1	6 feet.	Exposed.	2 feet.	Exposed.	2 feet.	Exposed.
2	Always remains exposed except at the time of floods.					
3	8 feet.	1 foot.	6 feet.	1½ feet.	4 feet.	½ foot.
4	10 "	2 feet.	7 "	1 foot.	5 "	½ "
5	Always remains exposed except at the time of floods.					
6	8 feet.	1½ feet.	6 feet.	1 foot.	2 feet.	Exposed.
7	3 "	½ foot.	1½ "	Exposed.	Exposed.	"
8	10 "	1½ "	5 "	½ foot.	3 feet.	"

BULSAR.

History.—The port of Bulsar is situated Latitude 20° 38' and Longitude 72° 58' on the estuary of the navigable though small river, Auranga and is at the same time a station on the Railway between Surat and Bombay. It is about 40 miles south of Surat and 115 miles north of Bombay. It is noted for its large trade in timber from the Dangs and Bansde and Dharampur forests.

Creeks and Sub-Ports.—The Auranga river, rising in the Dharampur hills, flows for about 12 miles, first westward and then towards the north-west and falls into the sea at Kosambe. In the upper parts of its course the banks of the stream are steep and the country somewhat rugged. A mile above the town of Bulsar there is the Railway bridge 1,000 feet long and 32 feet above the stream. At Bulsar the river passes over rocks and gravel along a channel 600 feet wide. The only tributary is the Wanki, which after a rocky and winding course falls into the Auranga within half a mile of the sea.

There are no sub-ports.

Navigable Channels.—The following description appears in the Bombay Gazetteer :—

“Except for the last 15 miles including the windings of its course the Auranga is a tidal stream navigable by boats of 50 tons and under for about 6 miles from the sea. West of Bulsar the depth of the channel at low tide varies from 7 to 9 feet till after 4 miles the bar at the mouth of the river is reached. This bar at low tide springs is covered only by 2 to 3 feet of water but has a tidal rise of 18 feet.”

The following description appears in the West Coast of India Pilot :—

“Bulsar Khari, the estuary of Auranga river, at 6 miles north of Omersari forms the port of Bulsar; the town being on the south side of the river about 2½ miles from the coast. An extensive flat of mud and sand dries at low water half a mile outside the entrance and the creek also is then nearly dry, but in the river there is a depth of 7 to 9 feet. Vessels can only cross this flat towards high water.

Large vessels must anchor outside the 5 fathoms Custom-line or about 8 miles from the coast.”

Mr. J. P. D'Arcy, Superintendent of Lights, Bombay, who was appointed by the Government of Bombay to make a survey of the ports in Gujarat in 1925 reported on Bulsar as under :—

“ Here again the siltation in this creek has been abnormal. The entrance is only approachable after 4 hours flood whereas plenty of water was obtainable on one hour's flood formerly. An enormous amount of erosion has taken place on the south bank of the creek, i.e., from where the Wanki Khari joins the main creek to the entrance and with the result that the whole bed of the creek here has silted enormously. Here again vessels drawing 5 feet can only get up to Bulsar on the top of the springs but, when they do get there they cannot lay afloat. There used to be always a Ghat at Bhadeli but it was easily crossed on about one hour's flood, now it is completely silted up. There used also to be a small bank where the Wanki runs into the Auranga : this has now become quite a large island and with a lot of growth on it thus showing that it does not cover even on the springs. In my short experience I have known this creek to break through the land between the Kosambe light and the entrance. I have heard but I cannot vouch for it, that at one time this creek so, changed in its course as to cause some anxiety for the safety of the site of the present light-house. To give a good idea of the amount of siltation and erosion which has taken place, where I had my boat moored on this visit she did not keep afloat at low water even on the neaps, whereas, years ago in exactly the same spot there were 5 to 6 fathoms of water at low water.”

Generally vessels up to 50 tons burthen visit Bulsar. During the past three years vessels above 50 tons, which visited Bulsar port are detailed below :—

Tonnage.	1935-36.	1936-37.	1937-38.
	Nos.	Nos.	Nos.
51 to 60	12	13	15
61 to 70	19	16	12
71 to 78	5	7	10
	36	36	37

Out of the above vessels most of them being owned by local fishermen arrived and left empty. The following are the details of shoals :—

Where situated.	Approximate distance from.	Whether of sand or rock.	Approximate length of the shoal.
1. Shoal situated at Bhagda Bandar between Bhadeli and Bhagda.	½ mile from Bulsar Custom House.	Sand and gravel.	L. 400 feet. B. 300 ..
2. Shoal situated between Kosambe and Bhadeli.	1½ miles from Bulsar Custom House.	Sand and gravel.	L. 200 feet. B. 100 ..

Tidal waters on the above shoals.

Name of shoal.	High Spring.		Mean Spring.		Neap Tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1. Bhagda Shoal	10'	Dry.	6'	Dry.	3'	Dry.
2. Kosambe Shoal	10'	1'	6'	1'	3'	1'

Vessels go for shipment to Lilapur village on the opposite shore off the Custom House and near the Railway Bridge. At high tide vessels of 50 tons can ply from the Custom House as far as to Bar but at low tide even a boat of 5 tons cannot cross the shoals.

The following are the principal articles of imports and exports :—

Imports.—Mangalore tiles, Mangowood planks, rice, oilseeds, sugar, all sorts of hardware, ghee, vegetable oils, wet dates, fish, onions, etc.,

Exports.—Timber, bamboos, firewood, charcoal, bricks, grains, pulse, jaggery, etc.

Statistics of Trade.—Separate statement attached.

Existing Facilities—(1) *Jetties.*—There is a wharf opposite the Bulsar Custom House and an approach road below on the shore. At Bhagda bandar there is a wharf originally constructed in 1931 (210 feet) and extended in 1937 (335 feet).

(2) *Navigational Aids.*—There is a lighthouse at Kosambe.

(3) *Storm Signals.*—Nil.

Annual Income.—The average annual income from Port due is Rs. 3,400 and nil from Landing and Wharfrage Fees.

Roads.—The Ahmedabad-Bombay trunk road passes by the Bulsar Custom House in the north of which Chikli town is situated at a distance of 14 miles and Pardi town in the south is 8 miles. A pacca road from Bulsar station in the south-east leads to Dharampore, which is 18 miles and Khergam in the east is also connected by a pacca road 12 miles from Bulsar town. Bhagda bandar is connected with Bulsar town by a pacca road.

General.—Bulsar is a Railway Station on the B. B. & C. I. Railway.

PANVEL.

History.—The port of Panvel is situated Latitude 18° 58' N and Longitude 73° 12' E. on a creek on the Poona road about sixteen miles east of Bombay and by road twenty miles south-east of Thana.

It is stated in the Gazetteer published 50 years ago that though a good deal of money has been spent in improving it the port is poor and can be used only at high water. The existing condition is therefore not of recent origin.

Creeks and Sub-ports.—The Panvel creek or Kalundri river is formed of several small streams from the west slopes of the Matheran hills. The river about 9 miles from the sea meets the tidal wave at Panvel. The following are the sub-ports :—

Taloja, Waghivli, Divala (Chinchbandar), Ulva and Belapur.

Navigable Channel.—The following description appears in the Bombay Gazetteer :—

“ Besides small vessels of from 4 to 20 tons batelas and Phatemarries of from 35 to 50 tons from Bombay and Verawal visit the ports anchoring 100 feet from the landing in Belapur, 50 feet in Kherne, and 40 feet in Panvel.”

At present vessels up to 35 tons can approach Panvel on full tide days only and these vessels anchor about a furlong away from the Panvel wharf. Vessels up to 12 tons can approach the wharf at high and mean spring tides. At neap tides no vessel can approach the Panvel bandar; at neap tides they anchor nearly a mile away from the bandar. At Belapur vessels up to 110 tons can anchor off Belapur port and in the creek between Belapur and Ulva at high tides and vessels up to 50 tons can approach Belapur or Ulva at any stage of the tide.

A list of shoals is attached.

Imports and Exports.—(1) *Panvel—Imports.*—Gunnybags, cocoanuts, grains, cotton piece goods, kerosine oil, crude oil, tea, manure, cement and wheat-flour.

Exports.—Rice, bricks, old gunnies and water-melons.

(2) *Belapur—Imports.*—Paddy, old gunnybags and Mangalore tiles.

Exports.—Rice, straw and sand.

Statistics of Trade.—Separate statement attached.

Existing Facilities.—(1) *Jetties.*—There is a jetty at Belapur, a wharf with a wooden pier head at Ulva, a stone wharf at Panvel.

(2) *Navigational Aids.*—There are 9 buoys between Nhava and Belapur. There are bandar lights at Belapur and Panvel bandars.

(3) *Storm Signals.*—Nil.

Annual Income.—The average annual income under port dues is Rs. 400 for Panvel and Rs. 300 for Belapur. That under Landing and Wharfage Fees is Rs. 10 for Panvel and Rs. 190 for Belapur.

Roads.—There is a road from Panvel to Thana and Bombay as also to Ghats. There is a District Local Board road from Panvel to Ulva and thence after crossing the river by ferry from Divala to Belapur and from Belapur to Thana.

General.—There are about 150 fishing tonies in the creek.

List of shoal between Belapur and Panvel.

Shoal No.	Where situated, distance from Panvel, length etc.	Approximate tidal waters on the shoals.					
		High Spring.	Full Ebb.	Mean Spring.	Full Ebb.	Neap Spring.	Full Ebb.
1	2	3	4	5	6	7	8
A	Situated near "Divala" off Ulva bandar nearly 6 miles from Panvel line of rocks length 500 × 40.	12'	At full ebb there is no water on these rocks	9'	Only the upper portion 200' in length is not submerged under water the remaining part is under water about 2½' deep.	7'	About 100' in length is under water 3 feet.
B	Sand shoal situated between Waghvali and Divala 5½ miles away from Panvel 350' in length, highest width about 100' with one island on the centre which is never submerged under water.	15' all round the island in the centre.	The shoal is dry at full ebb after high Spring.	12'	3 feet of water on the extreme boundary around the shoal.	9'	4 feet of water on area 30' around the shoal.

Shoal No.	Where situated, distance from Panvel length, etc.	Approximate tidal waters on the shoals.					
		High Spring.	Full Ebb.	Mean Spring.	Full Ebb.	Neap Spring.	Full Ebb.
1	2	3	4	5	6	7	8
C	Flat sandy shoal near the Waghivli area of the creek. 4 miles away from Panvel 300' x 50'.	16'	Dry	12'	Shallow side, part under water 2' deep.	9'	3' fee water.
D	Rocky shoal 40' x 10'. 3½ miles opposite the north end of Waghivli island, 3½ miles from Panvel.	15'	Dry	11½'	Do.	9'	Do.
E	Shoal of sand and mud opposite southern end of Waghivli, 3 miles from Panvel 400' x 90'.	15' to 12'	Dry	About 11'	Above 3' on the shallow portion.	8'	2' water.
F	Rocks, 60' x 12' 2½ miles from Panvel.	12'	Dry	9'	Side part 30' length under water 2½'.	6'	1½'
G	Rocks Flat-bed, 110' x 30. 2 miles from Panvel.	15'	Dry	12'	1'	9'	3'
H	An island situated at a distance of 1½ miles from Panvel. Mud and sand; only the middle part is slightly submerged at high spring tides extreme length 350' and breadth 10 feet.	12' excepting the top surface on which there is only 3' water at the High spring tide.	Dry	9' 11' on the top surface.	2½' on the extreme outer boundary.	7' on the side excepting the top surface.	3' on the extreme outer boundary.

KARANJA.

History.—The port of Karanja is situated Latitude 18° 51' N and Longitude 73° 2' E at the mouth of the Amba river or Dharamtar creek. It is a small village and except for the Salt-pan industry has no historical importance.

Creeks and Sub-ports.—The Amba river rises in the Sahyadris and after a south-west course of about fifteen miles, turns sharply to the north-west, and about four miles lower meets the tidal wave two miles above Nagothna. The river winds below Nagothna until it reaches Dharamtar. From there it runs about nine miles and goes into Bombay harbour.

The principal sub-ports are Rewas, Dharamtar, Nagothna and Antora.

Navigable Channels.—The following description of the Navigable channel appears in the *Bombay Gazetteer* :—

“As far as Dharamtar pier, about ten miles from its mouth, the creek is at all times navigable to boats of 62½ tons (250 khandis). Above Dharamtar navigation is difficult, and, at low tides, impossible. At ordinary high tides boats of fifteen tons (60 khandis) and at spring tides boats of 25 tons (100 khandis) can pass as high as Nagothna. But the passage almost always taken even ordinary sized vessels two high tides. So much time is wasted in waiting for water enough to cross the first rocks, that when the second barrier is reached the ebb has set in and it is no longer passable. Large boats which can go to Nagothna only at spring tides are forced to stay there until the next spring tides. In passing down to Amba, Nagothna must be left within two hours of high tide. During the dry season, because the tide is then higher and the wind favourable, the passage is made only at night. The Shepherd ferry steamers ply daily from Bombay to Revas and Dharamtar piers, and, in the fair season, there is a considerable traffic to Nagothna, chiefly the export of rice and the import of salt and fish.”

A list showing the existing shoals in the creek and tidal waters on them is attached.

The present condition of the channel is that big sailing and steam vessels of about 300 tons can enter the port and anchor off Karanja. Vessels of about 40 to 50 tons can go from Karanja to Dharamtar at high tide and up to about 4 to 5 tons only at low tide. Vessels of 10 to 12 tons can go from Dharamtar to Nagothna at high tide only. No vessel can get to Nagothna at the time of low tide. Vessels up to about 10 tons can ply in the Antora creek up to Antora village at the time of high tide only. Similarly vessels of about 10 tons can ply in the Apta creek up to Rawa village at high tide only. In the Khopta creek flat-bottomed salt boats up to about 40 tons and other vessels up to about 10 tons can ply up to Chirner at the time of high tide only. Flat-bottomed salt boats up to about 20 tons and other vessels up to about 10 tons can go up to Washi at high tide in the Washi creek. Vessels of about 5 to 7 tons can ply in the Revas and Hasivra creeks at high tide and smaller tonnies can ply in these creeks at low tide. Similarly small boats and tonnies can ply at high tide for some distance beyond Nagothna, Antora and Apta in the respective creeks.

Imports and Exports.—The value of imports and exports for Nagothna and Dharamtar is given below for as many years as possible :—

IMPORTS.

Year.				Nagothna.	Dharamtar.
				Rs.	Rs.
1935-36	..	..	..	2,04,356	2,57,928
1936-37	..	..	..	1,97,214	2,08,128
1937-38	..	..	..	1,71,817	2,90,588

EXPORTS.

Year.				Nagothna.	Dharamtar.
				Rs.	Rs.
1935-36	..	..	..	1,44,265	2,25,880
1936-37	..	..	..	2,11,288	2,05,403
1937-38	..	..	..	1,82,243	1,30,048

Coastal traffic is mainly by country craft. Only salt is sent in steamers specially chartered for the purpose.

Imports.—The chief imports are :—Petrol 20 per cent., Sugar 20 per cent., Kerosene oil 15 per cent., Matches 1 per cent., Cocoanuts 4 per cent., Dry fish 3 per cent., tea 4 per cent., cotton saris 6 per cent., ghee 2 per cent., groceries 15 per cent., copper pots 5 per cent., and other miscellaneous articles 5 per cent.

Exports.—The chief exports are :—Paddy 40 per cent., salt 30 per cent., sand 10 per cent., rice 6 per cent., grass 4 per cent., fish 1 per cent., timber 1 per cent., fuel 2 per cent., charcoal 4 per cent., other miscellaneous articles 2 per cent.

Except salt trade the remaining trade is for the interior markets.

Existing Facilities—(1) *Jetties.*—There is a jetty at Karanja. There is a steamer pier at Revas. At Dharamtar (Pen-side) there is a wharf with a T head pier, a two-staged wooden landing place with an approach road and a stone jetty. On Alibag side (Dharamtar) there is a stone jetty, a wooden landing stage and a second stone jetty (under construction) in the creek at Shahabaj. There is also a stone jetty at Antora and one at Nagothna.

(2) *Navigational Aids.*—There is a bandar light and an anchorage buoy at Karanja. There is a bandar light at Revas, also atone at Dharamtar (Pen-side) and another on Alibag side and one bandar light at Antora.

(3) *Storm Signals.*—There is no storm warning signal at the port.

Income.—The average annual income from Port dues is about Rs. 3,000 and that from Landing and Wharfage Fees Fund cess and rent is Rs. 17,000 (i.e., for Karanja, Mandva, Revas and Dharamtar).

Roads.—There is a road from Karanja to Uran. A road also runs from Uran to Panvel. Revas is connected by road to Alibag and to Dharamtar. Dharamtar (Alibag-side) is connected with Alibag and Revas by road. Dharamtar (Pen-side) is connected with Poona-Bombay (via Kharpada) and Nagothna by road. Nagothna is connected by road with Pen and Mahad. Antora is connected with Pen by road. Beside the following minor sub-ports have roads linking them with other towns or trunk roads—(1) Kharpada, (2) Shahabaj, (3) Pezari and (4) Poynad.

Forests.—Round about Nagothna there is Government Forest mostly of teak.

General.—There is a daily passenger steamer service from Bombay to Revas and Dharamtar. There are about 10 fishing vessels in Apta, 15 to 20 at Revas and 50 to 75 at Karanja going out to sea for fishing besides small tonnies which fish in the creeks.

Shoals between Karanja and Nagothna.

Where situated.	Approximate distance from.	Whether sand or rock.	Approximate length of the shoal.
1. Near Rewas Pier (on way to Dharamtar).	1½ mile from Rewas pier.	Rocks	50 feet.
2. Near Mankole Village.	1 mile from Mankole	Sand	70 "
3. Near Gadab Village	¼ mile from Gadab Village	"	50 "
4. Near Jui Village	1¼ mile from No. 3 above.	Sand and rock	50 "
5. Near Sambri Village	2 miles from No. 4 above.	Rocks	25 "
6. Near Jambhul-Tep Village.	3 miles from No. 5 above.	"	25 "
7. Near Bendse Village	1½ mile from No. 6 above.	Rock and sand	40 "
8. Near Nidi Village	2 miles from No. 7 above.	"	15 "
9. Near Nagothna Village.	2 miles from No. 8 above.	"	10 "

Tidal waters on the above shoals.

Name of shoal.	High-Spring.		Mean-Spring.		Neap-Tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1. Rewas ..	16' to 18'	3' to 4'	12' to 14'	2' to 3'	6' to 8'	2' to 3'
2. Mankol y a- chi Bhati.	12' to 16'	..	10' to 12'	..	5' to 6'	....
3. Gadab chi Bhati.	10' to 12'	..	6' to 7'	..	5' to 6'	....
4. Juicha lag.	8' to 9'	..	7' to 8'	..	4' to 5'	....
5. Sambric h a lag.	8' to 9'	..	7' to 8'	..	5' to 6'	....
6. Kothal y a- cha lag.	7' to 8'	2' to 3'	5' to 6'	3' to 4'	4' to 5'	3' to 4'
7. Benschac h a lag.	7' to 8'	..	5' to 6'	..	3' to 4'	During ebb tide carts and men can go across the bank easily.
8. Nidicha lag.	7' to 8'	..	4' to 5'	..	3' to 4'	
9. Bhokric h a lag.	6' to 7'	..	3' to 4'	..	2' to 3'	....

REVDANDA.

History.—The port of Revdanda is situated at the mouth of the Kundalika river in the Kolaba District, Lat. 18° 33' N. and Long. 73 E.

Creeks and Sub-Ports.—The following description of the Kundalika river appears in the *Bombay Gazetteer* :—

“The Kundalika or Roha river rises in the Sahyadris and after a westerly course of about 20 miles it meets the tide at Roha and for about twenty miles more to the west and north-west stretches a navigable tidal inlet falling into the sea at Revdanda. During its passage across the District the Kundalika receives only two considerable streams. From the right about 4 miles above Cheul the streams join the creek in the village lands of Bhonang, the Ramraj with a westerly course of about six and the Bale with a southerly course of about 8 miles. The chief other tributary is the Achalbag which after draining the hills near the Janjira border falls into the Kundalika about ten miles below Roha.”

These are the following sub-ports :—

Ramraj, Nhava or Achalbag and Roha.

Navigable Channels.—The following references to the bar at the mouth of the river appear in the *Bombay Gazetteer* :—

“The following is a summary of De Castro's account of the Chewool river written in 1538. ‘Within the bar to the south of the river is a great and beautiful hill which from outside appears to be an island. To the north of the hill are two sand-banks one of which runs straight to the bar and the other meets the river. To the south of the hill is long low tongue of the sand which is the reason why the rock has been thought to be an island. From the place where this tongue ends rises a high rugged

hill which to the north falls abruptly and throws out a narrow point in which at the foot of a great green tree is a well of water. Inside of the hill the land along the river is low until it meets a very long point behind which the river disappears. The other or the north bank of the river is one beautiful shore. Facing the hill a spit of sand runs into the river and from it the shores stretch in different directions. The sea or outer shore runs to the north-west but that which goes inside the river takes a turn to the east. The Portuguese fortress stands on the spit of sand. A little to the east the shore begins to bend and the river forms a great bay on the north of which is the city of Cheul."

The Bar of the river has one sand-bank.—At low tides there are standing pools on it and (at high tide) the depth is $2\frac{1}{2}$ fathoms. The channel is wide. It runs from south-east to north-east and on both sides are great banks where the sea continually breaks. These sand-banks run north-east to north and south. The larger one is in the channel. The other which comes from the side of the hill and enters the river is small. About a gunshot from the point of sand at the foot of the hill where the shores turn in different directions banks stretch in two long arms. One runs straight to the point of the hill which is over the bar and the other along the coast. The Italian traveller Pietro Della Valle twice visited Cheul in March-April 1623 and in November-December 1625. He describes the entrance as commanded on the right by the famous hill known as it Morro de Chaul or the hill of Cheul. Inside of the rock the river wound among hills and between low shores. Near the city it formed a safe roomy port with deep water too close to the bank that from a small galley you could slip ashore by a gangway. In 1634, Antonio Bocarro described the mouth of the river as blocked with a sand-bank to the north but with a channel to the south-east which at low water had a depth of not more than 7 feet and high water about 13 feet and a half. Inside of the bar there was depth and room for many barks to enter without fear of damage. On the 5th December 1728 Andre Ribeiro Coutinho described the walls of Revdanda as they are now. He said "though the fortification were in good order the sea was damaging the west wall. Between Sam Jacinto and Sam Luiz, apparently two bastions at the north-west corner, which had been added since 1634 the walls were in need of repairs; the ditch probably on the north-west was in places filled with sand and required an outwork or stockade on the sea side to prevent further encroachment. The existing entrance to the port lies close to the north of the Korlai Hill with 10 feet of water at dead low tide." Inside the bar there is a wide anchorage with plenty of water. Last year, i.e., 1936 an Arab Dhow of 168 tons entered and left the port with full cargo without any difficulty. In Ramraj creek vessels up to 30 tons burthen ply with cargo. From Revdanda to Gophan a distant of 18 miles vessels of the capacity up to 40 tons can ply loaded at high tide. There are the following shoals and rocks between Gophan and Roha, a distance of six miles.

Shoals and rocks.

Where situated.	Approximate distance from Gophan.		Whether of sand or rock.	Approximate length of the shoal.	—
	M.	F.			
1. Vaveli	0	$1\frac{1}{2}$	Gravel	40 feet.	(Waghbandar).
2. Vaveli	0	4	Rock	60 ..	(Pera).
3. Kunibhashi	2	0	Gravel	70 ..	(Ghareli).
4. Jholambe	2	2	Double reef of rocks.	70 ..	....
5. Ara ..	3	0	Gravel	150 ..	....
6. Kopra	4	0	Rock	40 ..	(Karada).
7. Padam	4	2	..	40 ..	(Bambani).
8. Roha	5	2	..	40 ..	(Tata Co.'s crane).

Tidal waters on the above shoals.

Name of shoal.	High Spring.		Mean Spring.		Neap Tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
Waghbandar ..	10'	Dry.	8'	Dry.	4'	Dry.
Pera ..	7'	2'	5'	2'	4'	2'
Kunibhasi ..	9'	2'	5'	2'	4'	2'
Ghareti ..	6'	Dry.	5'	Dry.	4'	Dry.
Ara ..	10'	1'	8'	1'	4'	1'
Karada ..	10'	1'	8'	1'	3'	1'
Bambani ..	8'	Dry.	6'	Dry.	4'	Dry.
Tata Co's. Crane	10'	2'	8'	2'	4'	2'

The state between Gophan and Roha in 1883 as described in the *Bombay Gazetteer* was as follows :—

“ At Roha a stone wharf or causeway is used at spring tides by boats of 15 tons (60 khandis). But except in the rains the creek is dry for about 12 hours in the day, and vessels can reach the pier only for about an hour and a half at each tide. About a mile below Roha are several ridges of rock through one of which there is only one narrow channel. For 5 miles more the water is shallow with numerous sand bars. At present though small vessels and toneys above $\frac{1}{2}$ ton or 2 khandis cannot navigate this portion at low tide, vessels of burthen up to 25 tons can go right up to Roha at high tides.”

Imports and Exports.—The commercial prosperity of Bevdanda during the last 500 years can be divided into three broad periods, viz., the period in the sixteenth and seventeenth centuries, the period in the eighteenth and the first part of nineteenth century and the period in the latter part of the nineteenth and the first part of the twentieth centuries. The following description will give an idea of the imports and exports in the three above periods :—

I. Barbosa, who visited Cheul in 1514 when it was the emporium of the largest part of the East, writes :—“ Cheul was not a large town. In the rainy season there were few inhabitants but by December, numbers began to pour in bringing their goods in great caravans of oxen one man for about 30 or 40 beasts with packs like donkeys packs and on the top long sacks placed cross-wise. They stopped about 3 miles from the town, set up their shops and during December, January, February and March the place was like a fair. By sea there was a great trade with the Persian Gulf and Arabia, coconuts being exported and dates and horses imported. There was also a great coasting traffic with Malabar and Goa to the south and with Gujarat to the north. Some of the ships belonged to Gujarat but the bulk of the trade seems to have been in the hands of the Malabar vessels. During the busy months December to March many ships came from Malabar laden with coconuts, betelnuts, spices, drugs, palm-sugar and emery. They also brought from the factories of the King of Portugal much copper, quick-silver, and vermilion by way of Mekka and Div, cotton stuffs and many other goods. From Cheul the Malabar boats took wheat, vegetables, millet, rice, sesame, oil of sesame, pieces of fine muslin for women's head-dresses and many cotton stuffs called beranis. Malabar boats that went on to Gujarat took with them from Cheul chiefly muslins and cotton clothes; and Gujrat boats on their return voyage took coffee, quick-silver, vermilion, muslin and cotton stuffs. Much of the muslin and cotton stuffs going by Div to Arabia and Persia”. In his account of the exports from Cheul, Barbosa does not distinguish between local products and articles

brought from the Deccan. It seems probable that the vegetables, rice, some of the sesamo and some of the cotton cloths were local and the wheat, millet, a share of the cotton cloth and the bulk of the muslins came from the Deccan.

II. The *Bombay Gazetteer* published in the latter part of the Nineteenth century describes the trade at Revdanda as follows :—

The articles exported from Revdanda are produced chiefly in Revdanda, Cheul, Ramraj and other neighbouring villages. They are cleaned rice, fuel, leather, live stock vegetables, horns, betelnuts, and brooms sent to Bombay; (vari nachani and cocoanuta, firewood and brooms sent to Panvel. The imports are cloth, clarified butter, sugar, almonds, dates, copper sheets, tin, lead, paper, and umbrellas from Bombay; and onions, potatoes, shembi-bark, coriander seed and chillies from Habsan, Bankot and Bhivandi. These articles are imported partly for local use and partly for export to Roha. Most of the traders are local Vanis, Brahmins, Marathas, Kolis and Bhandaris. The vessels that frequent the port are machvas of 25 to 30 tons phatamaris of 40 to 50 tons and small steam boats of 50 to 150 tons. At spring tides ships of 100 to 400 tons can move in the Cheul Harbour.

III. At present the principal articles of imports are sugar, grains, tea, sweet oil, matches, spices, cement, jaggary, tobacco and of exports are paddy and rice, charcoal, wood and fuel, betelnuts, brass and copper wares, cocoanuts, fish, grains.

Statistics of Trade and Passenger.—*Vide Appendix III.*

Existing Facilities.—(1) *Jetties.*—there is a jetty at Roha. The proposal for constructing a jetty at Revdanda is being considered by the Landing and Wharfage Fee Fund Committee and plan and estimates are under preparation. There is a jetty at Salav in the Janjira State opposite Revdanda.

(2) *Navigational Aids.*—There is one Kerosine oil lamp on a wooden post on the shore near the landing place. It is a guiding light for boats approaching the bunder and is maintained by the Salt Department.

(3) *Storm Signals.*—There is no storm warning signal station at this port.

Roads.—There is a nine mile Local Board road from Revdanda to Alibag which is further connected by roads to Revas and Dharamtar to Khopoli. Roha is joined to the main trunk road in the District by a feeder road meeting the main road at Kolad about 10 miles south of Nagothna.

Forests.—The following table shows the chief details of the forest blocks and ranges in the vicinity of the Kundalika river as they stood in 1881 :—

Name.	Sub-Division	Acres.	Villages.	Produce.	Outlet.
Bidvagle Bhel-ashi.	Alibag ..	14,000	16	Teak and ever-green forest.	Revdanda and Sambri.
Sukeli Range..	Nagothna, Alibag and Roha.	31,500	63	Do. ..	Nagothna and Roha creeks.
Roha-Hallsun block.	Roha ..	17,000	57	Do. ..	Roha.

Income.—The average annual income of the port under Ports Fund is Rs. 1,600 and under Landing and Wharfage Fee Fund is Rs. 1,400.

General.—There was a daily passenger steamer service from Bombay to Revdanda until 1936.

BANKOT.

History.—The port of Bankot is situated at the mouth of the Savitri river or Bankot creek Latitude 17° 75' N and Longitude 73° 2' E.

Creeks and Sub-Ports.—The Savitri river or Bankot creek rises in the village of old Mahabaleshwar and after flowing for 22 miles meets the tidal waters about two miles above the town of Mahad. In its course through the Kolaba District the Savitri receives six large tributaries, four from the right bank and two from the left, but of these

tributaries the Ghod which runs from Goregaon and meets the Savitri a little below Dasgaon is important. From Mahad the river runs to Mhapral a distance of about 16 miles and thence to Bankot a distance of about 18 miles. The small tributaries to this river in the Ratnagiri District are at Umroli, Nigdi, Panderi and Mhapral.

The names of Sub-ports are :—

Umroli, Nigdi, Panderi, Mahapral, Dasgaon, Goregaon and Mahad.

Distance from Bankot to Panderi 10 miles.

Distance from Bankot to Mahapral 18 miles.

Distance from Bankot to Dasgaon 24½ miles.

Distance from Bankot to Goregaon 31 miles.

Distance from Bankot to Mahad 31 miles.

Navigable Channels.—The condition of the Bankot bar at various periods during the last 60 years can be understood from the following description taken from the official records, *Bombay Gazetteer*, page 320, published in 1880 :—

I. "A mile outside of the village and two miles south-west of Fort Victoria the bar of the Bankot river, with a narrow channel on its south-east side, stands 9 feet deep at low water."

II. Report dated 10th November 1906 from Mr. Walke, Coast Guard Inspector, Alibag Beat :—"The channel over the Bankot bar has 9 feet of water on it at L. W. S. T. The Channel is extremely narrow where the water is shallow and there are banks on both sides of it at this point. I have attached (not available) a rough chart showing the position of the buoys, banks and the sounding at L.W.S. T. and on comparing this with the chart submitted with No. 177/8-11-05, it will be seen to what extent banks have formed on the coast of the channel and how the bank on the west has changed in formation and encroaches. Although this channel is very narrow it may be used by the steamers for 2 hours after and before high water or even 2½ hours provided there is not a strong west or N.W. wind blowing and due allowance will have to be made for the steamers rise and fall with the swell. A west or north-west wind throws up a very heavy cross swell in the channel especially on the ebb tide. At L.W.S.T. with a strong west or north-west wind the break along the west bank extends right through the channel and joins that of the east bank. The heavy swell coming across the channel changes in character on coming into shallower sounding, the drift is curtailed and the crest becomes packed up and breaks."

III. Report dated 1908 from the Superintending Engineer of Bombay Steam Navigation, Co. Ltd. :—"Herewith enclosed (not available) please find the depth of water at different places on the bar, and you will see from this that it is not possible to take the steamers in at low water, as there is only 5 feet water in the channel; to meet all contingencies 10 feet at least is necessary. The rise and fall at the bar is 9 feet, so that if we add this to the low water depth we have 5 feet plus 9 feet, total 14 feet at high water. This would mean that the steamers would be able to go to Bankot 4 hours before low water and 4 hours after low water. This would mean that the channel is blocked to our steamers for 8 out of 12 hours or 16 out of 24 hours as the tide regularly ebbs and flows twice in the 24 hours".

IV. Letter dated 1909 from the Director, Royal Indian Marine :—"A chart with a tracing of the soundings taken is herewith forwarded (not available); the soundings were reduced to the same datum as that used in the former survey of 1880, namely, ordinary Indian low water springs. By placing this tracing over the existing Admiralty Chart, it will be seen that the alteration of the bar and river entrances has been exceptionally small during the 29 years, which elapsed since the last survey was completed and it is still possible to cross the bar with nine feet least water at low water springs the same depth as shown in the Admiralty Chart. The best crossing for the bar now is about one cable north of the previous crossing and the bar itself is about one cable to the eastward to its former position; the sandspit to the northward has been washed away to its extreme south-west point about one cable, and the southern sandbank has correspondingly extended about one cable to the northward. Outside and inside the bar as far as Bankot jetty, the soundings are, to all intents and purposes, similar to those shown on the Admiralty Chart, and the sandbanks on either side of the river seem to have preserved their original shape and dimension."

V. Report dated 27th April 1921 from Mr. P. Glyn Messent, Chief Engineer, Bombay Port Trust :—"The latest official chart is dated 1880, but I have obtained copies of surveys made by the Executive Engineer, Ratnagiri District, 1908 and by the Marine Survey of India in 1909. I had a few rough sounding taken last January.

From a comparison of these surveys which are shown on Drawings (not available) Nos. 6, 7 and 8, it will be seen that the position of the bar shifts considerably and it is now much farther north than it was 41 years ago. I was told at Bankot that the position of the bar is always varying and I should think this is very likely true. On the old chart the least water was 8 feet, but I found barely 6 feet. I understand that this port may be re-surveyed next season. It has been suggested that the bar should be dredged away, but as mentioned above I do not recommend this as I feel it would quickly form again and the dredging would have to be repeated once a year if not oftener."

VI. Report dated 20th November 1933 from Mr. G. Ebrahim, Assistant Dock Master, B. S. N. Co., Ltd. :—"As directed in the Head Office letter No. 149/4083, dated 13th instant, I reached Bankot on the 17th instant, when it was not possible to examine the Bar. On the 18th instant, with the help of a Motor Launch from the Sarkarkun Bankot, I proceeded to the Bar to take soundings at 5-30 p.m. being spring low tide, and found 8 feet of water on the Bankot Bar when there was slight swelling. The Bar being exposed is inclined to get rough with slight seas. The steamers navigating this port will be solely at the mercy of the bar and in my opinion our Harnai Line steamers will only be able to make this port six days in a fortnight on the down voyage in day time at half-flood tide when the breeze is normal. The anchorage is in deep water and safe, but the bar will be a *big problem* for the Commanders while entering and leaving the port. Under these uncertain conditions and in view of the steamers calling there 12 days in a month, I am afraid it will not pay the Company and the passengers by opening Bankot as a port of call as it will serve no fruitful purpose. I trust I made myself clear as far as navigation is concerned."

VII. Report dated 4th February 1934 from Mr. A. Logsdail, Deputy Superintendent of Lighthouses :—"I arrived on the 4th of February at low water and was met outside the bar by the Captain representing the Bombay Steam Navigation Co. in a Launch. We immediately commenced taking soundings and the following depth of water was discovered—Between the Outer buoy west of bar 4 fathoms—We steered from this position in an easterly course taking soundings at every twenty yards. The water on the bar was 12½ feet which was our lowest sounding. All other soundings varied on the bar to 15 feet. It must be taken into consideration that although 12½ feet of water was found this day, there is lower spring tide, but as there is only a difference of 2 feet between the neap tide rise and the ordinary spring tide, the lowest water to be found on the bar will be at least 9 feet. This can only happen on the lowest spring tide. The chart I was using for this purpose was a new chart issued by the Agents of Messrs. Potter and Co., S.W. 1 London, with no corrections in the year 1929. We discovered that there is a slight alteration in the channel since the issue of this chart. Also it is evident that more water is on the bar now than what is shown on the chart. This is due to the slight alteration of the silt depositing itself further towards Hareshwar or the north side of the channel."

The Bankot creek for all practical purposes may be said to extend from Bankot to Mahad, a distance of 30 miles. Mahad, the head-quarters of the Taluka of that name in the Kolaba District is the principal place of importance on the creek. At Mahapral 18 miles from Bankot there is a Traveller's Bungalow, and Daegaon where there is also a Traveller's Bungalow is the termination of the journey of the daily steam launch belonging to the B. S. N. Company and the I. C. N. & T. Company plying for passengers. The main creek branches off at Sapa 23½ miles distant from Bankot and at this place country vessels anchor and are loaded with paddy brought from Goregaon, a distance of 2 miles by small machwas. The creek is navigable for all vessels at all tides for a distance of 18 miles as far as Varad-Juva a small island, situated in the creek near Mahapral, which stated to have been the scene of some wrecks and accidents in former times. Small vessels can sail as far as Daegaon 26 miles from Bankot at low tides and at ordinary high tides navigation by vessel of about 25 tons as far as Mahad is possible.

A list of shoals is attached.

For about 20 miles from the mouth portion of the creek on the north are in Janjira State limit and there are two ports of the State in the creek, viz., Hareshwar at the entrance and Khadapchowkie in the interior.

Imports and Exports.—The following descriptions of trade at Bankot and Mahad appears in the *Bombay Gazetteer*, published in 1880 :—

Bankot.—Trade has long left Bankot. It is now little more than a large fishing village. A few coconuts, betelnuts, grafted mangoes and small quantities of salt fish and fins and inaws are exported. A few resident shop-keepers supply the people

with cloth, grains and groceries. Bankot has no manufactures but at Bagmandala on the north bank of the creek, a few salia (weavers) find employment in weaving course cotton cloths.

The principal articles of imports and exports at present are:—

Imports.—Sugar, copra, matches, tiles, betelnuts, kerosine oil, rice, salt, cocoanuts, fish (salted and unsalted), cement, tea, grain and pulse, cocoanut oil and chillies.

Exports.—Myrabolans, vari, cocoanuts, rice, sweet oil, nagli, betelnuts, onions, paddy and mangoes.

The total value of the trade during the year 1936-37 was Ra. 9,99,760 out of which imports amounted to Ra. 8,20,210 and exports to Ra. 1,79,550.

Statistics of Trade.—Separate statement attached.

Existing Facilities.—(1) *Jetties.*—There is a wharf at Bankot Custom House and a jetty near the Bankot village. There is a jetty at Mhapral, and also at Dasgaon. There is a wharf at Mahad.

(2) *Navigational Aids.*—There is a landar light at the Custom House and two buoys to mark the entrance to the port. There is one buoy inside the bar.

(3) *Storm Signals.*—Nil.

Roads.—There is a cart track from Bankot to Mhapral and thence to Poladpur connecting the Varanda and Fitzgerald Pass. There is also a road from Mhapral to Mandangad and further on to Dapoli connecting with the main trunk road running through the district. Mahad and Dasgaon are situated on the Nagothna-Mahad-Mahableshwar Road, which joins the main Bombay-Poona Road. There are now regular motor bus services running between Bombay, Dasgaon and Mahad and also between Mahad to Poona. There is a good feeder road connecting Goregaon with the main Nagothna-Mahad road.

Forests.—There are now no forests.

Income.—The average annual income under Port Dues is Ra. 1,080 and that under the Landing and Wharfage Fees is Ra. 125.

General.—The steamer port for Bankot and the Savitri river is Hareshwar on the north bank in the Janjira State. Copies of the undermentioned Government Resolutions (not typed) dealing with the question of improving the port of Bankot are attached.

1. G. R., R. D., No. 4153 of 30th April 1809.
2. G. R., R. D., No. 10273 of 25th October 1909.
3. G. R., R. D., No. 11819 of 28th December 1910.
4. G. R., R. D., No. 2052 of 5th March 1910.
2. There are 380 fishing vessels at Bankot including sub-ports.
3. On 1st February 1938 a vessel (kotia) of 113 tons entered the bar at high tide.

Shoals between Bankot and Mhapral, Dasgaon and Mahad.

Where situated.	Approximate distance from Bankot.	Whether of sand or rock.	Approximate length of the shoal.		Remarks.
			Lth.	Bth.	
Umroli	5 miles	Rocks	25'	6'	
Adi	7 "	Sand	50'	50'	
Nigdi	9 "	"	50'	50'	

Where situated.	Approximate distance from Bankot.	Whether of sand or rock.	Approximate length of the shoal.		Remarks.
			Lth.	Bth.	
Panderi ..	11 miles ..	Sand ..	50'	7'	
Amshet ..	12 ..	..	40'	15'	
Laganjiva ..	15 ..	Sand and rock also.	250'	80'	
Mahapral ..	17 ..	Sand ..	250'	10'	
Kokran ..	From Mahapral $\frac{1}{2}$ mile.	Rock ..	....	
Dardiva ..	From Mahapral 3 miles.	Sand ..	200'	15'	
Dabhole ..	From Mahapral 4 miles.	..	250'	60'	
Wovla ..	From Mahapral 5 miles.	..	40'	6'	
Sape ..	From Mahapral $5\frac{1}{2}$ miles (1).	Sand (1) Rock (2) Sand ..	Very big. 40' x 10' 12' x 25'		
Mhaiskhinda ..	From Mahapral $6\frac{1}{2}$ miles.	Rock and sand	Very big.		
Jui ..	From Mahapral $7\frac{1}{2}$ miles.	Do. ..	Do.		
Daegaon ..	From Mahapral 7 miles.	Rock ..	30'	15'	
Wahoor ..	2 miles from Daegaon	Sand ..	250'	30'	

Gotha and further up rocks and sand.

Tidal waters on the shoals in the Bankot creek.

Name of shoal.	High spring.		Mean spring.		Neap Tide.		Remarks.
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.	
Umroli ..	7'	Nil.	4'	1 $\frac{1}{2}$ '	2'	1'	
Adi ..	10'	Nil.	5'	Nil.	1'	Nil.	
Nigdi ..	8'	Nil.	4'	Nil.	2'	1'	
Panderi ..	10'	Nil.	6'	Nil.	4'	3'	

Name of shoal.	High spring.		Mean spring.		Neap Tide.		Remarks.
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.	
Amshet ..	3'	<i>Nil.</i>	2'	<i>Nil.</i>	1'	<i>Nil.</i>	
Laganjiva ..	7'	<i>Nil.</i>	4'	<i>Nil.</i>	3'	<i>Nil.</i>	
Mahapral ..	8'	<i>Nil.</i>	5'	<i>Nil.</i>	4'	1'	
Kokran ..	3'	<i>Nil.</i>	2'	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	
Dardiva ..	4'	<i>Nil.</i>	3'	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	
Dabhole ..	6'	<i>Nil.</i>	3'	<i>Nil.</i>	2'	<i>Nil.</i>	
Wovla ..	5'	<i>Nil.</i>	2'	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	
Sape (1) ..			No water.				
(2) ..	6'	1'	3'	2'	<i>Nil.</i>	<i>Nil.</i>	
Mhaishkhinda ..	4'	<i>Nil.</i>	3'	<i>Nil.</i>	1'	<i>Nil.</i>	
Jui ..	4'	<i>Nil.</i>	3'	<i>Nil.</i>	1'	<i>Nil.</i>	
Dasgaon ..	3'	<i>Nil.</i>	1½'	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	
Wahoor ..			No water.				
	Water further up is 4 feet only at high spring and at ebb tide water is very low.						

DABHOL.

History.—The port of Dabhol is situated at the mouth of the Vashisthi river or Dabhol creek Lat. 17°. 34' N and 73°. 16' E.

Though it has long been of no consequence Dabhol would seem to be a settlement of very great age. It was one of the places destroyed by Malik Kafur in 1312. About 50 years later (1357) it is again spoken of as the western limit of the Bahmani dominions. In the fifteenth century, during the prosperous times of the Bahmani Kings, Dabhol was the centre of a great trade.

It continued to be an important trade centre in the sixteenth century also. But at the beginning of the seventeenth century and after it was plundered alternately by the Portuguese and the Marathas and lost its trade importance. It came into the possession of the British in 1818.

Creeks and Sub-Ports.—The river Vashisthi rises in the Tivra pass (Bankot) and becomes tidal at Chiplun. Passing the island of Govalkot it suddenly widens and after a course of 25 miles through low mud banks fringed with mangroves it reaches the sea at the port of Dabhol. Several smaller tributary streams are on either bank received into the Vashisthi. The Jagbudi the principal tributary rises near the Hatlet pass. In its first 12 miles its course lies from north to south. Here it turns at a right angle and after 12 miles from east to west reaches the town of Khed. It here meets the tidal wave and again turning sharply continues its course for another 12 miles from north to south till from the right it joins the Vashisthi about 20 miles from the coast.

The following are the sub-ports :—

On the South side.—(1) Anjanvel, (2) Veldur, (3) Sakhri Trishul, (4) Peve, (5) Karul, (6) Waghivra, (7) Chiveli, (8) Gangrai (Donavli), (9) Maldoli, (10) Karbone, (11) Kaluste, (12) Govalkot and (13) Chiplun.

On the North side.—(1) Onavre, (2) Pangari, (3) Dabhil, (4) Pannale Kaji (Shirvane), (5) Bhadvale, (6) Palanje, (7) Tumbad, (8) Sawnas and (9) Khed.

Navigable Channels.—(Condition of the bar at the mouth) Chiplun and Khed are the chief market places in the creek. The oldest reference to the bar at the mouth of the creek is in 1639 by Mandelslo, who describes the entrance as one of the best by reason of a sand bank at the mouth, which was dry at low water. The following description of the bar appears at page 318 of the Bombay Gazetteer :—

“The river mouth, about a mile broad, is narrowed by a sand-bank, that from the north runs within two cables length of the south shore, where on the edge of a plateau 300 feet high is the ancient temple of Talkeshwar. On the bar at low tide are ten feet of water with, at springs, a rise of 10 feet.”

The Assistant Collector of Salt Revenue, Ratnagiri, reported under date 26th June 1911 on the Dabhol bar as follows :—

“There is a sand-bar at the mouth of the Dabhol creek which is said to be of a very peculiar nature in-as-much as during the monsoon it practically closes the entrance every year. In the fair season the obstruction disappears and a deep water channel about quarter of a mile broad exists. This is no doubt owing to the force of a rough sea meeting floods flowing down the creek which deposits all matter at the place of junction and the obstruction is afterwards washed away a forcible current on the sea becoming calm.”

The Sarkarkun, Dabhol wrote under date 27th April 1931 :—

“There is a sand-bar at the mouth of the creek but vessels drawing about 10 feet of water can enter the mouth at any state of the tide.”

The present condition of the bar is that though the depth of water thereon at Dead Low Water height varies from 10' to 11'. It is always 30' to 40' inside.

Condition of the creek in the interior.—There are numerous sandy tracts on the northern side of the creek from the mouth to a distance of about half a mile in the interior running almost parallel to the rocky shore of the Anjanvel village on the opposite bank. The anchorage at Dabhol is about 2 miles from Anjanvel. The creek from Anjanvel to Karbone (22 miles) is very deep and 6 furlongs to one mile broad. There is not a single bar or shoal of any kind in this area.

On the section from Karbone to Chiplun (7½ miles) there are in all nine shoals. Big vessels stop at Govalkot between Karbone and Chiplun about 5 miles from Karbone. The shoals can therefore be divided in two parts those between Karbone and Govalkot and those between Govalkot and Chiplun.

Shoals between Karbone and Govalkot.

Where situated.	Approximate distance from Karbone.	Nature of shoal.	Length.
1. Near Bhilla	1 mile	Sand and shingle	200 feet.
2. Near Songao	1½ mile	Do.	50 „
3. Near Dhamni	3½ „	Do.	450 „
4. Near Govalkot	5 „	Do.	150 „

Tidal waters on the above shoals.

Where situated.	High Spring.		Mean Spring.		Neap Tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1. Shoal near Bhilla ..	13'	N \bar{u} .	10 $\frac{1}{2}$ '	2'	7'	3'
2. Shoal near Songao ..	13'	N \bar{u} .	10 $\frac{1}{2}$ '	2'	7'	3'
3. Shoal near Dhamni ..	10 $\frac{1}{2}$ '	N \bar{u} .	7 $\frac{1}{2}$ '	N \bar{u} .	6'	2'
4. Shoal near Govalkot ..	10 $\frac{1}{2}$ '	1'	7 $\frac{1}{2}$ '	1'	6'	2'

Shoals between Govalkot and Chiplun.

Where situated.	Approximate distance from Govalkot.	Whether of sand or rocks.	Approximate length.
1. Near Kalki (Bamboo trees).	$\frac{1}{2}$ mile ..	Sand and Shingle ..	300 feet.
2. Near Bag ..	1 ,, ..	Do. ..	350 ,,
3. Near Char ..	1 $\frac{1}{2}$,, ..	Rock ..	150 ,,
4. Near Pulan ..	1 $\frac{3}{4}$,, ..	Sand and Shingle ..	400 ,,
5. Near Chiplun ..	2 $\frac{1}{4}$ miles ..	Rocks ..	200 ,,

The creek between Karbone and Govalkot is navigable by big vessels at high tide. That between Govalkot and Chiplun is navigable only on spring tide by flat-bottomed boats having a draught of less than 4 feet as it is very shallow. It is also very narrow so much so that only one boat can go up at a time.

On the other main section of the Dabhol creek viz., between Karbone and Khed there are 4 shoals as shown below :—

Where situated.	Approximate distance from Karbone.	Whether of sand or rocks.	Approximate length.
1. Near Shirshi ..	8 miles ..	Sand ..	200 feet.
2. Near Nandgaon ..	12 ,, ..	Rocks ..	200 ,,
3. Near Alsur ..	14 ,, ..	Sand ..	250 ,,
4. Near Chambharwadi ..	15 ,, ..	Rocks ..	350 ,,

The tidal water on all the above shoals is approximately of an uniform height. The depth of water on the shoals is about 7 feet at full tide, on high spring days. All vessels bringing cargo for Khed stop at Karbone. Only flat-bottomed cargo boats and Gujarat type Batelas requiring less than 5 feet water can go up to Khed.

Imports and Exports.—The following description of trade in olden days at Dabhol and Chiplun appears in the Bombay Gazetteer :—

Dabhol.—“Dabhol is connected by a road with Dapoli 12 miles north. Coasting steamers call daily during the fair season and up the Vashihti in connection with the service to Bombay a small steam launch takes passengers to and from Govalkot, the landing place for Chiplun. Except betelnuts sent in small quantities to Bombay there is no trade.”

Chiplun.—“At the head of a navigable river and near the entrance to the Kumbharli pass one of the easiest routes from the Deccan to the sea, Chiplun must have always been a centre of trade. Of late by the opening of a cart road through the pass traffic has much increased. Its leading merchants are local Brahmans and Bhatias within the fair season a few agents of Bombay firms. All goods passing through Chiplun are in the first instance consigned to local merchants in accordance with orders given by them to their correspondents in Bombay or the Deccan. Bulk is broken on arrival and the goods are sold in large or small lots to the petty dealers and agents of Bombay firms. After changing hands most of the imports are in the course of 2 or 3 months again exported. The chief articles received from the Deccan are cotton, molasses, clarified butter, oil, grain, turmeric and chillies; and from Bombay, most of them to be sent on to the Deccan, are piece-goods, metals and other miscellaneous articles. In ordinary years little or no grain travels east. During the busy season February to May from 300 to 400 carts pass daily into Chiplun through the Kumbharli pass.”

At present the principal articles of Imports and exports are :—

Imports.—Cocoanuts from Goa, Kerosene oil, cement, sugar, grains, and other sundry provisions.

Exports.—Groundnut seeds, turmeric, corriander seed, jaggery, betelnuts, myrabolams, ahembi bark and other forest produce including sewri cotton, mangoes, etc.

Statistics of Trade and Passengers.—*Vide* Appendix III.

Existing Facilities.—(1) *Jetties.*—There is a steamer wharf at Dabhol and jetties at Karul, Chiveli, Karbone and landing places at Khed and Chiplun. There is a wharf at Govalkot too.

(2) *Navigational Aids.*—There are two buoys, one outer and one inner at the entrance of the port. There are three lights viz., (1) at Tolleshwar, (2) at Anjanvel and (3) Veldur. There is also one guiding light on the wharf at Dabhol.

(3) *Storm Signals.*—There is a storm signal station at this port.

Names of sub-ports and the roads linking them.	Road to which linked.
Roads.—(i) Anjanvel and Veldur	.. .. to Guhagar.
(ii) Karul	.. .. to Guhagar-Chiplun Road.
(iii) Govalkot	.. .. to Chiplun.
(iv) Chiplun	.. .. to Karad, Ratnagiri-Mahad roads.
(v) Khed	.. .. to Mahad, Chiplun and Dapoli roads.

(a) Dapoli-Khed-Mahad is a trunk road.

(b) Khed-Mahad and Khed-Chiplun are trunk roads.

(c) Chiplun-Khed-Mahad, Chiplun-Karad and Chiplun-Ratnagiri are trunk roads.

(d) Dabhol-Dapoli is a good metalled road.

Forests.—There are no forests.

Income.—The average annual income of the Port under S. G. Ports fund is Rs. 2,700 and that under Landing and Wharfage Fees Fund is Rs. 6,500.

General.—There is a daily passenger steamer service in the fair season with a connecting steam launch services for the creek,

JAIGAD.

History.—The port of Jaigad is situated at the mouth of the Shastri or Sangameshwar river Lat. 17° 17' N and Long. 73° 15' E about 99½ miles south of Bombay.

Creeks and Sub-ports.—The river Shastri rises in the Sahyadri hills and after a total course of about 40 miles falls into the sea at Jaigad. Flowing for about 16 miles west, past the town of Sangameshwar until it meets the Bav river at Fungus the course for a few miles changes abruptly to the north and then takes a north-westerly direction to the coast. The tidal wave reaches as far as Sangameshwar. During its course several small rivers unite with the Shastri.

The following are the Sub-ports :—

Dhamankhol, Jambhari, Mobar, Chafe, Rai, Veshvi, Fungus, Makhjan, Kurhandia and Sangameshwar, where passengers are landed and Tavsal, Padve, Saitavde and Kudli where goods are landed. Makhjan and Sangameshwar are the principal market places in the creek. The approximate distance between them is 17 miles by road and 18 miles by sea. Each is about 30 miles inland by sea from Jaigad.

Navigable Channel.—The port of Jaigad is a good and safe port open throughout the year. Steamers and vessels up to 200 tons can enter the port as far as Jaigad Custom House at any time. Cargo steamers up to 1,000 tons can at any time pass through the entrance into the sub-port of Dhamankhol which is 2 miles seaward from Jaigad Custom House. At low tide vessels up to 50 tons burthen can go from Jaigad to Rai a distance of about 18 miles. At high tide vessels up to 10 tons burthen can go up from Rai to Makhjan and from Rai to Sangameshwar a distance of about 12 miles but at low tides no vessels can pass between these places. Only small tonics can ply between these points at low water.

A statement showing shoals and tidal waters on them is attached.

Imports and Exports.—Jaigad itself is not a trade centre. The chief trade centre is Sangameshwar and to a smaller degree Makhjan.

The following description of the trade of Sangameshwar in olden days appears in the Bombay Gazetteer :—

“Sangameshwar's decline is chiefly due to the silting of the creek and partly since a cart road has been made through the Khumbarli pass to the turning of the through Deccan and Bombay trade to Chiplun. The pack traffic through the Mala pass is, of imports, piece goods and other articles, and of exports, cotton. The opening of a cart road through Devrukh to the Amba pass to the south-west will greatly benefit Sangameshwar. But till the Mala pass has been opened for carts the town will not recover its past importance.

At present the principal imports are Rice, tea, sugar, cloth, glassware, grocery, Mangalore tiles, cocoanuts, timber, salt etc. The exports are Myrabolams and bamboos.”

Statistics of Trade and Passengers.—*Vide* Appendix III.

Existing Facilities—(1) *Jetties.*—There are two jetties at Jaigad one belonging to the Landing and Wharfage Fee Fund and the other owned by the Bombay Steam Navigation Company. There are also jetties belonging to the Ports Fund at Dhamankhol, Jambhari, Mobar and Rai. There is a jetty at Fungus belonging to the Bombay Steam Navigation Company Ltd.

(2) *Navigational Aids.*—There are two lights the Jaigad outer and the inner. There is, besides, a bandar light near the Custom House.

(3) *Storm Signals.*—There is one storm signal mast at the Jaigad outer light.

Roads.—Except Makhjan and Sangameshwar sub-ports no other sub-ports are connected with main or branch roads. The sub-port of Makhjan is connected by a Local Board motor road about 7 miles long with the Ratnagiri-Chiplun trunk road. The Ratnagiri-Chiplun trunk road passes through the sub-port of Sangameshwar.

Forests.—The following description about forests appears in the Bombay Gazetteer :—

“Half way between Bankot and Rajapur, too far from Rajapur and with trade insufficient to attract the Arab ships the lands along the south bank of the Shastri river and its tributary the Bar were covered with fine forest, mostly teak, much of

it of a large size. About the beginning of the present century the district was richly wooded. This was mostly brush-wood, but on the slopes and spurs of the Sahyadris on the undulating red soil strip that runs midway between the Sahyadri Range and the sea and on the banks of many streams, rivers and estuaries there was abundance of ain, kinjal and teak of no great size but hard and lasting much valued for ship building. At this time the district was thinly peopled and except round the hill forts cultivation was scarcely possible. The Peshwa Bajirao and after the transfer of the district (1818) the British Government imported and settled labourers; tillage gradually spread, fire and the axe cleared large tracks of dense scrub and even of fine timber and areas nearly as large again were gradually laid bare to supply wood ashes to enrich the new fields. The Maratha Government always cared for its trees and forests. Though allowed to supply their own wants the people seem to have been prevented from selling or exporting timber. For some time the British Government maintained the old restriction but about 1829 the forest were for the most part placed at the disposal of the people. The land-holders it was thought would regard the forests as among their best resources, use them thriftily and husband them with care. But with almost all the grant was considered a charter for unlicensed, unlimited and unguarded wood cutting. The nearness, and the ease and cheapness of the sea carriage to Bombay tempted the people to busy themselves in felling, cutting and carrying timber. Untold quantities of Ratnagiri wood were, year after year, sent to Bombay. The forests on the south bank of the Shastri and Bav rivers had until the proclamation stood almost uninjured. After the proclamation the land-holders sold the standing timber as fast as they could find buyers and fleets were built of the largest native craft. The result is that for the present the Ratnagiri forests are almost destroyed."

At present along and in the area served by the Jaigad creek with its Sangameshwar and Makhjan branches there is no Government protected or private forests.

Income.—The average annual Income of the port under Ports Fund is Rs. 1,600 and that under Landing and Wharfage Fees Fund is Rs. 3,700.

General.—There are about 300 fishing vessels in this creek. The cargo steamer call at this port during the monsoons. There is a daily passenger steamer service in the fair season with launch service in the creek.

There is a Fish Curing Yard at Tavsal and a number of fishing boats which go out into the sea for fishing.

Shoals and sand bars in the creek and in the upper reaches of the creek.

Where situated.	Approximate distance from.	Whether of sand or rock.	Approximate length of the shoal.
<i>Dhamankhol-Jaigad Section.</i>			
(1) Sand bar off Kardi Band ..	Two miles seaward from Jaigad Custom House.	Sand ..	Half a mile.
(2) Sand bar opposite the Jaigad Custom House.	Half a mile from Jaigad Custom House.	Sand ..	$\frac{1}{2}$ mile long.
<i>Between Rai and Fungus Section of the Creek.</i>			
(3) Sand bar at Davkhol obstructs navigation at low tide.	$1\frac{1}{2}$ miles from Fungus.	Sand ..	50 feet long.
(4) Bar at Dingni village ..	$\frac{1}{2}$ mile from Fungus.	Shingle ..	40 feet long.

Where situated.	Approximate distance from	Whether of sand or rock.	Approximate length of the shoal.
<i>Rai to Makhjan Section of the Creek.</i>			
(5) At Tisang	1½ miles from Rai.	Mud and gravel.	½ furlong in length.
(6) At Karjune village called Kavdichapar.	2 miles from Rai.	Rocks ..	20 feet long.
(7) At Dhamapur village called Bagechapar.	2 miles from Makhjan.	Sand and mud.	One furlong in length.
(8) Nardave village	1 mile from Makhjan.	Do. ..	25 feet long.
(9) Near Makhjan called Nimbarichapar.	½ mile from Makhjan.	Do. ..	40 „ „
<i>Fungus to Sangameshwar Section.</i>			
(10) Near Ozarkhol village called Vakdapar.	3 miles from Sangameshwar.	Shingle ..	20 feet long.
(11) Bhelekarnicha par	2½ miles from Sangameshwar.	Do. ..	50 „ „
(12) Near Sangameshwar village called Bhothachapar.	1 mile from Sangameshwar.	Do. ..	½ furlong in length.

Tidal waters on the shoals.

Name of shoal.	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
<i>Dhamankhol-Jaigad Section.</i>						
(1) Sand bar off Kardi Bund ..	18'	3½'	12'	3½'	6'	4'
(2) Sand bar opposite the Jaigad Custom House.	7'	Bar exposed.	5½'	Exposed.	4'	Exposed.
<i>Between Rai and Fungus Section of the Creek.</i>						
(3) Sand bar at Davkhol village.	8'	2½'	6½'	3'	5'	3½'
(4) Bar at Dingni village ..	7'	1½'	5½'	2'	3'	2½'

Name of shoal.	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
<i>Rat and Makhjan Section of the Creek.</i>						
(5) At Tisang	8'	1½'	6'	2'	4'	2½'
(6) At Karjune village called Kavdichapar.	7½'	2'	5½'	2½'	4'	2½'
(7) At Dhamapur village called Bagechapar.	7½'	2'	6'	4½'	4½'	2½'
(8) Nardave village ..	6'	1½'	5½'	1½'	4½'	2'
(9) Near Makhjan called Nimbarichapar.	6½'	1'	5½'	1½'	4'	1½'
<i>Fungus to Sangameshwar Section.</i>						
(10) Near Ozarkhol village called Vakdapar.	7½'	2'	5½'	2½'	4'	2½'
(11) Bhelekarnicha par ..	7½'	2'	6½'	2½'	5'	2½'
(12) Near Sangameshwar village called Bhubhaticapar.	7'	Exposed.	5½'	Exposed.	3½'	Exposed.

RATNAGIRI.

History.—The port of Ratnagiri is situated at the mouth of the Ratnagiri or Rajivda creek, Lat. 17° N. and Long. 73° 19' E., and is the Headquarters of the Ratnagiri District.

Creeks and sub-ports.—The following description of the Ratnagiri Creek appears in the *Bombay Gazetteer*:—

“The Ratnagiri or Rajivda creek, with no special name and comparatively unimportant. Rising in the Amba paes it falls into the sea after a course of some 40 miles. The mouth of the river is very narrow and on the south side is guarded by a large sand-bank. Outside the entrance and to the north with a light-house at its extreme end lies the promontory on which stands the fort of Ratnagiri. As this bay gives safe anchorage for small craft during the north-west winds few vessels pass into the narrow creek. There are no important towns on its banks, but small craft work up on the tide 12 miles as far as Harcheri. Up to this point the influence of the tide is ordinarily felt.”

There are only two sub-ports in the creek, viz. Harcheri and Tondale. The former is a market place and is connected with Lanja by a Local Board road. The other sub-port is Kalbadevi creek to the north of Ratnagiri Bay. The monsoon sub-port of Mirya where cargo steamers call is situated at the mouth of the Kalbadevi creek and is connected by a good road with Ratnagiri town.

Navigable channels.—A jetty for landing passengers has been constructed in the Ratnagiri Bay. Vessels of any size can enter the Bay and anchor at the foot of the Light-house hill. The maximum tonnage of a vessel which can cross the entrance to the Rajivda and Kalbadevi creeks at high tide is 100 and 25 respectively. In the Rajivda creek at high tides vessels of the burthen of 10 to 15 tons can ply as far as Chinchkhari, a place 3 miles up the Rajivda bandar, and those of 1 to 2 tons burthen can ply from Chinchkhari to Harcheri which are about 9 miles apart. At low tide the entrance to

Rajivda creek is not passable. The Kalbadevi creek is navigable up to Sakhar by vessels of 9 to 10 tons at high tides only. At low tide only small tonies of 1 ton can ply up to Sakhar.

Shoals between Rajivda and Harcheri.

Where situated.	Approximate distance from Rajivda.	Whether of sand or rock.	Approximate length of the shoals.
1. Someshwar	4 miles	Sand ..	20 feet
2. Tembe	6 "	Do. ..	20 "
3. Kirachibag	7 "	Do. ..	25 "
4. Chinchpar	8 "	Do. ..	30 "
5. Tickapar	8½ "	Do. ..	15 "
6. Phanaspar	9 "	Do. ..	100 "

There are no shoals in the Kalbadevi creek.

Tidal waters on the above shoals.

Name of shoal.	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1. Someshwar	8'	2'	6'	1½'	4'	1'
2. Tembe	4½'	½'	3½'	½'	2½'	Nil.
3. Kirachibag	3½'	Nil.	2½'	Nil.	1½'	"
4. Chinchpar	2½'	"	1½'	"	½'	"
5. Tickapar	1½'	"	½'	"	½'	"
6. Phanaspar	1½'	"	½'	"	½'	"

Imports and exports.—Imports consist of rice, sugar, tea, petrol, kerosene, salt, stationery, hosiery, cotton piece-goods, iron and glass wares, brass and copper sheets, Mangalore tiles, teak and jungle wood and fuel.

Exports consist of groundnut seeds, jaggery, cotton piece-goods, myrabolams, turmeric, shembi barks, shikakai, soapnuts, honey-wax and cotton seeds.

Existing facilities.—(1) *Jetties.*—There is a passenger jetty at Ratnagiri.

(2) *Navigational aids.*—There is a light on the Ratnagiri Hill and a channel beacon light in the bay. There is also a bandar light near the Custom House.

(3) *Storm signals.*—There is a storm warning signal station at Ratnagiri.

Roads.—There is a trunk road from Ratnagiri to Kolhapur and to Chiplun and Rajapur via Lanja. The sub-port of Harcheri is connected by a Local Board road with the Ratnagiri-Lanja-Rajapur Road.

Forests.—There is no forest area on the banks of the Rajivda creek.

Income.—The average annual income of the port from Port Dues is Rs. 2,500 and that from Landing and Wharfage Fees is Rs. 9,000.

General.—There are about 3 to 4 hundred fishing crafts at Ratnagiri and a fish-curing yard at Rajivda. The cargo steamer calls at the sub-port of Mirya in the monsoon and ferry passenger steamers call at Ratnagiri during the fair season.

JAITAPUR.

History.—The port of Jaitapur is situated at the mouth of the Jaitapur or Rajapur creek, Lat. 16° 36' N. and Long. 73° 18' E. It is the outlet for the sea traffic from Rajapur. Mandelslo (1638) mentions Jaitapur under the name Suitapur as one of the best coast harbours, the island sheltering it from all winds. Ogilby (1670) calls it Jaitapur, one of the chief Konkan ports, and at the beginning of the 18th Century Hamilton (1700-1720) speaks of Rajapur harbour as one of the best in the world.

Creeks and sub-ports.—The Jaitapur creek rises in the Anaskura pass and after about 15 miles as a mountain stream reaches the ancient trading town of Rajapur where in years gone by the English and French had factories. Here it meets the tidal wave and after another 15 miles reaches the sea at Yeshwantgad.

The following are the sub-ports in the creek :—

Tulsunde, Ambulgad, Rumipir, Waghra, Jambali, Karel, Chavanvadi, Viliye, Dongre, Kaneri, Shede, Abhyanker, Gothane, Dewache Gothane, Goval, Vannala, Dhopeshtar and Rajapur.

Navigable channels.—The following description appears in the *Bombay Gazetteer* :—

“Yeshwantgar (Jaitapur) is a fair weather port and the creek is navigable to within 3 miles of Rajapur. The entrance under Yeshwantgar is narrow; but a mile or so further up, the river suddenly broadens into what at first sight seems a large land-locked salt lake, with an island in its centre, opposite Jaitapur. After passing this island the channel turns sharp to the south for two miles, where by a gradual curve it resumes its easterly direction. The Rajapur bay (Musakaji) as it is called affords shelter from the north-western winds, which blow during the fair season, but with westerly winds there is a heavy short swell in the bay which makes it a not very safe anchorage; at that time the north side of the bay should be resorted to. There are only seven or eight feet of water on the bar at low tide. But further in are depths from 18 to 24 feet abreast the large village of Jaitapur, inside on the left bank of the river.”

The sub-joined table shows the depth of water on this bar of Yeshwantgarh between Musakaji and Jaitapur :—

Depth.	Spring tide.	High tide.	Low tide.	Neap tide.
Full	9'	6'	4'	3'
Ebb	8'	5'	3'	2'

Vessels up to 30 tons can cross the bar at high tide and at low water vessels up to 15 tons can pass. Vessels above 50 tons can cross the bar only at spring tide, that is about 4 days in a month.

After crossing this shoal a channel a furlong wide, sufficiently deep for vessels of even 90 tons, runs by the northern bank of the creek up to a distance of 1½ mile opposite the Custom House at Jaitapur. At low tide the water at the place is 9 to 14 feet deep. The nature of the north bank is rocky and that of south sandy up to the fish-curing yard and thereafter mud. Transhipment of goods for Rajapur takes place in the channel in front of the Custom House. The creek as it flows further eastwards branches off into an estuary round the Jaitapur island and turns southwards and remains fairly straight up to Chavanvadi. The area round about the island is shallow with rocky shoals. The nature of the bed and banks is muddy. The depth of water from Rumipir up to Chavanvadi is 8 to 9 feet at high tide and 6 to 8 feet at low water. Padava of 15 tons and

launches can ply up to Chavanvadi even at low tide without any obstruction. The course of the creek from Chavanvadi onwards becomes serpentine with narrow bend and shoals at frequent intervals.

The sub-joined table gives particulars of shoals:—

Situation.	Distance.	From	Sandy or rocky.	Length of shoal.
Viliye	From Jaitapur.	9 miles.	Clayey mud ..	1 furlong.
Rai	From Rai ..	1 ,,	Do. ..	200 feet.
Goval	Opposite Rai ..	1 furlong.	Do. ..	100 ,,
Dongar	From Goval ..	2 miles.	Do. ..	200 ,,
Kumbharacha ..	From Dongar ..	1½ ,,	Do. ..	½ furlong.
Panhala	From Kumbharacha.	½ ,,	Do. ..	50 feet.
Sheda	Do. ..	1 furlong.	Do. ..	20 ,,
Abhyanker	Do. ..	2 furlongs.	Do. ..	75 ,,
Dhopeswar	Do. ..	4 ,,	Do. ..	50 ,,
Pimpalkhondi ..	....	....	....	....
Rajapur	From Kumbharacha.	2 miles.	Clayey mud ..	½ a mile.

The depth of tidal water on the above shoals:—

Name of shoal.	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1. Viliye	4'	3'	3'	2'	3'	2'
2. Rai	3'	2'	3'	2'	2'	1'
3. Goval	4'	3'	3'	2'	3'	2'
4. Dongar	3'	2'	3'	1'	2'	1'
5. Kumbharacha ..	3'	2'	2'	1'	1'	½'
6. Sheda	3'	2'	3'	2'	2'	1'
7. Panhala	2'	1'	1'	½'	1'	½'
8. Abhyanker	2'	1'	2'	1'	1'	1'
9. Dhopeswar	3'	2'	2'	1'	1'	½'
10. Pimpalkhondi ..	4'	3'	3'	2'	2'	1'
11. Rajapur	No water except in the channel about 1 foot.					

From Chavanvadi upwards only small boats up to 5 tons can go at high tide up to a distance of 3 miles from Rajapur town.

Imports and Exports.—The import and export of the port is chiefly to and from Rajapur. The following description of trade at Rajapur in olden days appears in the *Bombay Gazetteer* :—

“During the fair season active communication is kept up between Bombay, the Malabar coast and the Deccan. Every year a few Arab vessels from Zanzibar and the African coast bring fresh and dry dates to exchange for Molasses and other produce. The average yearly trade during the five years ending 1877–78 was Rs. 25,08,270 of which Rs. 12,25,590 represented exports and Rs. 12,82,690 imports. From Bombay piece-goods, metals, and miscellaneous commodities and from Malabar coconuts and betelnuts are imported for local use and for through carriage to the Deccan. From the Deccan to meet local wants and for export to Bombay come food grains, cotton, molasses, turmeric, chillies, tobacco, clarified butter, oil seeds and other products.” Very little local produce is exported. The trade is almost entirely a through traffic.

At present the imports and exports are of the following kinds :—

Imports.—Rice, grains, chillies, oil and kerosine oil, potatoes, onions, soaps, sugar, tea, cotton and woollen goods.

Exports.—Salted fish, forest produce, hemp, myrabolams, shembi and ain barks, dried rinds of Kokam, cashewnuts, mango pickles and sugar canes.

Statistics of trade.—A statement of trade and that of passengers travelled by the Bombay Steam Navigation Co.'s steamers is attached. (*Vide* Appendix III.)

Existing facilities.—(1) *Jetties.*—There is a wharf in front of the Custom House at Jaitapur and a jetty for passengers at some distance from the Custom House. There is a private wharf at Rajapur. There are District Local Board jetties at Rumpir, Devacha Gothane (known as Shivne) and Karel and small privately owned wharves at Goval Abhyanker.

(2) *Navigational Aids.*—There is a lighthouse at the mouth of the port and a bandar light near the Custom House.

(3) *Storm Signals.*—There is a storm signal station at Jaitapur.

Income.—The average annual income from Port Dues is Rs. 1,600 and that from Landing and Wharfage Fees is Rs. 3,000.

Forests.—See note on Jaigad. There are at present no protected or private forests on the banks of the creek.

Roads.—There are two roads one District Local Board running parallel to the creek from Musakaji to Rajapur and the other leading from Rajapur to Adivra. There is a cart road from Rajapur to the Ghats via Amba pass.

General.—There are about 200 fishing crafts in the Jaitapur creek and there is a fish curing yard. The fresh fish trade is confined to local consumption. Salted fish about 10,000 maunds is exported annually to Rajapur. There is a daily passenger steamer service at Musakaji in the fair season and a launch service in the creek.

VIJAYDURG.

History.—The port of Vijaydurg is situated at the mouth of the Vijaydurg creek or Vagotna river. Lat. 16°32' N and Long. 73°22' E 170 miles south of Bombay.

Creeks and Sub-Ports.—The Vijaydurg creek or Vagotna river rises in the Kajirda pass and flowing south-east for about 15 miles, receiving on its way the waters of several small streams reaches the tidal wave at or near Kharepatan. After this point its channel rapidly widens and passing the quay of Vagotna on its left bank reaches the sea at Vijaydurg, a bold headland on the south side of the estuary crowned by the ruins of an old fort. The mouth of the river is by the promontory of Vijaydurg completely sheltered from the south-west and being split into several bays and back water gives all the year round a splendid anchorage to craft of large size.

The following are the sub-ports :—

Waghapur, Pangera, Danda, Ansur, Vadap, Sagwe, Jambhari, Kutali, Ghodepoy, Ingawadi, Taral, Uple, Kunkun, Tirlot, Navanagar, Amberi, Waghotan, Mutat Manche, Dhalwel, Korle and Kharepatan.

Navigable channels.—This river has no bar. At its entrance between Vijaydurg fort and the high cliffs to the north-east on which there is an old Maratha battery there are depths of from 20 to 24 feet at low water. Inside it rapidly shoals, and 2½ cables

further in the depth at low water is only from 12 to 13 feet. After rounding Vijaydurg the channel turns south-east for 4 miles parallel to the line of coast and then passing a small island in mid-channel gradually curves to the east. At the bend of the river a large backwater runs south for 2 or 3 miles forming the peninsula or Gheria. The creek is navigable for vessels drawing 7 feet of water as far as the village of Vagotna where quays have been built and for smaller craft up to Kharepatan 20 miles inland.

Observations show that a new shoal is forming at the entrance of the Danda creeklet extending from Shirsi (Kolnichidhar) to Danda Pangera village. The following are particulars of the shoals in the creek :—

Where situated.	Approximate distance from	Whether of sand or rock.	Approximate length of the shoal.
Waghapur to the mouth of Danda creeklet.	2 miles opposite Vijaydurg creek.	Sand ..	1 furlong.
Uple	6 miles from Waghotna ..	Sand and mud ..	$\frac{1}{2}$ furlong.
Piracha Par	3 miles from Uple ..	Do. ..	100 feet.
Prindanvan	5 miles from Uple ..	Do. ..	50 ..
Kunkavne	3 miles from Kharepatan ..	Do. ..	50 ..

Tidal waters on the above shoals :—

Name of shoal.	High spring.		Mean Spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
Danda	6'	5'	4'	3'	2'	1'
Uple	3'	2'	2 $\frac{1}{2}$ '	1 $\frac{1}{2}$ '	2'	1'
Piracha Par	4'	3'	3'	2'	3'	2'
Prindanvan	5'	3'	4'	3'	3'	2'
Kunkavne	4'	3'	3'	2'	2'	1'

Details of islands formed by deposit of silt :—

Name.	Number of islands.	Condition.	Remarks..
Mutat	2 ..	One is cultivated and the other has been applied for cultivation.	Length varies from 50 to 200 yards and breadth from 50 to 100 yards and the shape is oblong.
Manche	2 ..	One is cultivated ..	.....
Uple	1 ..	Uncultivated ..	.....
Malpe	1 ..	Do. ..	.....
Korle	1 ..	Do. ..	.....

The above islands are overgrown with plantation. There are three more islands, viz. two at Waghota and one at Annapur but these do not appear to have been formed by the deposit of silt. These are all rocky and extensive in circumference ranging from half a mile to quarter of a mile. They abound in thick vegetation and plantation and are not cultivated.

Entrance.—The entrance to the Vijaydurg creek is remarkably clear of any obstructions right up to Waghota ten miles up the creek. It is a safe port for big steamers against south-west monsoon. Steamers therefore call here even in the monsoon. The channel is nearly two miles broad at its entrance between Vijaydurg Fort and the fortified cliffs to the north-east and has a depth of 20' to 24' at low tide. Inside near the steamer anchorage the deep channel is nearly 1½ mile broad lying close to the left bank of the western shore and except at high water and spring tides there is no room for large vessels to swing. The following is the result of sounding taken nearer the left bank of the shore towards the landing place in connection with the proposed construction of a boat jetty:—

Distance from the landing place on the western bank.	Low-tide.	High tide.
15'	2'-10"	10'-10"
20'	3'-4"	11'-4"
30'	3'-9"	11'-9"
50'	5'-6"	13'-6"
100'	6'-6"	14'-6"

Interior.—The creek shallows down from Kolnichidhar onwards. Unlike Rajapur creek the whole course starting from Tirlot to Korlai in dotted with Jivas (islands) numbering five in all which are formed by the accumulation of silt while the remaining two are rocky. Off Tirlot the creek branches into a channel leading up to Hurshi six miles away. The southern bank of the creek presents a luxuriant growth of mangrove bushes up to Mutat. The nature of the bank up to Waghota is mostly rocky though in some places in the vicinity of Khajan lands the soil is sticky earth. On the northern bank sandy soil mixed with a red earth is seen along the banks from Shirse bay up to Sagwe. Both the banks are fringed with Khajan lands as far as Mutat. The course of the creek is nearly straight with slight curves up to Waghota. The depth of water in this area is nearly 4' to 6' at low tide and 9' to 12' at high tide. From Waghota the formation of Juvas (islands) commences, the creek assuming tortuous curves. The channel grows narrower from Mancha onwards with a breadth of nearly 100 yards. The navigability of the creek is obstructed at every step throughout its ten miles lead from Mancha. Even at high tide navigators of vessels and launches have to be careful in avoiding shallower portion of the shoals. The silt is gravel of the type, which is met on river banks. At full high tides padavs of 12 tons and under can ply up to Kharepatan but passenger launches cannot proceed further than Kunkavne, 3 miles below Kharepatan. Only at spring tide, for 4 days in a month, launches call at Kharepatan. It is understood that owing to the Kharepatan river getting floods in the rains, gradual erosion of the southern bank of the creek at Kharepatan takes place every year. The river is being harnessed by bunds at various points along the upper reaches of the river and it is believed that this would tend to check the torrential flow of water at the junction. A project to bridge the river is also reported to be under contemplation so as to link the Bombay-Konkan-Goa road. This might have a far reaching consequence of checking the flow of water in the rains and preventing erosion and resultant siltation at the head of the creek. Kharepatan town is exposed to the visitation of abnormal floods so much so that when spring tide and floods coincide half of the town remains submerged under water, the rise of the water being nearly 100 feet.

In the creek vessels of 30 tons can go as far as Vaghota at high tide and up to Sagwe at low tide. Passenger launches also can go as far as Kunkavne at high tide and up to Vaghota at low tide. At mean high tide padavs up to 12 tons can ply as far as Uple

and thereafter at full tide only they can cross the shoals. At full tide the padavs reach Sakhli one mile from Kharepatan and at spring tide can touch the landing place at Kharepatan.

Imports and Exports.—There is very little trade at Vijaydurg proper. The chief trade centre is at Kharepatan at the head of the creek. The following description of trade at Kharepatan appears in the Bombay Gazetteers :—

“The trade of Kharepatan is chiefly in fish and salt. It has direct communication with the Deccan by the Phonda pass and is on the main line of road from Ratnagiri to Vengurla. A market held every Monday is attended during the fair season by about 1,000 persons and during the rainy months by from 200 to 300.”

“At the beginning of the sixteenth century (1514) Barbosa mentions Kharepatan, Arapatni, as a small place where Malabar vessels took on board cheap rice and vegetables. In the course of the same century it is mentioned as a place of trade and as a resort of pirates. In 1517 it was burnt by the Portuguese. In the seventeenth century Kharapatan is more than once mentioned as the best port on the Konkan coast. But these references belong to Vijaydurg rather than to Kharepatan. In 1819 it was described as one of the most suitable places for trade in the district. The largest boat could work up to it, and it was only about 15 miles from the Bavda pass. Still its trade was small. The exports were valued at Rs. 90,700 and the imports chiefly of salt, at Rs. 1,61,000.

At present the imports and exports are :—

Imports.—Rice, chillies, nagli, coriander seed, all kinds of grains and pulses, cocoanut and kerosine oil, potatoes, onions, Mangalore tiles and other miscellaneous provisions,

Exports.—Salted fish, forest produce such as bamboos and cudjans, hemp, myrabolams shembi and ain barks, dried rinds of cocum, cashewnuts, mango pickles, sugarcane.

Statistics of Trade.—Statistics of trade for the last four years are as follows :—

Year.	Value of Imports in Rupees.	Value of Exports in Rupees.
1933-34	11,94,958	2,24,815
1934-35	11,50,766	2,25,265
1935-36	10,81,406	1,74,866
1936-37	10,81,406	1,86,293

Figures for previous years will be found included in the Statistics attached to the note on Jaitapur.

Statistics of passenger traffic by the Bombay Steam Navigation Company's steamers are attached to the Note on Bankot. Those by the Ratnagar Steam Navigation Company are attached to the note on Jaitapur.

Existing Facilities.—(1) *Jetties.*—There is a wharf at the Custom House and landing steps for passengers in the Fort wall. At Sagwe there is a privately owned wharf. At Ingalwadi there is a District Local Board jetty. There are privately owned jetties at Ghodepai and Navanagar. There is a wharf at Mutat built by the villagers. The Bombay Steam Navigation Company, have provided small wooden landing places at Taral and Dhalwel. There is a large and massive wharf at Waghota looked after by the Public Works Department,

(2) *Navigational Aids.*—There is a “AGA” flash light erected on the fort wall and a Bandar light near the Custom House. There is one buoy outside the Ambulgar bay.

(3) *Storm Signals.*—There is no storm signalling mast at Vijaydurg.

Annual income.—The average annual income from port dues is Rs. 1,600 and that from Landing and Wharfage fees is Rs. 4,000.

Forests.—There are no protected or private forests on the banks of the creek.

Road.—There is a road from Vijaydurg to Kharepatan and another from Rajapur to Kharepatan. There is a cart road from Kharepatan to the Ghats via Phonda pass.

General.—Cargo steamers call at Vijaydurg during the monsoon and passenger steamers daily in the fair season. There are about 250 fishing vessels in Vijaydurg creek. There is a fish curing yard at Vijaydurg and salted fish about 5,000 maunds is exported annually to Kharepatan.

DEOGAD.

History.—The port of Deogad is situated at the mouth of the Deogad creek Lat. 16°·23' N and Long. 73°·21' E. It came into the possession of the British in 1819. It has no past history worth mentioning. The town lies on a flat rocky peninsula about 180 miles from Bombay.

Creeks and Sub-Ports.—The Deogad river rises in the Sivgad pass and after a comparatively straight course of about 35 miles from east to west reaches the sea at the fort of Deogad, which forms the southern headlands about 12 miles south of Vijaydurg. There are no towns of any importance on its banks.

The following are the sub-ports :—

Vada, Mond and Vanivda.

The harbour has been described as follows in the Bombay Gazetteer :—

“Its safe and beautiful land-looked harbour is at all times perfectly smooth. The cliffs, steep on the north, fall on the harbour side in steps with a slope varying from 25 to 40 degrees. The entrance is broad, but the passage into the harbour, only three cables wide lies close to the fort point. Here in 18 feet water ships may lie sheltered during the south-west monsoon, vessels up to 100 tons burthen can enter the port of Deogad.”

Navigable Channels.—The creek is navigable up to Kharada, a distance of about 16 miles for small boats and tonies at high tide only. Empty vessels up to 60 tons can navigate at high tide only up to Katta, a distance of 7 miles from the mouth of the creek. There is only one sand shoal about half a mile in length near the village of Malai about 3 miles from Deogad.

Tidal water on this shoal is as shown below :—

High Spring.		Mean spring.		Neap tide.	
Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
6'	Nil	2½'	Nil.	2'	Nil.

Imports and Exports.—The following description appears in the Bombay Gazetteer :—

“Deogad though a good port is inconveniently placed and has never had any but the most trifling local trade. For the five years ending 1877-78 the average yearly trade was valued at Rs. 2,46,114 of which Rs. 88,207 were exports and Rs. 1,57,907 imports. It has been joined by a good provincial cart road with the route over the Phonda pass. But the road has brought no traffic and is little used.”

At present the trade consists mainly of imports such as rice, grain, provisions, tiles, kerosine oil and salted fish from Bombay and other coast ports and of exports of hemp, myrabolams empties and mangoes

Statistics of Trade.—The following are the statistics of trade for the last eight years. Figures for previous years stand included in the statistics of Malvan Taluka attached to the note on Malvan.

Year.	Value of Imports (in Rupees.)	Value of Exports (in Rupees.)
1928-29	8,87,203	1,58,272
1929-30	7,76,535	1,23,058
1930-31	7,56,276	64,725
1931-32	6,81,005	64,117
1932-33	Not available.	Not available.
1933-34	7,22,874	86,861
1934-35	6,92,632	93,614
1935-36	7,18,176	1,03,471
1936-37	7,45,239	95,920

Existing Facilities—(1) *Jetties.*—There is a small landing jetty near the Custom House.

(2) *Navigational Aids.*—There is a lighthouse on the Deogad headland and a bandar light near the landing place at the Custom House.

(3) *Storm Signals.*—There is a storm warning signal station.

Annual Income.—The average annual income under Port dues is Rs. 700 and that under Landing and Wharfage Fees is Rs. 4,000.

Forests.—Nil.

Roads.—There is only one road called Deogad-Ponda road with branch roads leading to villages.

General.—There are about 600 fishing tonies in the Deogad creek. There is a fish curing yard at the mouth of the Mumbri creeklet 3 miles from Deogad. There is a daily passenger steamer service in the fair season.

ACHRA.

History.—Achra a small port is situated at the mouth of a small creek of the same name about 10 miles north of Malvan. It came into the possession of the British in 1819 and was not an important place.

Creek and Sub-Ports.—The Achra river rises in a spur of the Sahyadri Range near the Phonda pass and has a south-westerly course of rather less than 30 miles to the sea.

There are no sub-ports but goods are landed at Dongre, Adi, Karivne Par and Poirā all of which are within a distance of 3 miles from Achra.

Navigable Channels.—The entrance to the river is narrow and small craft can pass as far as Achra four miles from the mouth. At high tide loaded vessels up to 25 tons can cross the entrance and of 10 tons at low tide. In the creek at low tide even a small tony cannot navigate beyond Jamdul which is about half a mile from the entrance but at high

tide vessels of less than 8 tons can go up to Par which is 2½ miles from the mouth. The principal shoals in the creek are given below :—

Name of shoal.	Where situated.	Approximate distance from	Whether of sand or rock.	Approximate length of the shoal.
1 Achra Creek Nalla ..	At the mouth of the creek.	150 feet from Munge hill.	Rock ..	10 feet.
2 Nargadchi Keni ..	Adi village side .	¼ mile from Adi village.	Sand ..	150 ,,
3 Ambhyacha Par ..	Kariwana village side.	¼ mile from Adi village and south of Kariwana.	Do. ..	100 ,,
4 Veeracha Par ..	Par village side .	200 feet northward of Par.	Do. ..	75 ,,

Tidal water on the above shoals.

Name of shoal	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1 Achra creek Nalla ..	12'	4'	10'	6'	9'	7'
2 Nargadchi Keni ..	6'	Nil.	4½'	½'	3'	1'
3 Ambhyacha Par ..	5'	Nil.	4'	½'	3'	1'
4 Veeracha Par ..	3'	Nil.	2'	½'	1½'	½'

Imports and Exports.—Achra appears to have no trade of any importance. The imports consist of small quantities of rice and other provisions from Bombay and exports consist of salted fish, empties and small quantities of garden produce and mangoes.

Statistics of Trade, etc.—The value of imports and exports are shown below. Figures for previous years are included in the statistics for Malwan.

Year.	Value of Imports (in Rupees.)	Value of Exports (in Rupees.)
1929-30	2,12,106	21,730
1930-31	1,65,049	14,701
1931-32	1,25,101	9,639
1932-33	1,41,104	8,911
1933-34	1,11,461	7,507
1934-35	1,06,942	9,154
1935-36	1,14,407	8,476
1936-37	1,22,131	10,516

Existing Facilities—(1) *Jetties*.—There is a built up wharf at Jambol.

(2) *Navigation Aids*.—There is one bandar light.

(3) *Storm Signal*.—There is no storm warning signal.

Income.—The average annual income from Port dues is Rs. 100 and that from the Landing and Wharfage fees is Rs. 400.

Forests.—Nil.

Roads.—There is a Local Board road from Achra bandar to Kalavli which joins the Achra-Kankavli road with Achra village.

General.—There is a Fish Curing Yard at Achra. There are about 175 fishing tonies in the creek. Passenger steamer calls twice in a week in the fair season.

MALVAN.

History.—The port of Malvan is situated on a bay Lat. 16° 4' N. and Long. 73° 31' E. between the creeks of Kalavli on the north and of Karli on the south. The following history of the port appears in the Bombay Gazetteer—

“In a bay entirely blocked by rocky reefs, there were formerly three small islands two of them about a quarter of a mile from the shore and the third separated from the mainland by a narrow channel. On the larger of the two outer islands stands the famous Fort of Sindhudurg and on the smaller the ruined fort of Padmagad and now, at low tide connected with the mainland by neck of sand. On what once was the inner island and is now part of the mainland, lies, almost hid in palms, the old town of Malvan.”

Creeks and sub-ports.—Malvan itself is situated on a bay. Within the limits of the port there are two important creeks, the Kalavli or Sarjekot to the north and the Karli or Deobag to the south, both of which meet independently to the Arabian sea.

Sarjekot or Kalavli river.—The following description of this river appears in the Bombay Gazetteer:—

“The Kalavli rises in the Naradva pass near Bhairugad and for the first 24 miles forms the northern boundary of the Savantwadi State. At this point it receives the waters of a tributary stream, called the Gadnadi, and taking a south-westerly course, and passing in succession Ramgad on the right and Malund and Masura on the left, reaches the ocean after another 20 miles at a small bay, three miles north of Malvan. For the last 4 miles it flows due south, separated from the sea only by a narrow spit of land. During its course the Kalavli receives numerous small tributary streams. But the volume of water is comparatively slender, and the river, navigable for only 8 miles, has no important town on its banks. There are two chief ferries between Masura and Bhagwantgar, and between Revandi and Tondavli.”

Sub-ports.—Sarjekot, which is situated at the mouth of the creek is the sub-port of Malvan. The other important landing places in the creek are Tondavli Hadi, Kalavli, Masura, Bandivda and Maldli.

Karli or Deobag river.—The following description of this river appears in the Bombay Gazetteer:—

“The Karli river rises in the Sahyadri Hills, near Manohargad in the Savantwadi State, and after a winding course of about 30 miles passing Kudal on its left bank and engulfing numerous small tributaries reaches the Ratnagiri district and British territory at Talgaon. For the next 15 miles it forms the boundary between the Savantwadi State and Ratnagiri, then flowing west for 4 miles it turns sharp to the south, and following the line of the coast for 4 miles more, is to its mouth, eight miles south of Malvan, cut off from the sea only by a wall of sand hills less than a half a mile broad. Navigable for a few miles only it has no towns of importance on its banks.”

Sub-Ports.—Deobag (Mobar) which is situated at the mouth of the creek is the sub-port of Malvan. The other important landing places in the creek are Tarkari, Kalsevarad and Talgaon in the British territory and Kavathi, Walaval and Nerurpar in the Savantwadi State.

Navigable channels—(1) *Malvan Harbour*.—The following description of the Malvan Harbour appears in the Bombay Gazetteer:—

“The coast is very rocky and foul. Abreast the fort a large ship should not anchor in less than 8 fathoms. With a south-wind the landing is best in the little bay to the north of Malvan point and with a north-west wind in the Malvan Harbour.”

The condition of the bay has been described as follows in the West Coast of India Pilot:—

“*Malvan Bay.*—The entrance to Malvan bay is situated between Sindhudurg Janjira and Fort Rajkot, nearly half a mile apart, most of which space is encumbered with shoals. Small native vessels find a snug but limited anchorage in from 10 to 16 feet water northward and north eastward of Padangad Fort.”

At present coasting vessels of 100 tons can enter the port as also coasting steamers of light draught (about 1000 tons).

(2) *Kalashi Creek.*—Vessels of 60 to 70 tons can enter the creek at high tide and anchor opposite Sarjekot. From Sarjekot small vessels of not more than 10 tons can sail up to Masura at high tide. Only tonies up to 5 tons can sail further up Masura to Maldi, where practically navigation ends. At low tide no vessels except small tonies can navigate in this creek owing to the presence of shoals, which are described below:—

Name of shoal.	Where situated.	Nature.	Approximate length.
Talashil	1 mile from Sarjekot ..	Sand ..	Nearly $\frac{1}{2}$ mile.
Revandi	1 $\frac{1}{2}$ Do. ..	Rock ..	Do.
Hadi Jiva	5 Do. ..	Rock ..	About 2 to 3 furlongs.

N.B.—In addition to the above there is a massive stone groyne in the creek near Kalavali and several gravel bars between Masura and Maldi.

Tidal waters on the above shoals.

Name of shoal.	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
Talashil	3 $\frac{1}{2}$ '	Nil.	2 $\frac{1}{2}$ '	Nil.	1 $\frac{1}{2}$ '	1
Revandi	2'	Nil.	1'	Nil.	1'	Nil.
Hadi	3'	Nil.	2 $\frac{1}{2}$ '	Nil.	1 $\frac{1}{2}$ '	$\frac{1}{2}$ '

There are five islands in this creek and they have all been brought under cultivation.

Karli Creek.—Vessels up to 70 tons can enter the creek at high tide and anchor anywhere between Mobar and Tarkarli, a distance of 3 miles. Beyond Tarkarli village only boats of less than 10 tons can ply at high tide up to Nerur and Varad. At low tide only small tones of less than 5 tons can ply between Tarkavli and Varad.

Shoals between Mobar and Varad.

Where situated.	Approximate distance from	Whether of sand or rock.	Approximate length of the shoal.
Deobag	1 $\frac{1}{2}$ mile north of Mobar ..	Sand ..	About $\frac{1}{2}$ mile.
Deobag	East side of Deobag Fish Curing Yard.	Do. ..	About 3 furlongs.
Deobag	Near Deobag Ferry ..	Do. ..	About $\frac{1}{2}$ mile.
Amberi	5 miles from Mobar ..	Do. ..	About 3 furlongs.

Tidal waters on above shoals.

Name of shoal.	High spring.		Mean spring.		Neap tide.	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
1 Deobag	3'	Nil.	2½'	Nil.	2'	Nil.
2 Do.	3'	Nil.	2½'	Nil.	2'	Nil.
3 Do.	3'	Nil.	2½'	Nil.	2'	Nil.
4 Amberi	2½'	Nil.	2'	Nil.	2'	Nil.

In addition to the above there are some small shoals between Amberi and Nerurpar. Similarly there are six islands in the creek and all of them have been brought under cultivation.

Imports and Exports.—The following description under "Trade" appears in the Bombay Gazetteer:—

"Till the new road from Belgaum to Vengurla by the Parpoli pass was opened, Malvan was a place of considerable trade. Since then Vengurla has become the chief outlet for the produce of Belgaum and the neighbouring districts. A new road has lately been opened between Malvan and the Phonda pass, and a branch road made in 1877 as a famine relief work, joins it with the Parpoli pass at a point 12 miles east of Vengurla. As yet trade has shown no signs of recovering. Formerly the chief imports from the Deccan were food grains and pulses, cotton and Shahapur cloth, with in smaller quantities, molasses, tobacco, turmeric, chillies, oil nuts and myrabolams. To a small extent these goods, excepting cotton, are still received. The chief imports by sea are rice, piece goods, and fresh and dry dates. Formerly Malvan was a place of call for Arab vessels, who brought dates and umbrellas, and on return carried cotton, coconuts and food grains to Bombay. The only exports by land are salt, coconuts and coconut oil. By sea molasses, salt, tobacco, betelnuts and plaited palm leaves still go in small quantities to Bombay and other ports. The average yearly trade during the five years ending 1877-78, was valued at Rs. 6,76,950 of which Rs. 2,92,581 were exports and Rs. 3,84,369 imports.

At present the chief imports and exports are as follows:—

Malvan Port—Imports.—Rice, grains, tea, sugar, all provisions, potatoes, onion, cotton piece goods and kerosine oil and salted fish from Bombay and other Indian ports and cashewnuts from South Africa.

Exports.—Cashew kernels, coconuts, empties, cocam and coir manufactures, mangoes and miscellaneous garden produce.

Sarjekoṭ and Mobar (Sub-ports)—Imports.—Rice and all other kinds of food-stuffs, tiles, cement, etc.

Exports.—Sugarcanes, coconuts, earthen pots and brooms, etc.

Statistics of Trade.—Separate statement attached for trade. For Passenger statistics vide statement attached to Notes on Bankot and Jaitapur.

Existing Facilities—(1) Jetties.—There is a wharf for passengers at Malvan. There are no regular jetties in any of the two creeks.

(2) *Navigational Aids.*—There are in all 6 buoys and two gas buoys in the Malvan harbour. Besides there are two red lights on shore, one of which is a transit light. There is also a perch erected on the rock at the entrance of the harbour.

(3) *Storm Signals.*—There is a storm warning signal station at Malvan.

Income.—The average annual income of the port under Port dues is Rs. 2,200 and that under Landing and Wharfage fees is Rs. 5,400.

Forests.—Nil.

Roads.—Malvan is connected by good roads with Kolhapur and Belgaum (via Kasal, Kudal and Savantwadi). Besides there are feeder roads from Malvan to Masura in the

Kalavli creek, Malvan to Nerurpar (and further on to Savantwadi) in the Karli creek, Malvan to Sarjekot and Kalavli.

General.—There are fish curing yards at Malvan, Talashil, Mobar and Deobag. The number of fishing boats at Malvan proper and the two neighbouring creeks is about 3,000. Malvan has a large fishing industry and a large number of coasting vessels hail from Malvan. There are 3 cashew-nut Factories at Malvan.

There are a large number of country boats licensed to carry passengers in the Kalavli and Karli creeks.

There is a daily passenger steamer service in the fair season.

VENGURLA.

History.—The port of Vengurla is situated in Lat. 15° 15' N. and Long. 73° 41' E. 200 feet above the sea about a mile east of the mouth of a Swampy creek.

Creeks and Sub-Ports.—Vengurla is a main port having no sub-ports. There is a small creek about 6 to 7 furlongs between the Head-banqar and the old Custom House at Vengurla.

Navigable Channels.—Vengurla is the main port and large steamers and vessels call at the port, which is an open one. Small boats of 4 to 5 tons can ply in the creek between the Head-bandar and the Old Custom House at Vengurla at high tide only.

There are two sandy shoals in the creek at Vengurla. One is situated at a distance of three-fourth furlong from the head-bandar wharf and measures about 300 feet in length and the other which is situated at a distance of about 200 yards from shoal No. 1 and measures about 75 feet in length. There is about 3 to 4 feet of water at mean spring tide on these shoals. The first shoal completely dries up at mean spring ebb tide.

Imports and exports.—The following description of trade at Vengurla appears in the Bombay Gazetteer :—

“ Ever since the British conquest, Vengurla has been a rising place. It owed its importance in the first instance, to its nearness to the military cantonments of Belgaum and Dharwar, with which it was formerly joined by a road crossing the Sahyadris at the Ram pass. The people are vigorous, enterprising and energetic, and take much after the Bombay traders in their liberal and comprehensive views. The opening of the splendid cart road over the Parpoli pass and the erection of a lighthouse on the dangerous rocks outside of the port, have given a great impetus to Vengurla, which now among Konkan towns ranks next to, though far below, Bombay. Even in the fair season the port is at times most dangerous and in the south-west monsoon it is closed. In spite of this it monopolises the traffic with Belgaum and the neighbouring districts almost from Nipani to Gokak. The average yearly value of the trade for the five years ending 1877-78 amounted to Rs. 72,73,690 of which Rs. 30,33,086 were exports and Rs. 42,40,604 were imports. The chief articles that pass through the town from the Southern Maratha Country to Bombay are cotton, galmuts, molasses, hemp, grain, pulse, clarified butter, groundnuts, country cloth and in smaller quantities tobacco, turmeric, chillies, and spices. The local exports are cocoanuts, betelnuts, cashewnuts, oil of Kokam *Garcinia purpurea*, plaited palm leaves, coir fibre and salt. From Bombay come piece goods, metals, military stores, and miscellaneous foreign articles. As a rule no grain travels eastward. But during the famine 1877, within seven months no less than 52,000 tons of grain valued at Rs. 42,96,880 were received from Bombay and forwarded to the distressed districts.”

At present the imports and exports are :—

Imports.—Rice, sugar, iron manufactures, cashewnuts, coconut oil, kerosine oil, onions, cement, Mangalore tiles, grain and pulses, matches, stationery articles, motor and cycle accessories and fish manure.

Exports.—Groundnuts seed, cocum, brooms, tobacco chura, cashew kernels, harda, white sand, cotton seeds, tamarind, patravli, jaggery, jingelly oil, dry chillies, oil cake, and betel-nuts.

Statistics of trade etc.—Statement showing statistics of trade is attached. That for passengers is attached to the notes on Bankot and Jaitapur.

Existing facilities.—(1) *Jetties.*—There are two wharves. One at the Head-bandar and the other at the Old Custom House. The one at the head-bandar has got a crane.

(2) *Navigational Aids.*—There is a lighthouse on the hill at the head-bandar. Besides there are banqar lights at the head-bandar Custom House and the Old Custom House. There are three buoys in the open sea,

(3) *Storm Signals*.—There is a storm warning signal station at Vengurla.

Income.—The average annual income of the port from Port dues is about Rs. 2,700 and that from Landing and Wharfage Fees is Rs. 4,800.

Forests.—Nil.

Roads.—There is a good road from Vengurla to Belgaum via Savantwadi. There is a branch road from Vengurla to Shiroda in the south another from Vengurla to Kudal via Math and further to Malvan.

General.—There is a fish Curing Yard at Vengurla. There are about 600 fishing tenies at Vengurla and the surrounding coastal villages. There is a bi-weekly cargo steamer service at Vengurla during the fair season in addition to daily coasting passenger steamer service.

KARWAR AND SADASHIVGAD.

Karwar and Sadashivgad.—The port of Karwar is situated Lat. 14° 48' and Long. 74° 07' on the south portion of Karwar bay within Karwar head and includes Baikhal Cave. It is the head-quarters of the North Kanara District. The port of Sadashivgad is situated 2 miles north of Karwar at the mouth of the Kalinadi river.

Creeks and Sub-ports.—The Sadashivgad creek or Kalinadi river rises on the Goa Frontier and after a course of about 90 miles falls into the sea two miles north of Karwar. There are no sub-ports but goods are landed at Halge and Kadra.

Navigable channels.—The creek has a bar at the mouth and vessels up to 50 tons can enter the Sadashivgad harbour at high tide. In Karwar bay vessels of large size and cargo steamers can enter and lie safely. The Sadashivgad creek is navigable as far as Kadra, a distance of 18 miles on high tide by vessels of up to 10 tons. There are 5 jivas (islands) in the Sadashivgad river but they are very old and not inhabited.

Imports and exports.—The principal imports are grains, sugar, pulse, kerosine oil, cocoanut oil, Mangalore tiles, salt, matches, Burma rice, tea, etc.

The principal exports are timber, firewood, paddy, rice, laterite stones, sweet potatoes and bamboos etc.

There has been no transit trade by the creek-route between Upghat districts and Bombay.

Statistics of trade.—The value of imports at Karwar is about 5 lakhs per year and of exports about 1½ lakh.

The value of trade at Sadashivgad is as under :—

Year.	Imports.	Exports.
	Rs.	Rs.
1936-37	4,70,000	3,36,959
1937-38	1,98,295	1,63,393

(Vide Appendix III)

Existing Facilities—(1) *Jetties*.—There is a wharf and a screw pile pier at Karwar. There are Public Work Department jetties at Sadashivgad and Kodibag. There is also a screw pile pier at Kodibag, in front of the Custom House, which is in need of repairs.

(2) *Navigational Aids*.—There is a Central Government Light House on the Oyster Rocks off Karwar and another Light House at Koney in the port. There is a bandar light at each of the Karwar and Sadashivgad Customs Houses.

(3) *Storm Signals*.—There is a storm signalling station at Karwar.

Income.—The average annual income of each port is as under :—

Port Fund.	Karwar.		Sadashivgad.	
	L. & W. Fund.	Rs.	Port Fund.	L. & W. Fund.
Rs.	Rs.	Rs.		
3,000	300	2,000	Nil.	

Roads.—There is a good trunk road from Karwar to the Ghats. There are vehicular roads on both sides of the river. (1) Starting from Sadashivgad wharf 5 furlongs to the north and then running parallel as far as Kadra and further to Londa and (2) starting from Kodibag wharf to the east as far as Siddar, a distance of 10 miles from Kodibag *via* Sezwad and Kadwad.

Forests.—In the Sadashivgad creek the approximate Government forest area is about 120 square miles and private forest area is about 18 square miles.

General.—There is a bi-weekly cargo *cum* passenger steamer service to Karwar in the fair season.

TADRI.

History.—The port of Tadri is situated Lat. 14° 31' Long. 74° 21' at the mouth of the Aghanashini river.

Creeks and Sub-Ports.—The Donihalla or Tadri river rises near Sirsi and after a winding westerly course of about 45 miles falls into the sea about 6 miles south of the Gangavli river.

The principal sub-ports are Uppinpattan, Divgi and Manaki.

Navigational Channels.—The creek is navigable at high tide as far as Uppinpattan—18 miles from Tadri—for vessels up to 30 tons. Large vessels can enter at high tide and anchor at Tadri. There are 6 shoals in all up to Uppinpattan. The principal shoal is near Kodkani.

The following extracts have been taken from the Bombay Gazetteer :—

“ For the remaining 15 miles during which it is navigable to craft of 4 to 9 tons (16-36 khandia) the river is known either as the Tadri or as the Aghanashini river from two towns on the right and left banks of its mouth. From Uppinpattan it winds S. W. and then N. W. together about 8 miles to Mirjan, an old seat of trade. From Mirjan it forms a lagoon or back-water, which runs parallel to the coast about 8 miles long and one to three miles broad cut off from the sea by a belt of land with a nearly uniform breadth of about a mile. The outlet to the sea is about 3 miles from the north and of the lagoon. It is between two hills one 300 and the other 400 feet high, and has a depth of about 17 feet at high tide. Inside there is as much as 25 feet of water so near the shore that vessels of 20 tons can be laden from the bank. Unfortunately the entrance is narrow, nearly blocked by a rocky reef, and not to be attempted during the S. W. monsoon.

Imports and Exports.—Mirjan was formerly a great pepper trade centre.

The present imports and exports are :—

Imports.—Rice, hardware, iron goods, kerosine oil, cocoanut oil, Mangalore tiles, and sundries.

Exports.—Salt (from Sanikatta works near Tadri), rice, chillies, ragi, betelnuts, pepper, cardamoms and sandalwood.

Most of the goods are for or from Up-Ghat places like Sirsi and Siddapur.

Statistics of Trade.—*Vide* Appendix III.

Existing Facilities.—(1) *Jetties.*—There is a jetty at Tadri, one at Halkar and one at Uppinpattan.

(2) *Navigational Aids.*—There is a Light House at Tadri and a bandar light near the jetty.

(3) *Storm Signals.*—There is a storm signal station at Tadri.

Annual Income.—The average annual income from Port dues is Rs. 900 and that from Landing and Wharfage Fees is Rs. 50.

Roads.—The principal market places, viz., Tadri, Sanikatta, Uppinpattan, Divgi and Manaki are linked up by roads with the surrounding villages and these market places are themselves linked by motorable roads.

Forests.—There are small forest areas on the banks of the creek between Divgi and Uppinpattan.

General.—There is a bi-weekly cargo *cum* passenger steamer service at Tadri in the fair season.

KUMTA.

History.—The port of Kumta is situated Lat. 14° 25' Long. 74° 23' at the mouth of the Kumta creek. It was formerly a prosperous trade centre. Even at present Kumta is an important town in the Kanara District.

Creek and sub-ports.—Kumta creek is a small stream less than 5 miles in length. There is no sub-port.

Navigable channel.—The following description appears in the Bombay Gazetteer :—

“The small stream on which Kumta stands, though navigable only at high tide carries the whole trade of the port to vessels that anchor in the sea about half a mile off its mouth. The bar is dangerous and can be crossed only by flat-bottomed boats and light craft. The mouth is silted and boats of less than 5 tons can enter up to the wharf near the Custom House on high tide only. Above the Custom House there is a causeway joining Kumta-Honavar road and navigation above the causeway is impossible.”

Imports and exports—Imports.—Food grains, cement, hardware and general merchandise from Bombay and Karachi and oil from Malabar ports.

Exports.—Betelnuts, pepper, cardamoms, chillies and forests produce.

Statistics of trade.

Year.	Value of	Value of
	Imports.	Exports.
	Rs.	Rs.
1928-29	19,991	51,513
1929-30	14,416	52,545
1930-31	23,682	49,195
1931-32	18,966	26,768
1932-33	17,072	27,539
1933-34	23,940	24,833
1934-35	21,657	22,663
1935-36	15,924	31,212
1936-37	14,140	30,986

The trade is local as well as with Uṛghat areas like Sirsi, Siddapur and Yellapur Talukas.

Existing facilities.—(1) There is a wharf at Kumta opposite to the Custom House inside the creek.

(2) *Navigational Aids.*—There is a Light House at Kumta.

(3) *Storm Signal.*—There is a storm signal station at Kumta.

Annual income.—The average annual income under Port dues is Rs. 400 and that under Landing and Wharfage Fees is Rs. 125.

Roads.—Kumta is connected by road with the Ghats and the coast.

Forests.—There is no forest on the banks of the Kumta creek.

General.—There is a bi-weekly cargo cum steamer service at Kumta in the fair season.

HONAVAR.

History.—The port of Honavar is situated at the mouth of the Sharavati river in the north Kanara District, Lat. 14° 16' Long. 74° 29'.

Dr. E. F. Buchanan, M.D., writes of the port in 1807 as follows :—

“The lake is of great extent and like that at Kundapur contains many islands some of which are cultivated.

Lake of Honavar.—It reaches almost to the Ghats and in the dry season is quite salt, but it receives many streams which during the rainy monsoon become torrents and render the whole fresh. By the natives it is commonly called a river but lake is a more proper term. The lake abounds with fish but many more are taken in the sea and when salted forms a considerable article of Commerce with the inland country.”

Dr. W. W. Hunter, C.I.E., writes about 1882 in the Imperial Gazetteer of India as follows :—

“Honavar has long possessed a coasting trade of importance; and the trade has grown largely of recent years. Visitors to the celebrated falls of Gersappa halt at Honavar to procure boats to take them up the river 18 miles to the village of Gersappa. From Gersappa the journey to the falls, 18 miles, is made by road. The town itself lies about 2 miles from the coast at the mouth of the Gersappa river which with a dangerous bar and an entrance channel about 300 feet broad expands into a lake 5 miles long and 1 to 2 miles broad. In the lake are 5 islands, the largest 3 miles long, covered with palm trees. A ship may anchor in the road with the flagstaff of Honavar bearing East by North about 1½ miles from the shore in 5 to 6 fathoms soft ground.”

Sharavati river.—The following description of Sharavati river appears in the Bombay Gazetteer published in 1883 :—

“The Baraganga, Shiravati or Gersappa river after a northerly course of about 40 miles from Bednor in Mysore forms the south-east boundary of Kanara for about eight miles and then passes about 20 miles west or about 70 miles in all to the sea at Honavar. Soon after touching the border of Kanara, the Baraganga in four different bodies of water among magnificent forests and wild granite cliffs dashes over the west face of the Sahayadris, a height of 825 feet into a pool 350 deep. About 18 miles west it reaches the ruined capital of Gersappa. During the remaining 17 miles to the coast the river flows between richly wooded banks fringed with mangrove bushes, a broad tidal estuary, brackish in the dry weather but during the rains sweet even close to its mouth. About five miles from its mouth it widens to a lagoon about two miles broad containing a few islands, the largest being Mavin Kurve which is more than three miles long with a large area of rice land and studded with cocoa-palm and mango trees. For about a mile from the mouth the river has a breadth of about three-quarters of a mile. At the mouth it again narrows into a channel about 300 yards broad, outside which lies a formidable bar.”

Creeks and sub-ports.—The total length of the main creek (tidal) is about 18 miles. The following are the tributary creeks :—

Name of Creek.	Whether navigable and if so for how many miles.
1 Badgani	9 miles.
2 Gundbale	10 miles.

There are sub-ports as follows :—

(1) Upponi, (2) Herangadi, (3) Allasek, (4) Gersappa, (5) Nagari, (6) Kudrig, (7) Sansi, (8) Kodani, (9) Angad, (10) Heggur, (11) Balkoor, (12) Idgunji, (13) Kabin Hakkal, (14) Beranki and (15) Bingod.

Navigable Channels.—The bar at the mouth of the creek is very old. Of the dangers of the Honavar bar, Mr. Forbes wrote in 1775 that the tremendous surf made it extremely difficult to send merchandise to Honavar. Mr. Forbes never was in much danger as in attempting a passage over the surf. A little before he was at Honavar, a young member of the Civil Service was upset in a ship's boat with great loss of life. In 1859 Mr. Eastwick wrote :—A spit of sand across the mouth of the creek causes a surf at all times and in rough weather makes the entrance impassable. Even in the calmest season at spring tide there is much danger. During the Ebb the water runs with great violence and being hemmed in by the sand rises in huge billows. A breath of winds whitens the sea with

foam. The water shoals many feet in an hour and in so rough a sea if a vessel strikes it immediately falls to pieces. The port is an open one and affords no shelter to vessels. The bar has been the scene of many accidents in the past owing to its shifting nature and the shallow entrance. Usually there is about 4 feet of water on the bar at dead low tide and loaded vessels up to 50 tons can therefore enter only on high tide. Vessels up to 9 tons can ply between Honavar and Gersappa at high tide and below one ton at low tide. There has been no appreciable change in the course of the river channels during the last 30 years. The cargo steamer anchors outside the bar. The following are the particulars of the existing shoals in the creek.

Shoals between Honavar and Gersappa.

Where situated.	Approximate distance from Honavar.	Whether of sand or rock.	Approximate length of the sea.
Between Kelsinmothe and Malkar.	3 miles ..	Sand ..	180 feet.
Between Hosar and Idgunji ..	6 ,, ..	Do. ..	150 ,,
Between Upponi Kurve and Upponi.	12 ,, ..	Sand and gravel.	150 ,,
Between Haigand and Kodani ..	9 ,, ..	Do. ..	60 ,,
Between Ulligandi and Nagre ..	16 ,, ..	Stones ..	150 ,,
Gersappa	18 ,, ..	Do. ..	120 ,,

Tidal waters on shoals.

Name of shoal.	High spring		Mean spring		Neap tide	
	Full.	Ebb.	Full.	Ebb.	Full.	Ebb.
Malkode	6'	1'	4'	2'	3'	1'
Idgunji	6'	1'	4'	2'	3'	1½'
Kodani	5'	1'	3'	1½'	3'	1'
Upponi	6'	1'	4'	2'	3'	2'
Nagre	4'	1'	2'	1½'	3'	1'
Gersappa	5'	1'	2½'	1½'	3'	½'

Imports and Exports.—In the nineteenth century, the opening of the two main roads joining the ports of Kumta and Karwar with Belgaum and Dharwar the change from small fair-weather coasting craft to large steamships plying all the year round, and the introduction of the telegraph at Kumta and Karwar, greatly developed the trade of Kanara. Between 1850 and 1870 at Kumta and Karwar the through cotton trade with Belgaum and Dharwar greatly increased, but since 1870 it has again fallen.

In the Administration Report of the Salt Department for 1873-74 the following description of imports and exports in the Honavar Taluka, viz. Kumta, Murdeshwar, Honavar, Bhatkal and Shirali appears :—

Imports.

Principal articles.—Grain, coffee, fruits, piece goods, yarn, metal, specie, spices, sugar, catechu and oil.

Places from which imported.—Konkan, Bombay, Goa and Malabar.

Exports.

(1) *Local Produce.*—Catechu, cocoanuts, rope and honey.

(2) *Imports from other places.*—Piece goods, sandal, grain, metal and fruit.

(3) *Places from which goods were imported for exports.*—Malabar, Bombay and Konkan.

At present the imports consist of grains, salt, coconut oil, Kerosine oil, soap, sugar, matches, hardware, cement, Mangalore tiles, oil cakes, tobacco, cotton seed, tea and coffee. C. P. goods and the exports consist of fuel, timber, cashewnuts, betelnuts, groundnuts, onions, salted fish, palm Chakkaa and leaves, rice, chillies, jaggery and coir-yarn. The chief market place in the creek is Gersappa.

Statistics of Trade.—Vide Appendix III.

Existing Facilities—(1) *Jetties.*—There is a wharf at Honavar.

(2) *Navigational Aids.*—There is a Maat Head Light in the Hospital compound. There is a buoy placed at a distance of about a furlong from the ferry wharf and located above submerged rocks in the Honavar creeks.

(3) *Storm Signals.*—There is a storm signal station at Honavar.

Roads.—There is a road from Honavar (Kasarkode side) to Bhatkal and to Mysore State territory. There is also a road to Kumta with a feeder road to Gersappa.

Forests.—The following description appears on pages 57 and 58, Bombay Gazetteer :—

The Honavar and Bhatkal forests most of which are unsurveyed are bounded on the north by Kumta ; on the east by Mysore and Siddapur ; on the south by South Kanara and on the west by Sharavati sea. The forests and waste lands of their 136 villages are estimated to cover on approximately area of 300 square miles. Wood-ash tillage was once general and Bhatkal has destroyed nearly all the forests. It has for some years been greatly restricted. Honavar has forests of both the leading varieties, leaf shedding forests to the south of the Sharavati and evergreen forests to the north. The minor products of the Honavar and Bhatkal forests are Catechu or Kat, Cinamon or dalehini, wild nutmeg or Jajikai, wild pepper honey, the vegetable ivory or bajerbetta, the seeds of the corytsha Umbrecatifera and a few myrabolams and soap-nuts.

Income.—The average annual income of the port under Port dues is Rs. 1,080 and that under Landing and wharfage fees is Rs. 20.

General.—Formerly there was a bi-weekly Cargo and passenger steam service to Honavar. It has been made a weekly service since 1935. The approximate number of fishing vessels at Honavar is 400. There is a Fish Curing Yard at Kasarkode.

Bhatkal.

History.—The port of Bhatkal is situated at the southern end of the Presidency Lat. 13° 58' N and Long. 74° 32' E and has a small river called Sherabi, running from the interior of the town and navigable up to about 3 miles. It appears from the early history of Bhatkal in the Bombay Gazetteer that it was a prosperous port in the sixteenth to

eighteenth centuries. In 1508 Portuguese ships are mentioned as going for cloves to Batecala. In 1550 Sidi Ali Kopadhan notices that there was trade between Bhatkuli and Arabia. About 1580 Vincent De Blank describes Bhatkal as a fine place still of great trade. In 1678 the Portuguese were allowed to build a factory. About 1720 Hamilton describes Bhatkal as the near seaport south of Honavar with the ruins of a large city four miles from the sea. In 1758 the French Scholar Anquetil Du Perron notices it as Batekol a port built on a rock with a river. In 1801 Buchanan describes Batakalla as standing on the bank of a small river, the Sankadiholi, which watered a beautiful hill-gird Valley. It was a large open town with 500 houses, many wealthy Mussalman families lived there and traded to different parts of the coast.

Creeks and Sub-Ports.—The Bhatkal river rises in the Sahyadris and with a westerly course of 12 miles passes the town of Bhatkal about 3 miles from its mouth. There are no tributary creeks or sub-ports.

Navigable Channels.—The entrance to the port is narrow and shallow. When the entrance was inspected by the Assistant Collector of Salt Revenue of Kanara at Ebb-tide on 26th September 1937 it was less than 100 feet wide. There is a sand bar and a number of sunken rocks at the entrance. At the high tide the water at the entrance is about 5 feet and vessels of only small draught can enter. The maximum tonnage of a vessel which can enter the port laden is $\frac{1}{2}$ to 2 tons and empty is 5 to 10 tons.

Imports and Exports.—It appears from the description given in about 1514 by the Portuguese traveller, Duarte Barbosa that many ships gathered from Ormuz to load very good white rice, sugar in powder of which there was much, much iron, and some spices and drugs of which myrabolams are chief. Formerly many horses and pearls came to Bhatkala, they now went to Goa. In spite of the Portuguese some ships went to Aden. The Malabars brought coconuts, sugar, oil, and wine and some drugs. They took rice, sugar, and iron. There was sale of copper which was used as money and made into caldrons and other pans and much sale of quick-silver, vermilion, coral, alum and ivory. The present imports are:—Food grains, Mangalore tiles, coconut oil, oil cake, cotton seed, cutlery, hardware, matches, soaps, tea, coffee, and sugar, and the exports are salt, dry fish, mangoes, betelnuts, cashewnuts and rice.

Statistics of Trade.—Vide Appendix III.

Existing Facilities.—(1) *Jetties.*—There is a jetty on the northern bank.

(2) *Navigational Aids.*—There is a Lighthouse at Bhatkal on the summit of the hill north of the port and west of the Custom House. The light is nearly 120 feet above the sea level. There is also one buoy in the sea nearby a mile distant from the hill and in water 40 feet deep. The buoy is laid in September and removed in May every year.

(3) *Storm Signal.*—There is a storm warning signal station at Bhatkal.

Roads.—There is a road from Bhatkal to Honavar and Bhatkal to Mysore Territory (Sagar).

Forests.—Reference is requested to the description in the note on Honavar.

Income.—The average annual income of the port under Ports Dues is Rs. 150 and under Landing and Wharfage fees is Rs. 100.

General.—There is a bi-weekly cargo and passenger steamer service at Bhatkal in the fair season.

APPENDIX III

APPENDIX

STATEMENT SHOWING VALUE OF IMPORT AND EXPORT TRADE

Statement showing the value (in thousands) of Import and Export

Year.	Dhollera.		Broach.		Surat.	
	1		2		3	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1873-74 ..	13,54	68,53	14,61	12,68	8,86	15,82
1874-75 ..	15,59	77,72	12,75	14,98	8,17	20,77
1875-76 ..	17,01	48,46	10,99	16,07	11,12	17,15
1876-77 ..	16,66	39,45	14,34	19,07	9,17	37,07
1877-78 ..	17,45	39,03	15,07	41,42	14,98	25,10
1878-79 ..	15,64	18,55	16,50	19,44	14,66	19,61
1879-80 ..	14,99	17,71	19,91	58,58	14,09	47,98
1880-81 ..	11,37	29,95	15,51	44,99	11,61	40,89
1881-82 ..	13,94	28,76	16,04	33,26	10,55	27,24
1882-83 ..	14,59	22,19	18,52	66,24	10,17	36,38
1883-84 ..	13,24	25,20	21,17	23,54	14,67	18,05
1884-85 ..	11,83	19,51	18,93	14,99	12,74	13,69
1885-86 ..	10,26	6,49	24,52	17,38	18,20	15,11
1886-87 ..	7,12	14,60	19,64	17,96	16,28	16,51
1887-88 ..	9,14	18,07	23,60	22,97	17,41	20,08
1888-89 ..	14,09	25,16	22,37	18,90	22,61	32,25
1889-90 ..	12,75	19,25	16,48	16,02	19,47	24,57
1890-91 ..	11,10	23,13	23,93	19,48	20,85	35,31
1891-92 ..	10,10	19,58	24,01	30,23	21,11	31,18
1892-93 ..	8,60	19,42	21,83	25,60	18,41	27,79
1893-94 ..	8,91	23,28	21,92	20,08	25,85	17,90
1894-95 ..	9,35	13,17	26,01	18,37	17,93	16,68
1895-96 ..	7,81	11,47	24,99	24,02	20,69	23,89
1896-97 ..	8,98	12,40	24,25	18,91	19,17	17,24
1897-98 ..	1,91	9,68	23,22	20,41	13,04	10,71

iii.

NUMBER OF VESSELS AND NUMBER OF STEAMER PASSENGERS.

trade at the various ports during the undermentioned years.

Bulsar. 4		Revdanda. 5		Bankot. 6	
Import.	Export.	Import.	Export.	Import.	Export.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
4,16	15,28	4,89	9,25	5,16	6,25
4,97	20,05	5,78	8,68	6,32	9,18
4,92	17,60	5,19	7,28	7,91	7,24
7,56	23,01	5,93	8,26	8,28	7,16
8,96	18,59	6,34	8,46	6,79	9,35
8,71	16,61	6,88	9,64	4,47	8,05
5,30	15,80	5,63	7,89	7,94	8,92
2,22	6,19	5,02	5,56	7,86	5,05
2,64	6,70	5,38	7,03	7,48	6,00
3,51	7,10	6,04	6,32	7,70	6,05
4,08	7,37	6,17	6,61	8,57	5,55
4,48	8,25	5,92	6,37	8,06	5,27
3,38	8,25	7,47	9,01	8,69	5,61
4,04	7,80	6,70	8,45	8,36	5,35
3,90	7,36	6,93	9,26	8,96	5,57
3,90	7,33	6,11	7,94	8,57	6,52
3,59	7,86	6,29	8,53	8,79	6,98
4,36	8,82	7,06	9,73	9,29	7,45
4,24	8,76	7,52	9,85	9,74	7,78
4,96	11,44	7,28	9,13	9,16	6,87
5,76	10,73	6,63	7,22	10,15	6,56
5,14	9,88	6,44	6,92	10,33	4,77
5,50	10,96	7,45	9,06	10,16	5,94
4,79	7,88	6,40	6,86	9,84	5,93
3,23	7,27	4,96	6,53	11,83	5,48

Year.	Dabhol.		Ratnagiri.		Jaitapur.	
	7		8		9	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1873-74	22,54	29,45	7,53	129,87	13,79	12,32
1874-75	20,76	38,66	7,37	7,03	10,65	14,05
1875-76	26,41	48,35	8,01	5,11	11,51	18,45
1876-77	37,65	41,13	10,04	4,07	18,58	13,57
1877-78	33,38	26,21	10,37	4,43	17,19	11,15
1878-79	26,38	41,87	9,43	3,76	11,07	13,96
1879-80	23,43	53,67	8,79	3,74	9,95	14,87
1880-81	30,28	46,60	9,64	3,91	12,76	12,48
1881-82	31,66	36,32	8,54	3,52	11,42	13,87
1882-83	33,53	32,32	8,81	3,25	11,46	10,69
1883-84	40,84	62,67	9,74	4,45	11,79	15,05
1884-85	39,27	50,02	10,19	5,07	12,75	14,94
1885-86	39,08	51,28	12,19	5,82	13,51	17,64
1886-87	30,25	41,83	11,02	5,83	13,07	16,38
1887-88	27,24	43,27	13,68	8,72	13,42	15,23
1888-89	23,18	42,12	12,49	8,39	13,94	15,87
1889-90	22,79	38,63	13,44	9,74	12,43	16,53
1890-91	19,88	28,37	11,97	8,32	12,74	16,32
1891-92	19,81	29,38	11,51	7,93	13,76	17,97
1892-93	18,01	30,96	12,45	10,29	14,56	19,03
1893-94	20,18	28,95	14,20	11,12	15,76	20,51
1894-95	20,75	34,86	14,86	11,18	17,63	21,60
1895-96	17,07	26,49	13,21	9,39	15,31	15,70
1896-97	15,85	17,33	14,76	5,48	15,31	12,71
1897-98	16,88	14,71	15,05	4,70	14,72	12,70
1898-99	16,94	17,24	13,40	5,71	13,43	10,39
1899-00	20,17	17,29	16,21	4,66	16,77	9,24

III—contd.

Malvan. 10		Vengurla. 11		Karwar. 12	
Import.	Export.	Import.	Export.	Import.	Export.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
3,88	3,90	31,36	23,97	22,25	39,93
3,24	4,68	30,52	31,10	19,82	45,41
4,02	3,71	31,07	34,27	33,54	67,51
8,62	4,97	57,37	29,38	31,98	41,85
4,61	3,42	58,01	17,93	28,36	11,18
5,01	4,20	35,97	35,11	24,57	47,68
5,61	4,51	34,12	39,31	16,06	23,11
6,01	4,15	30,05	41,29	19,00	27,73
4,39	3,76	30,27	37,13	19,46	32,96
5,06	3,96	36,83	42,28	23,04	36,08
6,60	5,09	35,84	53,94	24,40	41,38
5,61	4,25	31,72	46,37	17,33	32,72
5,84	4,20	31,56	30,39	5,26	13,46
7,09	4,73	29,76	30,05	4,73	14,35
7,32	3,58	31,86	43,26	3,70	14,23
6,79	3,82	25,76	36,25	2,73	6,28
6,83	3,83	23,04	31,94	2,82	2,34
5,98	3,77	18,30	26,84	2,75	3,40
6,22	4,64	18,97	19,69	2,85	3,14
6,56	3,94	18,22	18,09	3,28	3,91
7,84	4,65	19,17	18,74	3,77	4,22
8,46	5,64	19,17	17,60	3,48	3,43
8,12	5,37	18,84	17,00	3,40	4,19
8,25	5,32	18,92	14,31	2,90	4,04
10,31	6,26	20,73	16,09	3,72	3,24
10,08	6,13	16,64	13,94	4,07	3,42
12,72	7,19	20,77	15,57	4,57	3,65

Year.	Sannikatta.		Honavar.		Jaigad.		
	13		14		15		
	Import.	Export.	Import.	Export.	Import.	Export.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1873-74	..	1,14	1,18	44,17	80,98	..	..
1874-75	..	85	1,48	30,05	49,45	..	..
1875-76	..	68	1,69	29,99	50,71	..	..
1876-77	..	1,22	2,31	32,48	48,51	..	..
1877-78	..	1,61	1,67	34,98	35,99	..	..
1878-79	..	1,13	1,58	38,41	70,86	..	..
1879-80	..	79	1,49	32,44	66,70	..	..
1880-81	..	96	1,70	24,96	69,68	..	..
1881-82	..	1,47	1,32	28,43	68,87	..	..
1882-83	..	1,59	1,06	30,44	63,40	..	..
1883-84	..	1,29	1,31	32,54	77,02	..	..
1884-85	..	1,33	1,91	27,37	63,43	..	..
1885-86	..	1,28	2,04	33,16	62,51	..	..
1886-87	..	1,08	3,05	24,85	53,57	..	..
1887-88	..	1,99	2,84	23,83	49,45	..	..
1888-89	..	1,37	2,69	23,52	43,61	..	..
1889-90	..	1,76	3,41	22,26	35,66	..	..
1890-91	..	1,79	2,06	20,31	27,30	..	..
1891-92	..	1,79	2,37	15,54	27,02	..	..
1892-93	..	1,47	3,23	12,95	27,74	..	..
1893-94	..	1,84	3,33	13,07	23,32	..	..
1894-95	..	2,37	3,42	14,78	26,82	..	..
1895-96	..	2,61	3,01	13,77	26,33	..	..
1896-97	..	2,15	3,38	10,20	17,51	..	..
1897-98	..	2,62	3,63	14,80	22,79	..	..
1898-99	..	2,69	3,92	13,34	24,84	..	..

APPENDIX

Year.	Dhollera.		Broach.		Saraj.	
	1		2		3	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1898-99 ..	6,72	9,94	19,25	18,27	15,94	14,50
1899-00 ..	10,14	3,82	27,84	11,42	14,80	9,90
1900-01 ..	5,62	93	..	..	..	..
1901-02 ..	5,63	4,01	21,44	10,19	20,64	10,47
1902-03 ..	5,51	2,29	21,36	9,74	20,42	9,85
1903-04 ..	6,47	12,76	18,77	12,98	17,76	12,15
1904-05 ..	8,05	8,44	25,20	12,90	17,18	12,82
1905-06 ..	7,92	5,75	31,98	12,99	20,28	14,52
1906-07 ..	5,90	6,19	23,84	9,23	18,60	7,64
1907-08 ..	7,80	3,39	32,23	14,12	18,23	8,41
1908-09 ..	6,86	4,98	29,72	21,85	18,74	9,81
1909-10 ..	6,54	7,21	30,88	28,05	20,10	10,55
1910-11 ..	5,91	5,59	42,78	15,63	21,06	14,70
1911-12 ..	5,07	2,53	40,92	17,76	18,61	11,65
1912-13 ..	5,10	1,54	33,13	13,33	19,84	6,24
1913-14 ..	4,81	5,31	35,66	16,06	18,26	10,78
1914-15 ..	5,56	5,44	26,58	11,17	14,21	9,46
1915-16 ..	7,21	3,80	22,17	10,38	12,66	6,94
1916-17 ..	4,70	66	24,81	10,44	14,48	8,44
1917-18 ..	5,01	8,13	32,50	12,29	9,21	5,40
1918-19 ..	4,64	56	25,70	19,91	10,10	10,98
1919-20 ..	4,43	9	23,16	8,17	12,49	6,60
1920-21 ..	2,88	2,31	20,23	10,46	13,30	6,56
1921-22 ..	2,61	2,89	20,22	12,64	19,72	8,08
1922-23 ..	2,50	3,27	33,87	28,49	15,34	10,76
1923-24 ..	1,90	70	33,50	18,24	15,70	9,27
1924-25 ..	2,15	59	35,39	17,05	17,01	5,32

III—contd.

Bulsar.		Revdanda.		Bankot.	
4		5		6	
Import.	Export.	Import.	Export.	Import.	Export.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
3,69	8,32	5,74	6,99	11,27	7,23
5,33	6,54	5,06	6,88	11,91	5,76
....	....	....	....	12,61	5,38
4,78	4,62	6,17	7,36	10,73	6,10
4,42	4,83	6,39	7,44	10,89	6,42
4,42	7,50	6,61	6,27	11,90	7,22
4,47	8,00	7,21	7,24	12,79	3,68
5,16	7,60	7,41	9,49	11,89	5,25
4,33	6,45	7,60	8,37	11,93	5,41
5,82	7,48	8,94	11,34	13,71	8,52
4,14	8,74	8,71	12,10	10,98	8,62
7,01	12,46	11,22	13,33	14,02	9,49
7,55	14,47	8,84	10,92	13,61	7,21
8,57	13,22	9,63	12,62	15,14	7,54
8,50	14,64	9,76	12,92	16,02	9,21
8,96	16,24	10,47	14,73	17,04	10,94
7,08	14,66	9,94	11,38	18,20	10,34
3,81	7,82	10,23	13,13	18,34	9,36
3,88	11,32	10,37	10,43	20,46	7,51
5,43	13,11	10,31	12,69	20,35	7,25
9,62	13,21	10,90	7,75	25,68	6,58
10,01	17,37	18,27	19,69	36,75	11,99
7,37	18,63	19,68	12,03	28,47	11,89
8,58	17,99	21,61	15,31	35,98	11,95
7,91	11,59	19,42	16,61	33,80	11,85
7,10	11,55	18,96	15,10	29,97	10,88
6,96	11,48	32,54	16,01	31,13	13,02

Year	Dabhol.		Ratnagiri.		Jaitapur.	
	7		8		9	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1900-01	19,97	10,98	17,02	4,42	15,76	8,62
1901-02	16,11	11,10	14,82	5,09	13,42	7,17
1902-03	16,54	13,27	15,31	5,84	13,23	8,27
1903-04	17,57	17,25	17,32	6,75	12,30	7,07
1904-05	18,65	11,79	17,32	4,85	12,93	6,05
1905-06	16,76	10,19	18,36	4,50	15,10	6,86
1906-07	14,65	9,92	17,94	4,88	14,25	5,94
1907-08	15,99	8,62	20,41	4,60	16,45	5,79
1908-09	14,84	11,01	18,10	3,97	14,13	5,36
1909-10	17,77	12,82	19,33	4,33	13,64	5,90
1910-11	19,42	10,92	21,80	3,69	14,74	5,16
1911-12	19,71	9,29	23,81	4,74	16,13	6,99
1912-13	20,31	10,11	25,05	4,00	16,20	5,32
1913-14	20,11	10,77	24,71	5,02	15,18	5,73
1914-15	21,64	8,52	26,08	4,66	18,61	5,88
1915-16	20,29	8,77	26,80	3,06	17,50	5,87
1916-17	25,02	9,52	30,18	3,78	20,85	6,66
1917-18	25,39	9,74	29,08	4,94	21,44	6,12
1918-19	31,17	12,05	42,39	5,24	26,72	6,45
1919-20	41,53	8,30	48,82	9,11	34,15	9,94
1920-21	33,78	8,62	47,74	4,64	33,56	7,54
1921-22	39,59	9,89	45,05	3,36	36,77	6,89
1922-23	37,19	8,07	43,39	3,74	31,47	7,33
1923-24	39,12	8,75	45,31	4,43	32,36	7,86
1924-25	34,28	7,40	40,89	4,94	30,35	8,07
1925-26	31,06	7,52	37,28	5,28	26,31	7,18
1926-27	30,35	5,64	39,95	3,95	30,47	7,21

III—contd.

Malvan.		Vengurla.		Karwar.	
10		11		12	
Import.	Export.	Import.	Export.	Import.	Export.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
12,36	8,60	18,63	12,44	4,00	3,52
9,56	6,46	18,67	13,21	4,43	4,47
10,53	7,07	24,37	12,96	3,54	2,31
11,19	6,51	19,34	14,55	4,26	2,59
12,42	7,74	19,61	13,70	4,61	3,24
14,06	6,26	21,81	15,61	5,42	4,59
12,47	6,83	17,77	11,22	4,52	3,97
14,99	8,10	19,83	12,53	5,01	3,13
15,19	7,59	17,52	12,35	5,86	3,36
15,59	8,52	20,43	15,08	5,66	3,80
16,56	8,65	22,51	16,75	7,30	4,23
18,87	11,32	20,63	19,34	6,02	4,92
20,06	11,48	22,79	22,29	7,58	4,86
21,10	14,00	22,05	20,26	7,90	6,09
20,77	10,52	20,38	14,23	7,57	5,35
23,16	10,10	21,21	14,24	7,75	4,47
26,98	11,93	22,56	15,40	8,72	4,77
27,79	9,38	26,39	15,99	8,43	6,30
35,25	11,04	29,62	17,94	10,23	6,58
44,18	15,04	50,29	24,65	14,73	9,01
35,57	12,76	39,01	22,56	14,99	6,05
31,31	11,84	37,45	21,04	14,92	7,77
32,59	10,50	32,64	16,17	12,82	5,68
34,96	11,87	32,98	16,47	14,64	7,04
36,14	11,93	35,99	18,62	13,00	5,87
36,20	14,23	30,24	15,35	12,05	6,88
35,85	11,99	33,12	16,40	14,25	8,04

	Sannikatta.		Honavar.		Jaigad.	
	13		14		15	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1899-1900 ..	3,29	3,62	18,21	28,48	..	..
1900-01 ..	3,67	3,78	17,68	28,57	..	..
1901-02 ..	3,14	4,60	14,28	28,06	..	..
1902-03 ..	3,52	4,34	14,77	29,70	..	..
1903-04 ..	3,86	5,64	17,46	32,86	..	..
1904-05 ..	3,72	4,57	16,80	36,00	..	..
1905-06 ..	4,29	4,75	18,10	34,12	..	..
1906-07 ..	3,23	3,95	16,36	35,18	..	..
1907-08 ..	3,72	4,42	14,90	30,96	..	..
1908-09 ..	3,75	4,29	13,31	26,37	..	..
1909-10 ..	3,76	10,63	15,83	24,47	..	..
1910-11 ..	4,31	12,45	13,93	20,58	..	..
1911-12 ..	4,86	13,77	13,43	24,69	..	..
1912-13 ..	5,05	16,14	15,38	23,91	..	..
1913-14 ..	5,04	14,83	15,74	25,12	..	..
1914-15 ..	3,93	11,28	16,90	21,03	..	..
1915-16 ..	4,43	4,89	14,60	30,78	..	..
1916-17 ..	4,27	6,47	13,30	29,05	..	..
1917-18 ..	5,64	6,45	13,48	33,05	..	..
1918-19 ..	5,58	5,15	18,19	23,20	..	..
1919-20 ..	6,40	5,22	37,48	36,26	..	..
1920-21 ..	5,48	6,24	22,77	32,20	..	..
1921-22 ..	11,82	16,08	21,93	32,95	..	..
1922-23 ..	8,16	20,19	22,90	26,07	..	..
1923-24 ..	13,98	35,81	12,62	4,41	..	..
1924-25 ..	12,83	27,92	22,41	23,39	..	..

APPENDIX

Year.	Dhollera.		Broach.		Surat.	
	1		2		3	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1925-26 ..	2,32	42	39,39	17,15	18,58	8,04
1926-27 ..	2,33	51	22,08	11,10	14,93	6,59
1927-28 ..	2,58	2,30	28,48	19,60	14,46	10,58
1928-29 ..	2,34	1,72	34,66	20,23	11,14	8,78
1929-30 ..	3,00	1,57	35,46	22,14	18,81	9,34
1930-31 ..	1,98	1,36	23,37	26,96	14,75	4,61
1931-32 ..	89	2,13	32,78	76,31	9,63	4,56
1932-33 ..	1,55	2,75	36,25	115,33	22,71	8,92
1933-34 ..	1,20	2,37	41,32	73,35	27,50	93,93
1934-35 ..	79	1,91	48,51	20,98	40,38	11,69
1935-36 ..	2,03	2,50	49,42	32,18	41,41	12,22
1936-37 ..	1,93	4,02	39,06	48,71	29,73	10,79

II—contd.

Bulsar.		Revdanda.		Bankot.	
4		5		6	
Import.	Export.	Import.	Export.	Import.	Export.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
7,23	12,49	65,82	19,92	29,85	16,74
6,85	10,12	51,26	19,75	29,36	14,48
5,49	10,34	19,36	17,48	29,14	14,93
6,78	11,82	18,38	22,27	26,53	14,35
5,85	7,94	16,91	18,41	27,83	11,50
5,47	5,97	15,40	14,96	23,75	8,88
5,74	7,64	14,42	10,47	24,63	6,76
9,02	8,45	13,79	7,96	26,20	6,39
8,24	7,75	13,45	8,03	21,94	4,97
9,96	7,34	11,77	7,78	23,97	4,67
10,09	8,63	12,23	11,16	21,68	6,85
11,71	7,96	12,43	10,89	22,00	6,41

APPENDIX

Year	Dabhol.		Ratnagiri.		Jaitapur.	
	7		8		9	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1927-28 ..	31,47	6,31	39,98	4,74	28,51	6,67
1928-29 ..	29,78	5,26	36,49	5,09	25,67	6,63
1929-30 ..	29,38	4,63	39,11	3,70	27,24	4,72
1930-31 ..	27,53	3,89	34,55	3,05	20,52	3,81
1931-32 ..	25,53	3,41	32,37	7,06	17,97	3,29
1932-33 ..	26,82	3,59	38,86	3,49	23,48	3,58
1933-34 ..	26,16	3,09	35,01	3,24	21,47	3,49
1934-35 ..	26,49	3,55	38,87	8,40	21,76	3,94
1935-36 ..	28,37	6,54	40,84	13,53	21,19	3,06
1936-37 ..	28,73	10,98	43,52	18,72	22,25	3,15

III—contd.

Malvan. 10		Vengurla. 11		Karwar. 12	
Import.	Export.	Import.	Export.	Import.	Export.
Ra.	Ra.	Ra.	Ra.	Ra.	Ra.
35,79	13,39	27,77	14,87	13,04	7,13
30,95	13,75	24,05	15,88	11,55	6,78
34,52	15,28	32,94	19,59	13,15	8,79
31,99	13,73	23,31	15,42	12,35	7,17
29,47	14,95	22,80	13,96	11,07	7,14
37,33	11,95	21,87	11,78	11,79	6,99
33,32	5,92	20,36	9,18	11,07	5,42
31,94	6,00	20,37	11,25	11,20	6,24
30,40	5,40	17,86	11,03	9,78	5,87
31,65	6,10	20,50	10,78	10,00	6,07

APPENDIX

	Sannikatta.		Honavar.		Jaigad.	
	13		14		15	
	Import.	Export.	Import.	Export.	Import.	Export.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1925-26 ..	8,64	22,10	22,59	29,85	..	..
1926-27 ..	9,08	18,59	24,50	28,34	..	..
1927-28 ..	10,69	17,94	24,03	32,51	..	..
1928-29 ..	11,56	17,80	26,46	36,43	..	..
1929-30 ..	14,60	13,57	23,52	35,06	..	..
1930-31 ..	8,75	11,61	19,24	25,59	..	..
1931-32 ..	8,16	11,81	18,65	18,19	..	..
1932-33 ..	10,71	14,79	18,76	15,97	..	..
1933-34 ..	8,17	11,58	15,43	13,14	12,31	67
1934-35 ..	9,92	13,49	17,70	10,98	11,88	64
1935-36 ..	8,25	12,97	16,96	12,48	12,10	68
1936-37 ..	9,23	11,02	16,84	11,53	11,67	60

III—contd.

Vijaydurg.		Bhatkal.		18		19	
16		17		18		19	
Import.	Export.	Import.	Export.	Import.	Export.	Import.	Export.
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
..
..
..	..	6,01	14	..	..	..	..
..	..	6,61	14	..	..	..	..
..	..	5,88	14	..	..	..	..
..	..	4,81	14	..	..	..	..
..	..	4,66	14	..	..	..	..
..	..	4,70	14	..	..	..	..
11,95	2,25	3,86	14	..	..	..	..
11,51	2,25	4,43	7	..	..	..	..
10,81	1,75	4,24	17	..	..	..	..
10,81	1,86	4,21	17	..	..	..	..

Statement showing the average value (in lakhs) of trade per annum at coast ports based

Name of Port.	Value of annual trade based on quinquennium ending 1877-78.		Value of annual trade based on quinquennium ending 1894-95.		Difference between two quinquenniums.		Value of annual trade based on quinquennium ending 1912-13.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Dhollera ..	16	55	9	20	- 7	-35	6	4
Broach ..	14	21	24	23	+10	+ 2	35	19
Surat ..	10	23	21	25	+11	+ 2	20	11
Bulsar ..	6	19	5	10	- 1	- 9	8	14
Bevdanda ..	6	8	7	9	+ 1	+ 1	10	13
Bankot ..	7	8	10	7	+ 3	- 1	14	8
Dabhol ..	28	37	20	31	- 8	- 6	18	11
Estnagiri ..	9	5	13	9	+ 4	+ 4	21	4
Jaitapur ..	14	14	15	19	+ 1	+ 5	15	6
Malvan ..	5	4	7	5	+ 2	+ 1	17	10
Vengurla ..	42	27	19	20	-23	- 7	21	17
Karwar ..	27	41	3	4	-24	-37	6	6
Honavar ..	34	55	17	28	-17	-27	14	24

on value in four quinquenniums during the period from 1873-74 to 1936-37.

Difference between two quinquenniums.		Value of annual trade based on quinquennium ending 1936-37.		Difference between two quinquenniums.		Whether increase or decrease in total trade.
Imports.	Exports.	Imports.	Exports.	Imports.	Exports.	
Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
- 3	-16	2	3	- 4	- 1	Decrease.
+11	- 4	43	34	+ 8	+16	Increase.
- 1	-14	32	12	+12	- 1	Do.
+ 3	+ 4	10	8	+ 2	- 6	Decrease.
+ 3	+ 4	13	9	+ 3	- 4	Increase.
+ 4	+ 1	23	6	+ 9	- 2	Do.
- 2	-13	27	6	+ 9	- 5	Decrease.
+ 8	- 5	39	9	+13	+ 5	Increase.
..	-13	22	3	+ 7	- 3	Decrease.
+10	+ 5	33	7	+16	- 3	Increase.
+ 2	- 3	20	11	+ 1	- 6	Decrease.
+ 3	....	11	6	+ 5	+ 2	Do.
- 3	- 4	17	13	+ 3	-11	Includes the important ports of Kumta and Bhatkal.

Statement showing the number of vessels

Name of Port.	1929-1930.		1930-1931.		1931-1932.		1932-
	No. of Vessels.	Total tonnage.	No. of Vessels.	Total tonnage.	No. of Vessels.	Total tonnage.	No. of Vessels.
Dhollera	137
Broach
Surat
Bulsar	1,200
Revdanda	1,208	21,662	1,009	17,013	1,050	17,069	1,043
Bankot	858	12,952	852
Dabhol	988	19,882	1,083
Jalgaod	760 *50	11,776 *25,984	967 *47
Ratnagiri	662	9,920	669	11,450	1,030	13,860	1,116
Jaitapur	522	13,184	531	12,327	579
Vijaydurg	712	13,067	790	14,217	810
Deogad	410	8,897	418	7,904	450
Achra	125
Malvan	1,218	28,533	1,238	28,443	1,430
Vengurla
Karwar	275 *137
Sadashivgad	648
Belekerie	217	8,416	229
Gangavl	92
Ankola	170
Tadri
Kumta	146 *137
Honavar	556 *60	12,041 *27,884	576 *61	11,810 *27,049	475 *60
Shirali
Bhatkal	194	74,153	208	79,107	206

arrived and their tonnage.

1933.	1933-1934.		1934-1935.		1935-1936.		1936-1937.	
	Total tonnage.	No. of Vessels.	Total tonnage.	No. of Vessels.	Total tonnage.	No. of Vessels.	Total tonnage.	No. of Vessels.
3,231	121	3,283	122	3,066	151	3,486	193	4,507
..	..	..	1,211	35,268	1,317	40,027	1,460	*283 39,966
..	..	..	..	..	1,164	24,332	1,089	23,256
15,000	1,210	15,000	1,203	15,000	1,230	15,000	1,279	15,500
15,229	1,093	16,565	1,193	17,642	1,352	22,115	1,241	21,309
14,617	927	12,995	952	12,490	898	11,301	914	12,135
22,222	1,125	23,602	1,270	22,819	1,149	22,417	1,077	22,160
12,728	823	13,886	766	12,633	781	12,485	741	12,075
*26,577	*42	*21,689	*35	*18,431	*50	*26,329	*50	*29,302
15,656	1,060	16,230	1,050	16,582	1,137	18,704	1,100	18,700
12,661	652	17,475	666	14,951	463	9,885	574	13,471
14,248	757	14,300	786	15,142	737	14,613	684	11,858
8,840	441	8,911	442	8,704	446	8,361	398	8,488
1,847	106	1,820	90	1,233	92	1,374	92	1,816
30,354	1,190	27,632	1,028	21,608	1,243	24,719	956	20,399
..	..	..	645	16,969	727	19,847	734	17,643
..	..	..	*146	*86,916	*140	*80,265	*159	1,07,574
7,970	276	5,806	256	2,863	223	3,432	148	2,666
*78,370	*136	*80,332	*137	*81,969	*141	*81,414	*147	1,04,927
17,459	734	19,019	735	19,779	851	22,050	763	18,510
8,265	204	6,462	182	6,122	248	8,671	440	12,317
2,516	96	2,260	85	1,765	152	3,540	86	2,194
2,274	161	2,466	167	2,501	174	2,575	158	2,503
..	546	11,518	514	11,584	529	11,482	564	11,384
..	*74	*50,702	*77	*43,897	70	*35,596	*78	*50,660
2,619	146	2,485	149	3,138	143	2,768	201	3,461
*78,202	*128	*75,717	*139	*82,922	*136	*78,481	*137	*95,084
9,837	*680	13,428	685	14,197	623	12,365	715	13,811
*31,775	*39	*33,088	*61	*34,759	*37	*18,688	*33	*20,770
..	..	..	..	..	160	2,013	108	1,394
81,263	72	1,839	88	3,485	106	2,052	96	2,359
..	*130	*77,241	*139	*83,068	*133	*76,320	*138	*96,645

* Denotes number of cargo steamers and their tonnage.

Statement of annual passenger traffic to and from the following

Name of Ports.	1931-1932.		1932-1933.		1933
	Inward	Outward.	Inward	Outward.	Inward.
Hareshwar	11,952	17,289½	9,633	10,623½	8,173½
Dabhol	31,556½	73,111	21,378½	47,426½	23,101½
Jaigad	10,144	36,473½	9,598½	34,106½	9,424
Ratnagiri	48,719	48,085	49,985½	53,677	42,716
Jaitapur	6,500	16,874	5,808½	15,765½	5,870½
Vijaydurg	22,196½	28,470½	22,191	32,165	20,377½
Deogad	26,663½	24,551½	25,872½	26,973	22,994
Malvan	33,911	33,746	35,900	36,950	32,492
Vengurla	31,821	32,597	32,355½	34,912	29,615
Karwar	2,921	3,179	2,912½	3,092½	3,029½
Tadri	565½	357½	559½	353½	582½
Kumta	1,095½	1,175	1,192	1,115	977½
Honavar	399½	309½	290½	322½	389
Bhatkal	787	791	823	901½	871

ports for the last six years (1931 to 1937) September to May.

1934.	1934-1935.		1935-1936.			1936-1937.	
	Outward.	Inward.	Outward.	Inward.	Outward.	Inward.	Outward.
10,553½	4,804½	4,752½	2,407½	2,010½	Closed.	....
49,620½	20,607½	38,670	19,714½	39,876	21,815½	34,684	
35,850	10,264	35,196½	9,849	35,087	10,505	30,348	
48,351	51,064½	54,860	51,213	57,266	67,004	66,896	
16,660½	6,126	15,142	7,133	16,042	13,994	25,092	
29,230	20,335	30,538	18,634	28,597	23,280	30,237	
23,891	24,108½	26,649	24,201	27,424	32,650	31,427	
33,043	33,170	34,726	29,561	32,359	40,792	40,029	
31,036	30,719	33863	27,211	30,572	36,552	36,657	
3,227½	2,885½	3,272	2,838	2,919½	2,945	2,900½	
410	471½	241½	315½	285	523½	242½	
899	1,113½	1,106½	1,031	1,150	1,080	1,320	
303½	341½	281	328½	47	319	8	
747½	890	811½	953½	740½	957	935½	

162

APPENDIX IV.

Cost incurred in connection with the work of the Ports Committee, Bombay.

(Not printed.)

APPENDIX V.

Note explaining the abbreviations and signs used in the rough maps of ports and creeks.

(Not printed.)