INTERIM REPORT

ON

PORT DEVELOPMENT OF ETHIOPIA

ASSAB AND MASSAWA

January 1973

OVERSEAS TECHNICAL COOPERATION AGENCY

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I. SUMMARY AND CONCLUSIONS

(1) Introductions

The present Japanese Survey Team for Port Projects has been dispatched in compliance with the request of the Imperial Ethiopian Government for preparing a master plan for the Ethiopian Ports, Assab & Masswa. Objects of the survey are accordingly to prepare a long-range master plan covering 15-20 years for the Ethiopian Ports and to estimate construction scales for each stage of development programme and to point out necessary improvements related to the plan with advice and recommendation. Methodology we employed for the present survey is as follows.

(i) By macroscopic analysis, export and import as the national total are estimated throughout the planning period.

(ii) Sectoral studies on the major exporting commodities are made and adjusted by the results of macroscopic analysis.

(iii) Then the estimated volumes of export and import are allocated to the hinterland of each port.

(iv) Capacity of the existing port facilities is estimated through the analysis of port statistics. In this approach, theory of waiting lines is utilized.

(v) Needs of additional capacities are calculated from the results of previous analysis.

Forcast of furture expansion plan has been made on the basis of figures and data thus prepared mainly taking into consideration natural conditions for suitable sites of the new ports.

Needless to mention, there need various further detailed works before a standard master plan shall be drawn up; the second and third survey must be conducted in continuation. However, we must state that we could have achieved to frame out a concept of a required masterplan within this limited time thanks to the kind and thoughtful assistance to and co-operation with us first of all extended by the Marine Department and other concerned Governmental agencies and institutions.

This report is and remain at any risk a mere interim one and presents a summary of our survey and conclusion and recomendations at this stage. Many changes shall be necessarily made by the future studies and investigations.

(2) Conclusion

(2)-1 Future roles of three major ports

With the progress of improvement programmes of ports and of inland transport systems, the hinterland of these ports will be changed in the future.

Djibouti may govern the area of Harar including Dire Dawa, Assab shall govern Addis Ababa and adjacent regions, while Massawa governs the north-western parts of Ethiopia. Anyhow the changes in cargo movement will be readjusted. It is expected that growth rate of cargoes to and from Ethiopia at Assab and Massawa will be higher than that of Djibouti; on the other hand Djibouti will develop itself as a free port in handling transit cargoes, we assume. Under these circumstances expansion plan of both ports, Assab and Massawa, should be aimed at import and export in Ethiopia.

(2)-2 Volumes of cargoes to be handled

With the progress of national economy, volume of cargoes at these ports will increase. It is estimated that the total volume of cargoes at the end of the Fourth Five Year Plan, 1979, reaches 1,858,000 t and at the end of 10th year, 1984, 2,534,000 t, and at the end of 20th year, 1994, 4,493,000 t respectively. These figures, under consideration of progress of development programes and improvement in transport systems in hinterland, can be broken down as follows. (1,000 T)

	1979	1984	1994
Assab	982	1,431	2,667
Massawa	568	756	1,362

(2)-3 Need for construction of Additional public berths

Present capacity of existing public berths is estimated at 350 - 400,000 t per annum at Assab and 300 - 350,000 t per annum at Massawa. From the above estimation of cargo increase, numbers of additional public berth at the end of the Fourth Five Year Plan, in 1979 will be 4-5 at Assab and 1-2 at Massawa. By the end of 10th year in 1984 further 3-4 berths at Assab and 2 berths at Massawa must be constructed. By the end of 20 years plan, in 1944, additional 13-17 berths at Assab, namely 18-23 berths in total including existing 6 berths will be required, while at Massawa 7-9 new berths, namely 13-16 berths in total including existing 6 berths will be necessary.

(2)-4 Site and location of expansion of ports

Selection of site for expansion in the neighbourhood of the existing ports is relatively easy if there is available land nearby. New site will be at Assab water area to the south of the present port and at Massawa water area between present port and Sheikh Said Island respectively. It should be taken into consideration that the present bouy berth for crude oil at Assab shall be desirable to be shifted from the present location to further off-shore area in accordance with increase of oil import and larger tankers.
At Massawa due consideration shall be made to the copper export which will soon commences; a separate facilities for copper export from public berths will be necessary.

(3) Recommendation

(3)-1 Co-ordination between port projects and city plannings

a. Assab

Assab is now in process to be a port town. A well co-ordinated master plan for both port and town should be drawn up at this stage in order to be able to cope with the future development.

b. Massawa

Township of Massawa is now preparing a new town plan. The expansion project of port should be well co-ordinated with this town plan.

(3)-2 Unification of all statistics

In order to grasp daily status of operation of port facilities, movement of cargoes, ships, trucks and railway etc. clearly e. i. to get and analyze all necessary port information at a glance, an adequate system of unification of statistics should be arranged.

(3)-2 Preparation of lists of port facilities

Comprehensive lists for design, construction, assessment and lay-out of the ports will be of great value.

(3)-4 Improvement of prevailing unbalance of import and export

Paricularily unbalance between import and export at Assab is conspicuous, this state of affairs may affect the smooth operation of truck services a great deal, we presume.

(3)-5 Improvement of handling

Training of harbour workers and improvement in technical skill of equipment operators is necessary for accurate, prompt and safe handling of cargoes.

(3)-6 Management of Port

Ports of Ethiopia find themselves in the state of expansion in accordance with the National Planning. Development of ports coresponds with the national interests. Therefore, the ports should be managed and their expansion plan should be executed by the Government as it is.

(3)-7 Necessary Survey and Investigation for prepartion of the Master Plan of Ports.

In order to draw up the final Master Plan for ports in Ethiopia the further survey and investigation is absolutely necessary such as survey on natural and geological conditions and accurate sounding etc.

II. BACKGROUND

(1) Economic Development of Ethiopia, Import and Export

Ethiopia is the empire of 120 thousand square kilometer, faces to Red Sea with population of some 20 million. The most important part of economy is agriculture and 90% of the population is engaged in this sector. Industrialization in the nation has recently started, but has achieved pretty rapid development in the oil-refinery, cement, textile and food industries. Present pattern of economic structure will not be changed within the planning period, though industrialization, especially in the field of import substitute industries, will be continued.

The Imperial Ethiopian Government is guiding the economic development of the country by successive five year development plans. The 3rd economic development plan which has been extended for one year becomes its' final stage at present. The targets shown in the plan has not been achieved satisfactorily. Per capita income is about 65 U.S. dollar accordingly to UN statistics,should be understood with the back ground where 40% of total economy is depending on barter economy and so-called sustenance economy.

The major items of export are coffee, salt, oilseeds, pluses and vegetables. Export of coffee is the most important item and earns more than half of total export. But it suffers from fluctuation of price which is controlled by the world market. Oilseeds is said to be one of the most hopeful exporting items in near future, though the present situation is not so optimistic. Export of salt is large in quantity but there are many competitors in the world market.

Quality of products, distance to market and high transportation cost, affect the export volume very much so the rapid growth of this item could not be expected in the planning period.

As long as mining products are concerned, exploitations are now undergoing enthusiastically. Among these, copper and potash are going to be major export items within the several years.

(2) The Transport Sector (in the relation to export and import)

The domestic cargo transport of Ethiopia has been largely dependent on land transport. Owing to her geological conditions, share of domestic marine transport in the whole domestic cargo movement is not high. Refined oil which is shipped from Assab to the ports of Red Sea area becomes the most important items among the domestic marine transport in this country.

Two railway lines are in service at present, namely Franco-Ethiopian Railway which is connecting Addis Ababa to Djibouti of French Teritory of Afras and Issas via Dire Dawa, and Northern Ethiopian Railway operating between Massawa and Agoldat via Asmara.

In general, highway and railway are in the competitive situation but, as far as Franco-Ethiopian Railway is concerned, the situation is far from competition. Lack of the highway in this region gives the railway almost exclusive position for the cargo transport to and from Djibouti. Export and import of Ethiopia had been depended upon port of Massawa and Djibouti until 1963. Construction of Assab port and development of highway systems between the port and her hinterland have changed the situation. The hinterland of Djibouti port, except Harar area, and the hinterland of Assab port is overlapping each other.

When the Awash-Tendaho Highway is completed by 1975, transport by truck to and from Assab will be in favourable position against railway transport to and from Djibouti. The significant part of benefit from huge investment on highway construction will be yielded by making full use of Assab port.

One of the most serious problems in cargo transport between Assab and her hinterland is remarkable unbalance between export and import. Because of this onesided transport demand, trucks are idly waiting for cargoes at Assab. Average waiting time of trucks during the latest one month is far beyond one week. This should be solved urgently. In the long run, shifting the import cargoes from Djibouti will be the best solution.

Northern Ethiopian Railway is now serving between Massawa port and Agordat, its' gauge is 950 mm and difference of altitute between Massawa and Asmara in about 1500 m.

This fundamental handicap together with its' oldfashoned roiling stocks make the capacity of this railway very limited.

Table II-1

EMPIRE WIDE PRODUCTION OF SELECTED COMMODITIES

(1)

	Unit	1968	1969	1970
CARPETS (3214)				
Woolen Carpets	Sq.m.	8,752	6,707	5,090
ROPE & TWINE INDUSTRIES (3215)				
Gunny bags	1000 Pcs.	5,401	6,438	7,146
Sack Cloth	MT	45	171	191
Twines	MT	112	99	7
WEARING APPAREL & HOSIERY 3220)				
Dress Shirts	Pcs.	...	23,000*	77,000*
Hosiery	1000 doz.	...	...	465
Overalls	Pcs.	18,400	3,560	6,000*
Sport Shirts	Pcs.	...	125,415	87,000*
Trousers	Pcs.	66,000	31,362	62,500*
Underwear	Doz.	...	...	44,705
WOOD & WOOD PRODUCTS (331)				
Hard Board	1000 Sq.m.	...	361	424
Ply Wood	Cu.m.	2,200*	2,349	2,420
Soft Board	Kgs.	-	...	70,[illegible]
Styropor	Kgs.	13,600*	16,864	12,551
Wood Chip-board	Cu.m.	3,300*	3,700*	3,000*
Wood Mosaic Parquet	Sq.m.	25,202	14,162	6,300*

1/ Industrial Production only.

2/ * ; Estimate

Table II-1

EMPIRE-WIDE PRODUCTION OF SELECTED COMMODITIES

(2)

	Unit	1968	1969	1970
PAPER, PAPER BOARD & CONTAINERS (341)				
Corrugated Cardboard Sheets	MT	-	-	146
Corrugated Containers	MT	-	-	731
Multiwall Paper Sacks	MT	-	-	219
Printing Paper	MT	-	-	4,387
Wrapping Paper	MT	-	-	1,828
CHEMICAL PRODUCTS (352)				
Pharmaceutical Preparations (3522)				
Antibiotics	1000 Vials	-	-	300*
Capsules	1000 Caps	-	-	10,000*
Injection	1000 Amp.	-	-	2,400*
Ointments	Kgs.	-	-	15,000*
Syrup	Bottles	-	-	7,000*
Tablets	1000 Pcs.	-	-	80,000*
SOAP, PERFUME & COSMETICS (3523)				
Soap				
Laundry Soap	MT	5,413	6,600*	6,700*
Perfume Alcoholic (+)				
Large Bottles	Bottles	1,800*	2,000*	4,200*
Medium Sizes	"	5,600*	5,400*	7,900*
Small Bottles	"	292,900*	232,600*	236,100*
OTHER CHEMICAL PRODUCTS (3529)				
Matches	1000 Boxes	23,325	21,627	...
PETROLEUM REFINERIES (3530)				
Benzine, Regular	MT	59,469	53,045	56,041
Benzine, Super	MT	9,875	12,342	15,240
Buta Gas	MT	1,910	2,438	2,366

+/ The data on these refer to 1960, 1961 & 1962 FY (E.C.)

2/ * ; Estimate

Table II-1

EMPIRE-WIDE PRODUCTION OF SELECTED COMMODITIES

(3)

	Unit	1968	1969	1970
PETROLEUM REFINERIES (3530) Contd.				
Diesel Oil	MT	118,603	123,155	148,661
Furnace Oil (Fuel Oil)	MT	187,565	204,732	232,074
J.P.4	MT	14,834	23,538	30,082
Industrial Diesel Oil	MT	596	517	1,684
Kerosine	MT	840	2,919	-
Marine Diesel Oil	MT	5,307	3,372	2,595
Bitumen	MT	14,864	11,564	15,449
RUBBER & CANVAS PRODUCTS (3559)				
Basket Ball Shoes	Pairs	113,992	187,886	374,442
Knee Boots	Pairs	73,111	58,464	70,940
Out-Soles	Pairs	137,206	197,438	186,679
Oxford-Shoes	Pairs	17,573	-	-
Plim-Soles	Pairs	261,722	236,933	450,283
Rubber Sheets	Pcs.	1,538	4,632	2,095
GLASS & GLASS PRODUCTS (3691)				
Glasses, Bottles & Jars	1000 Pcs.	22,262	21,979	26,000*
CEMENT & LIME PRODUCTS (3692)				
Cement	MT	175,190	197,700*	174,440
Hydrated Lime	MT	7,562	8,250	7,675
OTHER FABRICATED METAL PRODUCTS (3819)				
Galvanized Iron Sheets (flat)	MT	...	...	20,000*
Galvanized Iron Sheets (Corrugated)	MT	...	17,500	19,000*
Nails	MT	...	3,507	...
ELECTRICAL APPARATUS & SUPPLIES (3839)				
Battery	Pcs.	1,025	1,974	2,330

+/ * ; Estimate

Table II-2

ELECTRICITY PRODUCTION & CAPACITY

(EELPA & SEDAO ONLY)

		CAPACITY (K W)			PRODUCTION (MILLION K W H)		
		Hydro	Thermal	Total	Hydro	Thermal	Total
1959	E.C.	91,956	43,617	135,573	208.9	81.6	290.5
1960		91,956	44,513	136,469	233.5	85.1	318.6
1961		91,432	44,375	135,807	240.0	92.3	332.3
1962		91,384	44,437	135,821	259.8	101.4	361.2
1962	Meskerem	93,408	38,859	132,267	19.6	7.8	27.4
	Tikmt	93,408	39,426	132,834	20.4	8.5	28.9
	Fidar	91,384	39,434	130,818	21.3	8.3	29.6
	Tahsas	91,384	40,004	131,388	20.9	8.9	29.8
	Tir	91,384	40,004	131,388	20.8	8.4	29.2
	Yekatit	91,384	40,004	131,388	21.1	8.0	29.1
	Megabit	91,384	40,004	131,388	22.5	8.5	31.0
	Miazia	91,384	40,154	131,538	20.8	8.2	29.0
	Ghinbot	91,384	40,154	131,538	21.4	8.5	29.9
	Sene	91,384	40,635	132,019	22.1	8.5	30.6
	Hamle	91,384	42,736	134,120	20.4	8.7	29.1
	Nehase	91,384	44,437	135,821	28.5[2]	9.1	37.6[2]
1963	Meskerem	91,384	49,437	140,821	22.2	8.5	30.7
	Tikmt	123,384[3]	50,758	174,142	23.0	9.0	32.0
	Hidar	123,384	50,917	174,301	25.2	8.8	34.0
	Tahsas	123,384	50,888	174,272	24.7	9.4	31.1
	Tir	123,384	56,638	180,022	24.0	9.2	33.2
	Yekatit	123,384	56,638	180,022	24.1	8.2	32.3
	Megabit	123,384	57,138	180,552	25.2	9.0	34.2
	Miazia	123,384	58,940	182,324	23.9	9.1	33.0
	Ghinbot	123,384	58,940	182,324	24.4	9.1	33.5
	Sene	123,384	59,090	182,427	25.7	9.2	34.9
	Hamle	123,384	59,090	182,427	25.6	8.8	34.4

1/ EELPA's Capacity in k v a has been converted into KW using 1 kva=0.8 kw.

2/ Includes part of the previous month's production.

3/ Awash III Commenced Operation.

SOURCE: 1) Ethiopian Electric Light & Power Authority.

2) SEDAO Electricity Share Co.

Table . II-3

VOLUME OF EXPORTS OF PRINCIPAL COMMODITIES

Unit: 1000 MT

		Coffee	Sheep skins	Goat skins	Hides	Vegetables	Oilseeds & Groundnuts	Meat	Fruits fresh
1966		73.64	4.76	4.73	9.41	79.42	54.00	5.88	17.35
1967		73.60	4.64	3.88	5.87	77.07	57.80	4.91	20.42
1968		80.25	4.63	4.72	3.46	82.11	50.14	4.66	17.69
1969		88.38	6.07	4.83	5.26	84.29	56.09	3.52	16.55
1970		70.86	2.85	1.97	5.80	57.14	56.27	5.04	11.76
1969	January	12.52	...	...	...	12.39	9.11	0.26	1.58
	February	11.77	...	...	...	9.60	4.28	0.49	1.15
	March	9.00	...	...	...	11.30	6.20	0.29	2.69
	April	4.14	...	...	...	4.51	6.34	0.48	1.60
	May	4.49	...	...	...	5.83	1.42	0.28	1.03
	June	4.65	...	...	...	4.89	5.97	0.20	1.67
	July	4.70	...	...	...	2.84	5.19	0.66	1.39
	August	8.82	...	...	...	7.15	2.46	0.10	0.63
	September	8.18	...	...	...	3.45	1.39	0.04	0.80
	October	4.42	...	...	...	5.49	1.76	0.07	1.89
	November	6.43	...	...	...	8.38	[illegible]	0.41	1.19
	December	9.26	...	...	...	8.26	6.75	0.24	0.93
1970	January	11.51	0.30	[illegible]	0.45	8.13	4.91	0.51	[illegible]
	February	9.64	0.32	0.16	0.63	9.44	13.21	0.75	2.97
	March	11.43	0.15	0.10	0.40	2.24	4.28	0.43	0.95
	April	8.23	0.24	0.25	0.59	4.34	3.76	0.51	1.61
	May	5.31	0.20	0.17	0.37	2.07	4.53	0.14	0.48
	June	3.31	0.35	0.11	0.60	1.71	1.75	0.44	0.72
	July	5.49	0.31	0.19	0.29	2.14	2.43	0.74	0.80
	August	2.86	0.25	0.19	0.50	2.16	5.67	0.28	1.01
	September	3.40	0.18	0.1[illegible]	0.45	7.09	4.10	0.09	0.66
	October	2.21	0.12	0.05	0.25	2.42	1.08	0.14	0.60
	November	4.13	0.19	0.21	0.74	7.91	3.31	0.32	0.41
	December	3.35	0.24	0.22	0.54	7.50	7.25	0.69	0.54

Source: Customs Head Office & Central Statistics Office Addis Ababa

Table II-4

PRINCIPAL EXPORTS OF ETHIOPIAN PRODUCE & MANUFACTURES

Unit: Eth.$1000.-

		PRINCIPAL COMMODITIES							National Exports Total
		Coffee	Hides & Skins	Vegeta-bles	Oil Seeds & Ground-nuts	Meat	Fruits	TOTAL	
1966		155673	35647	23688	21778	6900	5200	248886	268615
1967		139182	29837	22088	22700	5933	6112	225872	249976
1968		152962	24916	21595	23531	5269	4920	233193	258047
1969		173946	29160	24200	23185	4347	4769	259607	292003
1970		181269	24150	17984.	28467	5969	3354	261193	294576
1969	January	23725	2115	3712	3406	316	451	3725	36367
	February	21870	2193	2706	1797	603	322	29491	32213
	March	16705	2632	3431	2911	438	754	26871	30586
	April	7614	1489	1382	2532	736	453	14206	16668
	May	8087	2049	1654	607	317	305	13019	14809
	June	8273	4092	1558	2281	295	480	16979	19611
	July	8088	2081	943	1745	662	401	13920	16013
	August	15815	2157	1711	1004	100	184	20971	23240
	September	15921	2153	854	624	81	232	19865	22512
	October	10474	2071	1269	868	115	546	15343	17828
	November	15690	2519	2644	2566	428	363	24210	28471
	December	21684	3609	2336	2844	256	278	31007	33685
1970	January	28912	2244	2282	2388	744	287	36837	39406
	February	22013	2836	2699	5876	088	816	35128	37833
	March	28909	1501	698	2523	476	276	34383	36181
	April	22034	2440	1255	1478	545	452	28204	30634
	May	14321	1717	600	2567	255	141	19601	23068
	June	9084	2310	577	961	500	224	13656	16324
	July	15115	1862	795	1268	825	233	20098	22574
	August	8021	1843	606	2906	253	286	13915	17017
	September	9235	1801	2007	1548	177	193	14961	19338
	October	5603	1006	760	576	165	175	8285	10204
	November	10143	2360	2866	1998	401	115	17883	21222
	December	7879	2250	2839	4378	740	156	18242	20775

Source : Customs Head Office and Central Statistics Office, Addis Ababa.

Table II-5

VALUE OF EXPORTS OF ETHIOPIAN PRODUCE & MANUFACTURE

Unit : Eth.$1000.-

ECTC CODE AND DESCRIPTION	1967	1968	1969	1970
TOTAL ETHIOPIAN EXPORTS	249,976	258,047	292,606	294,[illegible]
0 FOOD AND LIVE ANIMALS	187,820	199,649	221,294	223,083
001 Live animals and poultry	3,280	2,719	3,362	2,292
011 Fresh, Chilled and frozen meat	1,920	2,398	1,275	2,066
013 Canned Meat and Meat extracts	4,007	2,994	3,071	3,904
025 Eggs	430	316	350	278
031 Fresh and Simply Preserved fish	871	643	680	853
051 Fresh fruits and nuts	6,112	4,920	4,769	3,354
054 Fresh, frozen or preserved vegetables	22,088	23,692	23,894	17,98[illegible]
071 Coffee	139,182	152,957	173,947	181,26[illegible]
075 Spices	2,904	2,464	2,296	2,209
081 [illegible] for animals	5,194	4,324	4,432	4,101
1 BEVERAGE AND TOBACCO	53	38	2	8
2 CRUDE AND INEDIBLE MATERIALS EXCEPT FUEL	60,130	54,299	63,729	61,[illegible]
211 Undressed Hides & Skins	29,837	24,915	29,159	24,486
221 Oil seeds	22,700	21,439	23,183	28,353
276 Common Salt	1,555	1,080	1,584	1,19[illegible]
3 Mineral Fuels and Lubricants	-	-	3,241	3,52[illegible]
4 Animal & Vegetable oils & fats	1,462	2,176	2,131	1,483
5 Chemical Products	8	18	76	1,614
6 Manufactured goods, classified	80	1,370	1,427	2,385
7 Machinery and transport equipment	-	-	57	3
8 Miscellaneous Manufactured articles	97	129	219	538
9 Miscellaneous Transactions	326	368	430	414

Source: Customs Head Office and

Table II-6

VALUE OF ETHIOPIAN IMPORTS

(1)

ECTC CODE AND DESCRIPTION	1967	1968	1969	1970
TOTAL ETHIOPIAN IMPORTS	357,369	432,522	388,302	429,080
0 FOOD AND LIVE ANIMALS	22,950	19,129	19,688	31,4[illegible]1
022 Milk and Cream	2,018	1,660	2,302	2,895
023 Butter	2,635	1,789	1,380	1,786
046 Wheat Flour or Meslin	4,706	3,100	2,371	5,485
048 Cereal & Flour Preparations	1,588	1,620	1,792	2,264
062 Sugar, fruits, vegetables & Confectionery	1,010	296	523	999
074 Tea	1,777	1,878	2,467	2,162
075 Spices	1,222	1,046	708	1,235
091 Margarine and Shortenings	151	90	210	186
1 BEVERAGE & TOBACCO	5,005	5,673	5,492	5,44[illegible]
112 Alcoholic Beverages	2,313	2,686	3,218	3,067
122 Tobacco Manufactures	2,111	1,060	1,234	812
2 CRUDE MATERIAL INEDIBLE EXCEPT FUEL	15,746	21,348	16,539	12,[illegible]
263 Cotton	5,281	6,745	7,602	3,786
266 Synthetic (regenerated fibre)	7,496	10,675	5,714	3,108
3 MINERAL FUELS, LUBRICANTS & RELATED MATERIALS	31,544	27,033	28,195	33,577
332 Petroleum Products	24,571	12,121	11,429	14,849
4 ANIMAL OIL & FATS	872	2,103	2,541	2,537
5 CHEMICAL ELEMENTS & COMPOUNDS	34,503	40,957	43,507	49,880
532 Dye, tanning extract	4,388	2,306	813	1,755
533 Pigments, Paints, Varnishes & related	1,904	2,482	1,929	1,522
541 Medical & Pharmaceutical Products	9,399	10,081	11,057	13,507
553 Perfumery & Cosmetics	2,284	2,845	2,648	2,597
554 Soaps, cleaning & polishing preparation	4,960	6,707	4,661	5,287
571 Explosive Products	570	482	421	993

Source: Customs Head Office and Central Statistics Office Addis Ababa.

Table II-6

VALUE OF ETHIOPIAN IMPORTS

(2)

Unit : Eth.$1000.-

E C T C CODE AND DESCRIPTION	1967	1968	1969	1970
6 MANUFACTURED GOODS, CLASSIFIED	89,400	95,453	86,465	109,167
621 Rubber Fabrics materials	314	869	1,063	2.095
629 Rubber Manufactures	13,186	12,214	11,644	16,110
631 Veneers Plywood Boards	1,137	693	527	573
632 Wood Manufactures	502	614	888	955
633 Cork Manufactures	529	550	166	263
641 Paper and paper Board	3,291	5,390	4,304	5,118
642 Pulp Paper Manufactures	3,085	3,773	3,337	3,878
651 Textile yarn & thread	12,885	11,466	11,382	12,127
652 Cotton Fabrics Standard	5,679	2,607	1,561	1,683
653 Other Textile Fabrics.	5,377	4,487	5,165	6,645
654 Tulle Lace, Embroidery	228	302	462	292
655 Special Textile Fabrics	333	762	871	1,022
656 Textile Manufactures n.e.s.	2,995	2,402	2,687	2,789
657 Floor covering tapestery	487	540	697	497
661 Lime, Cement etc.	276	1,552	820	973
662 Clay construction materials	903	1,158	579	626
664 Glass	681	881	752	869
665 Glassware	1,134	1,023	1,303	1,358
666 Pottery	601	459	514	989
672 Ingots	1,640	2,210	1,976	4,605
673 Iron & Steel	1,448	3,274	2,031	3,544
674 Universal Plates & sheets	8,813	7,744	9,803	14,272
677 Iron & steel wire	1,372	489	524	113
678 Tubes, Pipes & fittings	2,249	6,186	2,895	5,079
684 Aluminium	1,354	1,620	1,298	1,419

Source: Customs Head Office and
Central Statistics Office
Addis Ababa.

Table II-6

VALUE OF ETHIOPIAN IMPORTS

(3)

Unit : Eth.$1000.-

ECTC CODE AND DESCRIPTION	1967	1968	1969	1970
691 Finished Structural Parts	3,470	3,518	1,550	1,811
692 Metal Containers	609	772	909	1,418
693 Wire Products	1,042	1,836	1,445	2,449
694 Nails, Screw, Nuts, etc.	418	767	811	445
695 Tools	3,049	2,664	3,271	2,853
696 Cuttlery	569	[illegible]	1,161	1,114
697 Household Equipment	2,138	3,296	1,950	2,346
7 MACHINERY AND TRANSPORT EQUIPMENT	116,780	177,084	133,448	146,887
711 Power generating machinery	2,148	2,137	5,625	3,101
712 Agricultural Machinery & Implements	7,979	8,472	9,063	9,985
714 Office Machines	1,664	1,927	1,582	2,422
717 Textiles and Leather Machinery	6,789	10,399	11,726	9,679
718 Machines for Special Industries	13,531	24,788	17,174	16,516
722 Electric Power Machinery & Switchgear	7,638	5,862	4,883	7,575
724 Telecommunication-Apparatus	10,208	8,365	10,320	8,510
725 Domestic Electric Equipment	2,543	1,734	2,281	1,997
732 Road Motor Vehicles	40,469	39,686	38,528	47,444
733 Road Vehicles other than Motor Vehicles	1,559	2,283	1,903	3,102
734 Aircraft	5,575	46,378	11,404	6,438
8 MISCELLANEOUS MANUFACTURED ARTICLES	38,924	37,599	43,559	36,528
812 Sanitary, Plumbing, Heating & Lighting Fittings	2,441	2,467	2,579	2,402
821 Furniture	2,185	2,495	2,544	1,847
841 Clothing	14,406	14,366	12,831	12,181
851 Foot-wear	2,101	1,380	361	434
861 Scientific & Professional Instrument	3,798	4,073	4,680	5,477
862 Photographic & Cinematographic Supplies	1,122	764	1,078	956
892 Printed Matters	3,100	2,867	7,549	2,863
9 COMMODITIES NOT CLASSIFIED ACCORDING TO KIND	1,645	6,143	8,868	1,098
931 Special Transaction not Classified	1,046	764	8,766	712

Source: Customs Head Office and Central Statistics Office Addis Ababa.

From the purely economical view point, this railway have lost its significance as to the cargo transport between Massawa port and her hinterland.

If the plan extend this railway across the border and connect to the Sudanese railway becomes concrete, the situation may have another aspect.

Table II-7

T R A N S P O R T

TRUCK FREIGHT RATES-NORTHERN ETHIOPIA

Unit:Eth.$Per.100 Kgs.

	MARCH 1969			MARCH 1971		
	Assab	Asmara	Massawa	Assab	Asmara	Massawa
TO ADDIS ABABA						
Canned Food	5.50	6.25	...	6.00	8.00	...
Cement	...	...	...	5.50	6.50	8.50
Clothing	5.00	5.50	5.50	6.50	7.50	9.00
Corrugated Iron Sheets	...	...	...	...	...	8.50
Paint	...	...	...	...	...	9.00
Salt, Marine	5.00	...	...	4.50	7.50	7.00
Textiles	...	6.25	...	...	...	8.00
Vegetables, Fresh	...	7.00	5.65	...	...	...
Yarn & Thread	...	6.25	...	5.25	6.00	8.00
FROM ADDIS ABABA						
Bees. wax.	2.75	5.30	6.50	3.50	5.00	...
Butter	2.30	5.30	6.60	...	...	...
Cement	2.50	...	...	3.50	5.00	...
Cereals	2.75	...	...	3.50	5.00	...
Coffee	2.25	4.50	6.25	3.50	5.00	...
Hides & skins	...	...	6.50	...	...	9.50
Oil Seeds	2.50	...	...	...	...	...
Paint	...	...	...	...	...	8.50
Pulses	2.50	...	...	...	...	...
Red Pepper	...	...	...	...	...	8.00
Sheets Corrugated	2.00	4.75	6.25	3.75	6.25	8.50
Sugar	2.25	4.50	6.25	3.75	6.00	8.50

Source: 1) National Transport S.C.
2) Berhan Kokeb Heavy Transport Association.

Table II-8

TRUCK FREIGHT RATES-NORTH WESTERN ETHIOPIA

Unit: Eth.$Per 100 Kgs.

	MARCH 1969			MARCH 1971		
	GONDAR	BAHR DAR	D. MARKOS	GONDAR	BAHR DAR	D. MARKOS
TO ADDIS ABABA						
Bees wax	6.00	5.25	3.50	...	...	...
Butter	6.25	5.25	3.50	6.00	5.00	3.50
Cereals	6.00	5.00	3.00	6.00	4.00	3.25
Hides & Skins	6.00	5.25	3.25	5.00	3.50	3.50
Honey	6.25	5.25	3.25	5.50	4.00	3.00
Oilseeds	6.00	5.00	3.00	...	...	...
Pulses	6.00	5.00	3.00	5.25	4.00	3.00
FROM ADDIS ABABA						
Canned food	5.60	5.00	2.25	5.00	4.00	3.50
Cement	5.50	4.00	2.25	5.00	4.00	3.50
Coffee	5.50	4.00	2.25	5.00	3.75	3.50
Clothing	...	...	...	5.00	4.00	3.50
Paint	...	...	...	5.00	3.75	3.25
Salt, Marine	5.60	5.00	2.50	5.00	4.00	3.50
Sheets, Corrugated	5.60	5.00	2.50	5.00	3.75	3.25
Soap	...	...	...	5.00	4.25	3.25
Sugar	5.50	4.00	2.25	5.00	4.00	3.25

Source: 1) National Transport S.C.

2) Berhan Kokeb Transport Association.

Table II-9

FREIGHT RATES ON ADDIS ABABA DJIBOUTI RAILWAY

Eth.$ Per Ton

	Min. Load	1970 March	1970 June	1970 Sept.	1971 March
EXPORT GOODS:					
Beeswax	10T	31.-	31.-	31.-	41.-
Canned Meat	10T	61.70	61.70	61.70	61.-
Cattle, live (Per Sq.M.)	$27m^2$	27.-+	27.-+	27.-+	27.70+
Cattle hides	8T	41.-	41.-	41.-	46.-
Cereals & Wheat bran	20T	22.50	22.50	22.50	35.-
Chat (Per 100 kg.)	100Kg.	18.30	18.30	18.30	18.30
Coffee	20T	28.-	28.-	28.-	41.-
Eggs fresh	10T	78.-	78.-	78.-	78.70
Flour of Wheat	20T	46.70	46.70	46.70	46.-
Fruits & Vegetables, Fresh	10T	78.-	78.-	78.-	78.70
Goat & Sheep Skins	8T	41.-	41.-	41.-	46.-
Incense & Gum	12T	62.70	62.70	62.70	56.-
Oil Seed Cake	20T	20.-	15.-	20.-	31.-
Oil Seeds, Pulses	20T	22.50	22.50	22.50	36.-
IMPORT GOODS					
Artificial Fibres	12T	58.70	58.70	58.70	58.70
Canned food	20T	67.70	67.70	67.70	67.70
Cotton Raw	12T	40.-	40.-	40.-	41.70
Jute Raw	18T	40.-	40.-	40.-	41.70
Clothing	18T	55.70	55.70	55.70	90.70
Cotton Fabrics and Cotton Yarn	14T	55.70	55.70	55.70	67.70
Benzene	20T	51.-	51.-	51.-	56.-
Diesel Oil	20T	46.-	46.-	46.-	51.-
Motor Vehicles	20T	81.70	81.70	81.70	90.70
Machinery	20T	56.70	56.70	56.70	66.70
Ores, Scraps & Concentrates	20T	41.-	41.-	41.-	41.-
Pharmaceuticals	25T	90.70	90.70	90.70	90.70
Rubber (Crude & Synthetic)	6T	71.-	71.-	71.-	101.-
Rubber Tyres	6T	71.-	71.-	71.-	71.-
Radios, T.V. Sets & Cookers	25T	102.70	102.70	102.70	90.70

+/ There is an additional charge of Eth.$10.00 per wagon.

Source : Franco-Ethiopian Railway Co.

Table II-10

FREIGHT RATES ON DIRE DAWA DJIBOUTI RAILWAY

	Min. Load	Eth.$ Per Ton 1970 March	June	Sept.	1971 March
EXPORT GOODS:					
Beeswax	20T	26.45	26.45	26.45	26.45
Canned Meat	12T	37.10	37.10	37.10	36.10
Cattle, live (Per Sq.M.)	$27m^2$	11.30 ÷	11.30 ÷	11.30 +	12.00 +
Cattle Hides	12T	33.95	33.95	33.95	33.95
Cereals	20T	23.70	23.70	23.70	23.70
Chat (Per 100 Kg.)	100Kg	30.00	30.00	30.00	30.00
Coffee	20T	39.10	39.10	39.10	39.10
Eggs fresh	10T	31.45	31.45	31.45	32.75
Flour of Wheat	20T	21.70	21.70	21.70	21.70
Fruits & Vegetables, Fresh	10T	31.45	31.45	31.45	32.75
Goat & Sheep Skins	8T	37.50	37.50	37.50	37.50
Incense and Gum	12T	40.70	40.70	40.70	26.45
Oil Seed Cake	20T	18.15	18.15	18.15	18.15
Oil Seeds	20T	21.30	21.30	21.30	21.30
Pulses	20T	22.10	22.10	22.10	22.10
Wheat Bran	20T	23.70	23.70	23.70	23.70
IMPORT GOODS:					
Artificial Fibres and Raw Cotton	12T	24.85	24.85	24.85	24.85
Canned Food	25T	35.55	35.55	35.55	33.95
Jute Raw	18T	24.25	24.25	24.25	24.85
Clothing & Pharmaceuticals	25T	37.50	37.50	37.50	37.50
Cotton Fabrics, woven	25T	33.95	33.95	33.95	33.95
Benzene	20T	39.00	39.00	39.00	41.00
Diesel Oil	20T	26.50	26.50	26.50	28.00
Motor Vehicles	20T	33.95	33.95	33.95	59.85
Machinery	20T	28.40	28.40	28.40	28.40
Ores, Scraps & Concentrates	20T	28.40	28.40	28.40	27.65
Rubber tyres and crude rubber	6T	42.25	42.25	42.25	41.25
Radios, T.V. Sets & Cookers	25T	42.25	42.25	42.25	37.50

+/ There is an additional charge of Eth.$10.00 Per wagon

Source: Franco-Ethiopian Railway Co.

Table II-11

BUS TRANSPORT

Unit: Thousands

		Interurban		Addis Ababa Only	
		Passengers	Bus-Km.	Passengers	Bus-Km.
1957 E.C.		7,866	22,927	27,043	4,784
1958		7,936	22,924	29,124	4,999
1959		9,250	26,545	34,396	5,515
1960		10,000*	...	40,792	7,606
1961		11,000*	...	43,670	7,527
1962		12,000*	...	45,715	7,739
1963		...	...	45,503	8,199
1958	I	1,821	5,199	6,707	1,164
	II	2,060	5,520	6,716	1,149
	III	2,143	6,233	7,849	1,345
	IV	1,912	5,972	7,852	1,341
1959	I	1,863	5,917	7,586	1,244
	II	2,523	6,310	8,903	1,319
	III	2,537	7,182	8,506	1,344
	IV	2,326	7,136	9,401	1,608
1960	I	...	...	9,353	1,801
	II	...	...	10,022	1,980
	III	...	...	10,151	1,835
	IV	...	...	11,266	1,990
1961	I	...	...	10,694	1,861
	II	...	...	10,652	1,859
	III	...	...	11,054	1,878
	IV	...	...	11,270	1,929
1962	I	...	...	11,256	1,885
	II	...	...	11,126	1,917
	III	...	...	11,603	1,920
	IV	...	...	11,730	2,017
1963	I	...	...	11,672	2,033
	II	...	...	12,019	2,028
	III	...	...	11,218	1,938
	IV	...	...	10,594	2,200

Source: 1) General Ethiopian Transport S.C.

2) Department of Communications

Table II-12

TRAFFIC ON THE FRANCO-ETHIOPIAN RAILWAY

	Passengers Traffic		GOODS TRAFFIC				
	Number	Passenger-kms (Thousands)	METRIC TONS				Ton/Km (Thousands)
			Total	Inland	Export	Import	
1968	391,772	78,811	337,851	90,001	85,128	162,722	179,966
1969	445,262	89,095	380,491	113,273	117,987	151,231	205,528
1970	416,300	85,596	426,598	110,544	96,075	219,977	232,448
	342,335	65,452					
1969 April	35,514	7,151	28,740	8,415	6,236	14,089	15,567
May	35,910	6,939	26,144	9,104	5,977	11,063	13,805
June	36,354	7,016	26,346	9,611	5,308	11,427	13,292
July	43,143	8,386	26,638	11,185	5,107	10,346	13,1[illegible]
August	35,540	8,010	28,395	8,817	7,386	12,252	15,509
September	39,053	8,629	33,549	8,197	14,510	10,842	18,757
October	38,112	7,337	32,179	11,733	7,404	13,042	16,121
November	36,239	6,330	31,062	9,706	9,226	12,130	15,926
December	42,473	9,320	35,478	7,155	14,846	13,457	19,915
1970 January	40,826	8,784	42,930	10,174	17,373	15,383	23,306
February	33,132	6,285	33,957	8,970	10,399	14,588	18,[illegible]
March	38,186	7,046	37,567	9,805	11,178	16,584	20,695
April	37,687	7,426	39,043	10,671	8,754	19,618	21,127
May	37,869	7,812	34,832	10,206	7,066	17,560	18,643
June	35,469	7,014	35,833	10,499	5,412	19,922	18,184
July	39,317	9,032	33,698	8,849	4,937	19,912	18,975
August	31,850	6,999	31,896	8,559	5,802	17,535	17,630
September	35,568	8,349	32,968	8,062	5,588	19,318	18,525
October	31,921	5,954	34,078	7,216	4,081	22,781	19,702
November	18,867	3,469	32,595	9,207	6,935	16,453	16,[illegible]
December	35,608	7,426	37,199	8,326	8,550	20,323	19,434
1971 January	35,332	7,764	41,752	8,781	13,294	19,677	22,508
February	30,967	5,817	39,493	8,301	12,610	18,582	22,009
March	34,478	6,969	45,790	10,860	12,554	22,376	25,433
April	37,286	7,951	42,960	13,972	8,551	20,437	22,477

Source: Franco-Ethiopian Railway Co.

Table II-13

TRAFFIC ON THE AGORDAT - MASSAWA RAILWAY

		Passenger Traffic (Thousands)		GOODS TRAFFIC				
				METRIC TONS (THOUSANDS)				Ton/Km. (Thousands)
		Number	Passenger Km	Total	Inland	Export	Import	
1952	E.C.	218	11,845	153.9	43.2	64.2	46.5	18,130
1953		316	14,717	152.4	51.3	54.4	46.7	17,598
1954		384	19,553	178.0	50.5	68.9	58.6	19,850
1955		397	20,008	184.3	34.4	91.9	58.0	10,939
1956		411	20,073	192.2	40.2	100.0	52.0	11,895
1957		440	22,064	208.3	39.3	98.6	70.2	24,417
1958		449	23,958	209.7	44.9	97.4	77.3	24,223
1959		310	17,833	183.5	54.7	75.5	53.2	20,851
1960		...	15,014	...	...	...	...	...
1961		238	12,776	151.2	39.6	69.2	42.3	18,281
1962		262	14,638	164.4	53.2	59.3	51.9	19,462
1960	I	59	3,745	39.0	11.0	11.4	16.6	4,566
	II	75	3,562	47.3	10.7	23.1	13.5	5,845
	III	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...
1961	I	50	...	34.5	8.0	16.6	9.8	4,156
	II	77	...	44.1	11.1	23.1	10.0	5,235
	III	57	...	34.4	9.0	13.9	11.5	4,395
	IV	54	...	38.2	11.5	15.6	11.0	4,525
1962	I	46	2,544	36.5	13.4	11.7	11.5	4,163
	II	64	3,586	47.6	10.9	24.2	12.5	5,837
	III	76	4,187	40.1	18.0	11.5	10.5	4,663
	IV	75	4,321	40.2	10.9	11.9	17.4	4,809

Source: Eritrea Railways Administration

Table II-14

INTERNATIONAL AIR TRAFFIC+

YEAR & MONTH		ADDIS. ABABA			ASMARA		
		Air Crafts	Passengers	Freight (Kgs.)	Air Crafts	Passengers	Freight (Kgs.)
1967		14,367	132,205	3,045,542	18,175	67,040	2,751,609
1968		15,544	126,936	4,445,164	23,516	97,067	4,249,150
1969		18,038	96,032	3,046,781	22,899	117,869	5,708,024
1970		18,745	100,817	3,669,307	27,235	113,228	6,592,198
1969	January	1,782	7,028	253,352	1,510	8,554	539,474
	February	1,911	7,536	249,930	2,085	8,390	515,206
	March	1,592	8,420	293,975	1,938	9,251	581,249
	April	1,597	6,691	241,350	1,735	9,833	312,192
	May	1,457	6,462	206,631	2,068	8,648	519,699
	June	1,346	8,209	239,341	1,398	10,473	403,146
	July	1,320	10,394	227,348	1,677	10,916	365,304
	August	1,151	9,848	228,302	2,302	11,124	401,795
	September	1,284	9,424	290,178	1,661	11,123	413,492
	October	1,425	7,533	259,858	2,202	11,051	421,458
	November	1,532	6,915	241,519	2,378	9,161	457,606
	December	1,641	7,572	314,957	1,945	9,345	772,403
1970	January	1,570	7,664	325,047	1,727	10,131	715,141
	February	1,398	7,434	297,858	1,645	8,305	699,954
	March	1,808	8,167	299,494	1,659	5,126	648,178
	April	1,687	7,321	250,532	2,874	8,931	746,378
	May	1,609	7,136	251,893	2,625	8,873	471,982
	June	1,310	8,604	291,995	3,127	9,865	712,347
	July	1,268	11,554	289,143	2,355	11,731	546,404
	August	1,363	10,147	276,205	2,169	10,669	406,527
	September	1,549	9,787	253,356	2,178	12,301	415,965
	October	1,690	7,201	296,291	2,352	9,998	373,514
	November	1,651	7,473	494,544	2,624	7,703	498,639
	December	1,842	8,329	342,948	1,900	9,395	357,179

+/ Figures give totals for traffic in and out of the Air Ports.

Source : Civil Aviation Administration.

Table II-15

AIR TRANSPORT ON E A L

	Plane Miles	Passenger Miles	Passengers	FREIGHT	
	Thousands		(Number)	Metric Tons	Thousand Ton-Miles
1961	4139	71074	100436	7221	2618
1962	4096	77418	116642	6943	2744
1963	4597	102244	132349	7585	3280
1964	5102	132652	159769	6976	3507
1965	5139	145331	177586	6760	4530
1966	5566	161305	204267	8146	6119
1967	6255	177467	208317	7808	7438
1968	6802	186521	234886	9106	10011
1969	6848	187730	241992	8683	9234
1970	7036	195534	231907	7750	8856
1970 January	595	15289	21298	716	988
February	534	13680	18520	691	882
March	571	13608	18700	772	703
April	585	13398	17990	657	905
May	602	13531	17299	522	577
June.	595	16145	17436	579	566
July	623	21396	21416	575	610
August	608	19937	20520	565	696
September	609	21430	22653	632	656
October	591	15603	18266	700	756
November	548	13590	16647	692	700
December	575	17927	21162	649	817

Source : Ethiopian Air Lines

III. PRESENT STATUS OF SEA PORTS

(1) Port of Assab

The Port of Assab is located on the Red Sea nearest to the main trade route in comparison with another three principal ports in this area, Massawa, Djibouti and Aden.

At present only,one good road connects Assab with high plateau areas. A new highway, between Tendaho and Awash,is under construction and will be completed by June, 1973. This can shorten travel time between Assab and inland major cities, such as Addis Ababa to a greater extent.

The reconstruction of Assab Port was begun in 1957 to handle large size vessels. Yugoslavia had executed this work, and principal port facilities now in use were completed by 1961.

Existing installations including six main berths are shown in Table III-1.

Old port of Assab handled according to record cargoes about 70,000 tons in 1953. Recent movement of cargo volume through Port of Assab is shown in Table III-2, and major commodities and their volumes in 1964 Ethiopian Calendar are also shown in Table III-3.

Present and future organization chart of Port Office are attached, (refer to Figure III-1 and III-2).

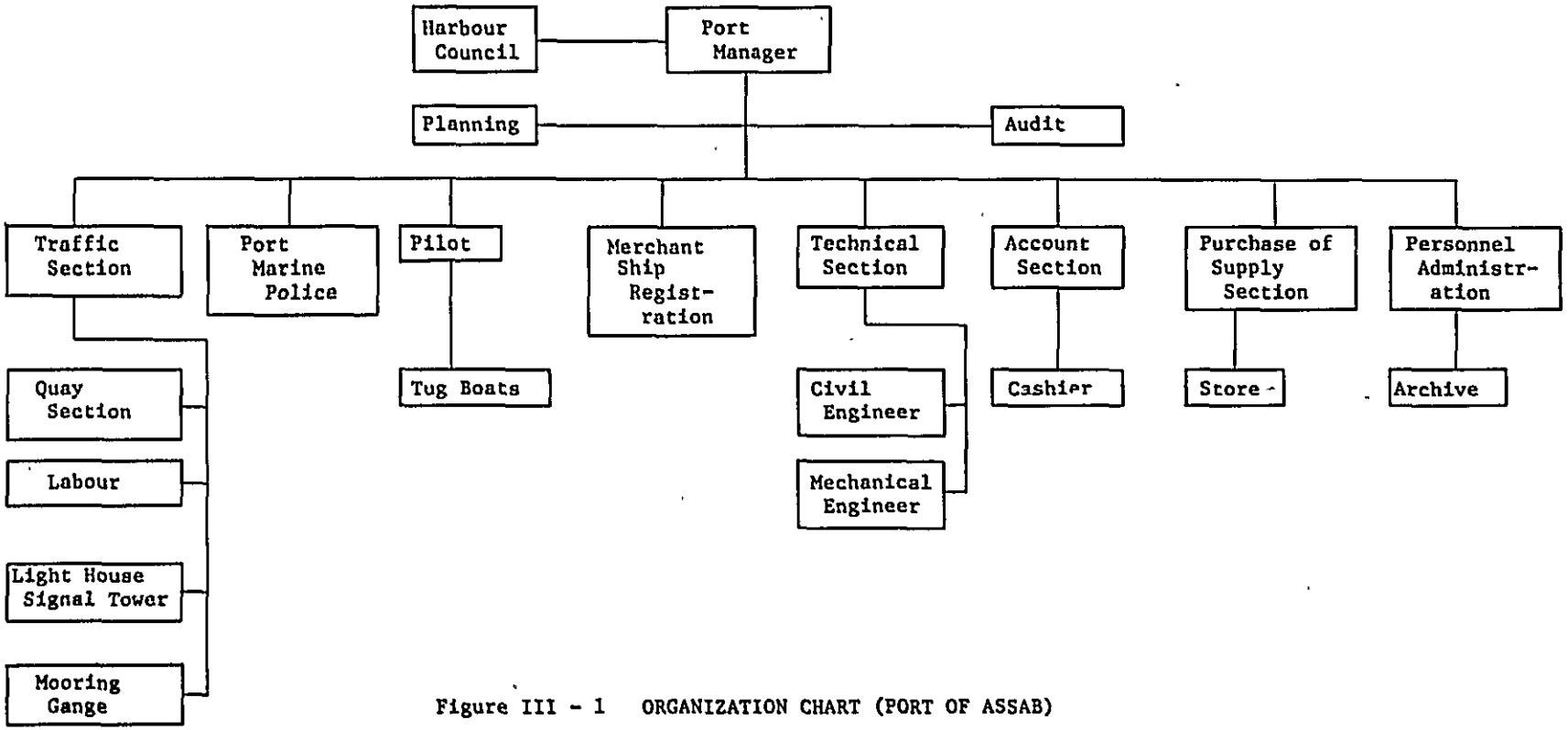


Figure III - 1 ORGANIZATION CHART (PORT OF ASSAB)

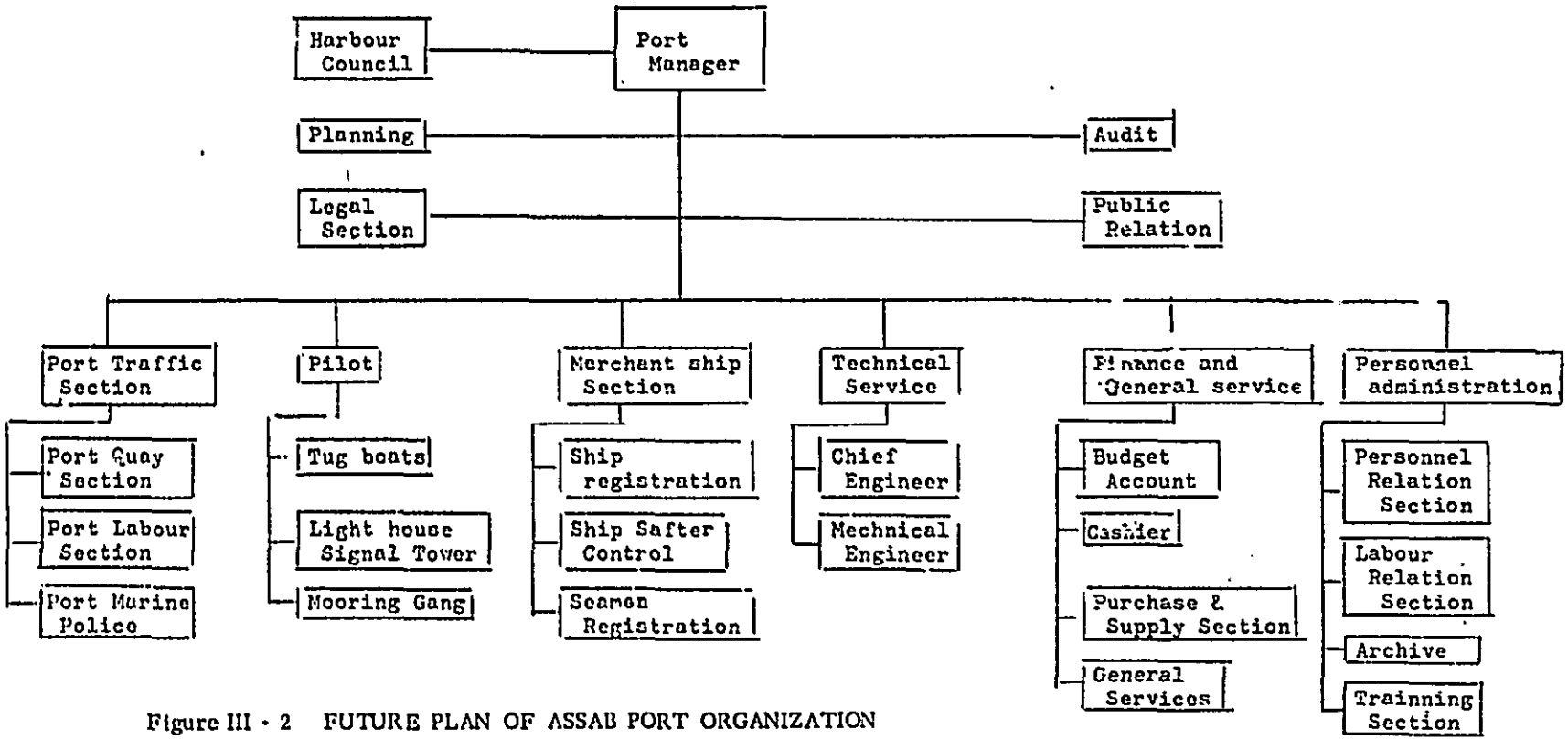


Figure III - 2 FUTURE PLAN OF ASSAB PORT ORGANIZATION

Table III - 1 Existing Port Facilities (Port of Assab)

Berth:

Commercial Harbour

	Berth	Length	Depth
The North Half Jetty	1)		
	2)	1,620 ft.	36 ft.
	3)		
The South Half Jetty	8)	164 ft.	19.0 ft
	9)	459 ft.	29.5 ft.
	10)	1,115 ft.	33.8 ft.
	11)		
Coaster Piers	4)	260 ft.	26 ft.
	5)	"	"
	6)	"	"
	7)	"	"

Oil Harbour

Shell Jetty			33 ft.
Coastal Tanker Jetty			27 ft.
Refinery Terminal			36 ft.
Salt Loading Terminal		Dolphin & Buoys'	33 ft.

Warehouse:	6	15,000 m^2 (Capacity 2,197,000 ft^3)
Stacking Area:		Capacity 1,872,000 ft^3
Cold Storage:	1	Capacity 49,000 ft^3
Towage:	2 Tug boats, Each capacity 600 HP	
Cargo Handling:	Derrick Crane (30T), Mobile crane (20T) .Folk Lifts (1.5 - 3T).	

Table III - 2 Imports and Exports through Assab

(Metric Tons)

E. C.	Imports *	Exports
1960	433,321	407,301
1961	556,768	444,409
1962	628,383	511,656
1963	688,637	491,852
1964	714,856	517,427

* Imports include crude oil

** Both of Imports and Exports include Home Trade and Transshipment

Table III - 3 Major Commodities Imported and Exported through Assab (1964 E.C.)

(Thousands Metric Tons)

Import	Chemical	7.0
	Fuel, Diesel, Gas Oil & Lubricant	10.1
	Machinery & Heavy Equipment	5.1
	Merchandise General	4.7
	Steel & Iron Bar	6.2
	Wheat, Flour & Other Grain	13.0
	Others	52.7
	Sub Total (Excluding Crude Oil)	98.8
	Crude Oil	612.3
	Total	711.1
	Home Trade	2.5
	Transshipment	1.3
	Grand Total	714.9
Export	Cofee	49.3
	Cotton & Seeds	22.3
	Fuel Oil	179.0
	Haricot Beans	12.4
	Hides	5.4
	Horse Beans	10.7
	Lentils	15.6
	Linseeds	15.9
	Niger Seeds	9.0
	Others	18.4
	Sub Total (Excluding Fuel and Salt)	158.8
	Fuel Oil	179.0
	Salt	59.6
	Total	397.4
	Home Trade	120.1
	(Including Fuel)	118.6)
	Grand Total	517.4

(Sources: Port Office of Assab)

(2) Port of Massawa

The Port of Massawa is serving for the northern Ethiopia, and its hinter-land occupies about one-third of the Empire.

The railway, 950 mm. gauge and 306 km. long, extends from Massawa to Agordat via Asmara, the capital city of Eritrea Province. Also good paved highways connect Massawa with Asmara and other principal cities in high plateau areas, up to Addis Ababa, 1,166 km. distant by road.

Existing port facilities are shown in Table III-4. Table III-5 shows volumes of recent imports and exports through Massawa. Major items and volumes of commodities in 1964 Ethiopian Calendar are shown in Table III-6.

Present organization of port office is shown in Figure III-3.

Table III - 4 Existing Port Facilities (Port of Massawa)

Berth:

Commercial Harbour

	Berth	Length	Depth
	1	176 m.	16.5 ft.
	2	150 m.	24.5 ft.
	3	137 m.	28.5 ft.
	4	137 m.	28.0 ft.
	5	137 m.	27.0 ft.
	6	170 m.	30.0 ft.
Salt Berth		Max.	32.0 ft.
Oil Terminals			
Agip Terminal			28.5 ft.
Mobil Terminal			30.0 ft.
Cement Berth		Max.	18.0 ft.
American Jetty		Max.	18.0 ft.

Werehouse:	6	Capacity	75,921 m^3
Open Shed:			2,616 m^3
Stacking Area:			33,555 m^3
Towage:	3 Tug boats	2 x 350 H.P. and 1,000 H.P.	
Cargo Hnadling:	6 Quay Cranes (5T, in tendem 9 T), 3 Folk Lifts		

Table III - 5 Imports and Exports through Massawa

(Metric Tons)

E. C.	Imports	Exports
1960	207,882	210,144
1961	256,547	240,656
1962	283,116	181,870
1963	290,195	259,565
1964	264,374	210,277

Imports and Exports include Home Trade and Transshipment

Table III - 6 Major Commodities Imported and Exported through Massawa (1964 E. C.)

(Thousands Metric Tons)

Import	Chemical Products	6.1
	Fuel & Lubricants	32.5
	Steam Coal	8.9
	Steal and Iron Materials	12.4
	Others	79.8
	Total	139.7
	Home Trade	123.3
	Transshipment	1.3
	Grand Total	264.4
Export	Fruits & Vegetables	19.7
	Lentils	6.7
	Meat Product	5.7
	Niger Seeds (Nehug)	12.6
	Seasame Seeds	42.1
	Yellow Graham	6.8
	Others	26.0
	Sub Total (Excluding Cement & Salt)	119.5
	Cement	17.8
	Salt	66.9
	Total	204.2
	Home Trade	5.9
	Transshipment	0.1
	Grand Total	210.3

(Source: Port Office of Massawa)

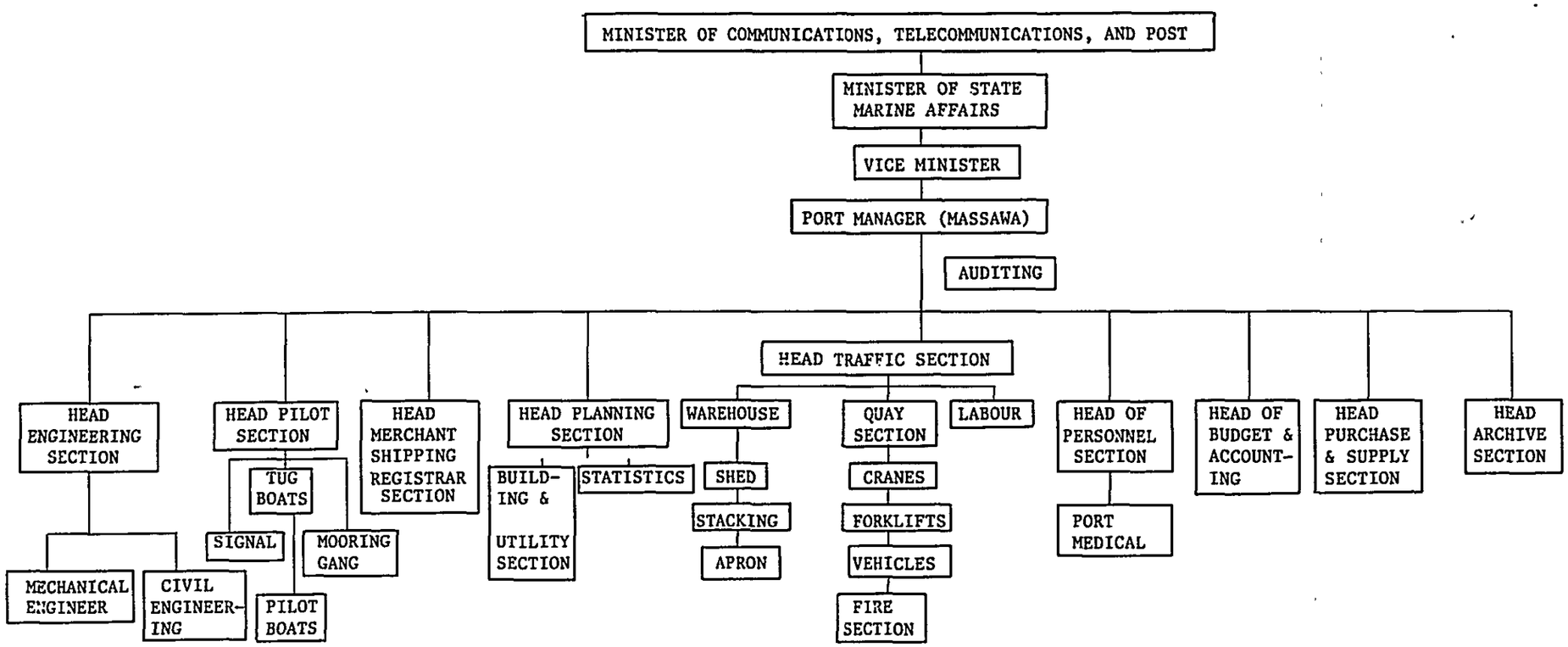


Figure III - 3 ORGANIZATION OF MASSAWA PORT OFFICE

NOTE

Port polices and quarantine section are with the port eventhough separate ministry

(3) Port of Djibouti

The Port of Djibouti belongs to the Territory of Afars and Issas, and is one of the principal ports for exports and imports of southern part of Ethiopia.

Djibouti is a free port and its two major activities are the bankering services for ships, and the transshipment including transit of traffic to and from Ethiopia. Especially the transshipment for other countries than Ethiopia will be more active as the result of decline of the Port of Aden.

The Ethio-Franco Railway, 1,000 mm guage and 781 km. long, connects directly Djibouti to some principal Ethiopian cities, Addis Ababa, Dire Dawa, etc. Poor road networks across the boarder necessitate the railway to accept most of cargoes to and from Ethiopia.

The port is operated under the state supervision by Government officials, who are responsible for administration, maritime and maintenance services. The port budget is annexed to, but distinct from, the general budget for the territory since 1955.

This port had only a rudimentary jetty before 1943 when the expansion project was started, and present port took shape between 1948 and 1957. Existing port facilities are shown in Table III-7. The movement of cargoes in the Port of Djibouti for recent five years is shown in Table III-8. Table III-9 shows items and volumes of cargoes which pass the Djibouti to and from Ethiopia.

Table III-7 Existing Port Facilities (Port of Djibouti)

Berth	Length	Depth	Remarks
1	180 m	9.5 m	
2	220 m	12 m	
5	230 m	8.2 m	
6	215 m	7.9 m	
7	215 m	7.9 m	
8	202 m	9.4 m	
9	200 m	8.2 m	Bunkering only
10	260 m	10.9 m	Bunkering & Discharging black oils
11	170 m	10.9 m	Bunkering only
12	260 m	12.2 m	Bundering & Discharging black oils
13	210 m	10.3 m	Bunkering & Discharging petroleum products (including liquid gas)
Coastal Quay	240 m	3.5 m	

Warehouse: Public 18,740 m^2

Private 6,878 m^2

Open shed: 183,000 m^2

To wage: 4 Tug Boats, 1,320 H.P., 1,000 H.P. and 2 x 600 H.P.

Cargo Handling: Floating Crane (80 T)

Table III - 8 Movement of Merchandises in Port of Djibouti

(Metric Tons)

	Disembarkation	Embarkation
1967	190,746	99,048
1968	204,175	85,876
1969	194,938	112,820
1970	232,866	88,092
1971	256,461	90,937

Table III - 9 Ethiopian Imports and Exports through Port of Djibouti as Transit (1971)

(Thousands Metric Tons)

Import	Grain	28.5
	Sugar and Salt	28.4
	White Products of Petroleum	28.3
	Gas-Oil and Black Products of Petroleum	43.8
	Papers, Cartons and applications	5.3
	Textile Fabrics, Fils, Cords etc.	12.2
	Iron, Foundry Iron, Steel	9.7
	Metal Pipe and Plate	14.3
	Machinery	6.2
	Chemical Products	27.8
	Others	26.2
	Total	230.4
Export	Fruits and Vegetables	12.2
	Meets and Fishes (Fresh, Frozen etc.)	7.3
	Coffee and Tea	35.9
	Sugar and Salt	10.0
	Others	4.3
	Total	69.8

Source: Bulletin de statistique et de documentation No. 7, Janvier 1972, Ministere des Affaires Economiques, Territoire Francais des Afars le des Issas

IV. ESTIMATION OF FUTURE DEMAND FOR EXPORT AND IMPORT

(1) Macroscopic Analysis

Average annual growth rate of export and import have been analysed and consultation on this matter have been made with economists in Planning Commission. The rate adopted for the planning period is 50%, both for export and import which excludes import of crude oil. As the basis of estimation, figures of 1968 which were provided by SRI report have been re-examined and adopted.

Results of calculation are as follows:

(unit: 1,000 M/T)

	1968	1979	1984	1994
Export	524	1,071	1,481	2,832
Import	460	896	1,214	2,227
Total	984	1,967	2,695	5,059

The rate suggested in Planning Commission is 7.0%, but we find some difficulties to make it consistent with the result from sectoral study. For a short range farecast such as 5 years, this rate should be adjusted within the frames of national development plan.

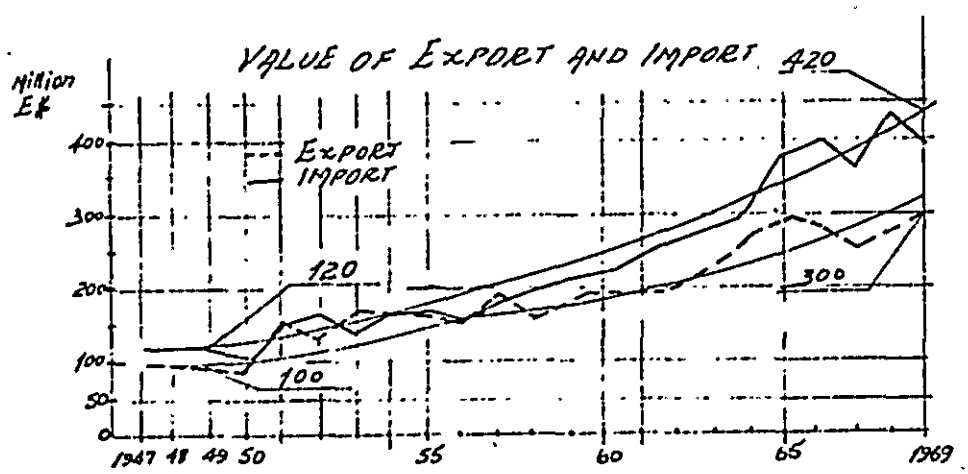
Trends of export and import for last 23 years are listed in Figure IV-1 (Money basis).

(2) Sectoral Study and Regional Allocation

Studies are carried out for major export commodities of Ethiopia, namely coffee, puluses, oilseeds, salt and others. Since data on the regional distribution of import commodities are not available at the time of our analysis, hinterland of each port for import commodities is fixed by population distribution and OD pattern of truck transport provided by "Ethiopian General Road Study".

(2)-1 Coffee

In the 3rd Five Year Development Plan, annual growth rate of 3.5 - 4.0 % is assumed for the export of coffee. SRI report presented two



SOURCE:- ANNUAL EXTERNAL TRADE STATISTICS (1969)
CUSTOMS HEAD OFFICE & CENTRAL STATISTS OFFICE

Figure IV - 1 ANNUAL GROWTH RATE OF EXPORT & IMPORT

figures, HIGH and LOW, which correspond to about 3.75% and 1.6% respectively. To this item, SRI high estimate is utilized without any modification. (Figure IV-2)

Table IV - 1 Export of Coffee

(unit: 1,000 M/T)

1979	1984	1994
124	149	216

In this country, exporting coffee is inspected at 2 stations, namely Addis Ababa and Dire Dawa. Coffee produced in Harrar is the main source to the Dire Dawa inspection station.

Examining the records of tonnage inspected at each inspection station during last 10 years, 10% is assigned as the most probable weight to the Dire Dawa. This 10% will be exported through Djibouti and remaining 90% via Assab. But some of the potential transport demand to Assab may shift to Djibouti by the following two reasons:

1) Franco-Ethiopian Railway may offer extreme preferential tariff to coffee transport from Addis Ababa to Djibouti (escalation of existing seasonal freight system).

2) Export tax for coffee is paid at Addis Ababa in case of via Djibouti while it is paid at site in case of via Assab. The fact will give a little thrust on coffee export whenever market price is increasing. The use of free port zone of Djibouti will amplify this tendency. (Volume of exporting coffee through Massawa to the Red Sea area is negligible.)

(2)-2 Puluses

Report of Experienced Incorporated is taken as the basis of estimation. Since the report present forecasting up to 1982 an extrapolation is made by Logistic Curve. (Figure IV-3)

$$Y = 320/(1 + 13 \text{ Exp. } - 0.3X)$$

here, X : Numbers of years from 1972

Y : Volume of export (unit: 1,000 M/T)

Table IV - 2 Export of Puluses

(unit: 1,000 M/T)

1979	1984	1994
125	235	315

Proposed area of puluses production are classified into 5, namely i) Awasa, ii) Awash Valley, iii) Dese, iv) Dire Dawa - Jijiga and v) Nazaret South. We have allocated these 5 areas to the port in following manner.

i) Dire Dawa - Jijiga: Djibouti
ii) Dese: 1/2 to Massawa, and 1/2 to Assab.
iii) Others: Assab

The results are shown in Table IV - 3.

Table IV - 3 Allocation of Puluses Export

(unit: 1,000 M/T)

	1979	1984	1994
Dire Dawa-Jijiga	13	15	20
Dese (1/2)	9	18	22
Others	103	202	273

Maps showing the production area is attached to Figure IV-4.

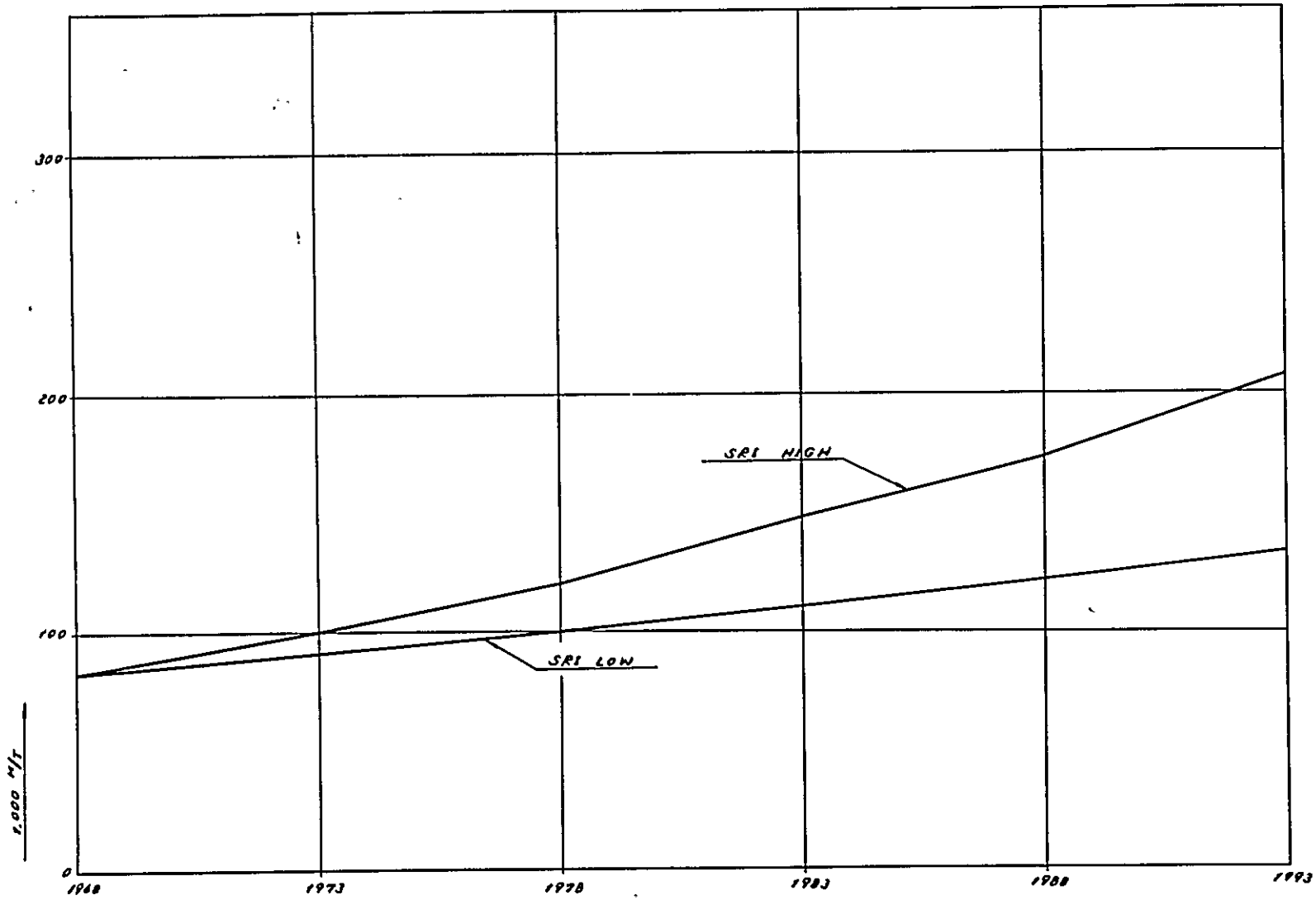


Figure IV-2 ESTIMATION OF COFFEE EXPORT

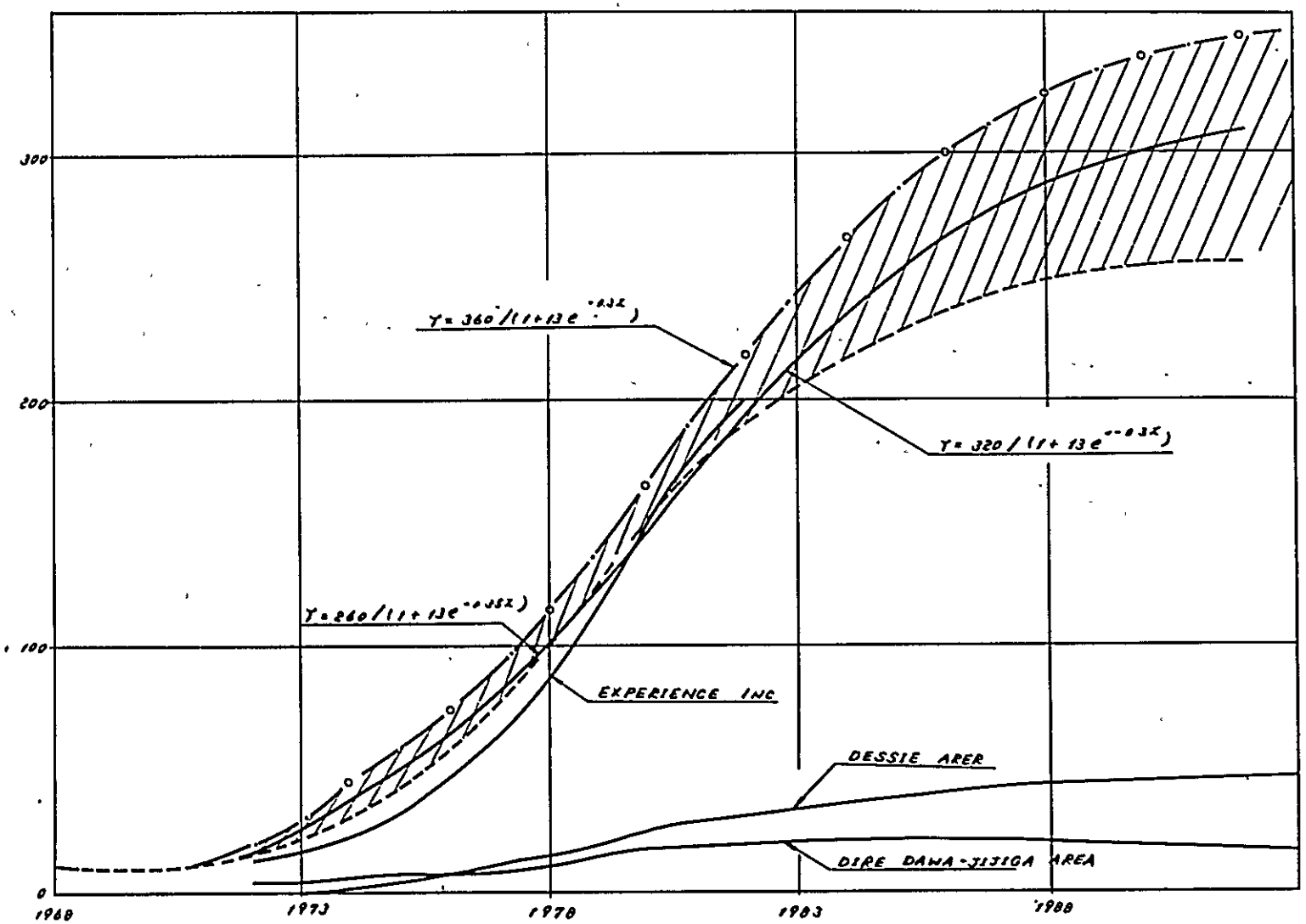


Figure IV-3 ESTIMATION OF PULSE PRODUCTION
(Soura: Experience Incorporated)

(2)-3 Oilseeds

Oilseeds is the one of the most promising export commodities in Ethiopia, but present situation is a little far from the ambitious target of the 3rd Five Year Development Plan.

SRI report contained very wide range of estimation on this item. The difference of assumed average annual growth rate among their high and low estimates amount to about 7 to 8%.

We assumed average annual growth rate of 7.0% along the line of Atkins Report on oilseeds. (Figure IV-5)

Table IV - 4 Export of Oilseeds

(unit: 1,000 M/T)

1979	1984	1994
177	249	489

On the regional allocation, figure of SRI report are utilized but, their transport routes are revised.

Table IV - 5 Revised Transport Route and SRI Original

	SRI	Revised
Area I	Massawa	Messawa
Area II	Assab Djibouti	Assab Massawa
Area III & VIII	Assab Dijibouti	Assab
Area IV	Dijibouti	Dijibouti
Area V & VI	Assab Dijibouti	Assab
Area VII	Massawa Assab Dijibouti	Massawa Assab

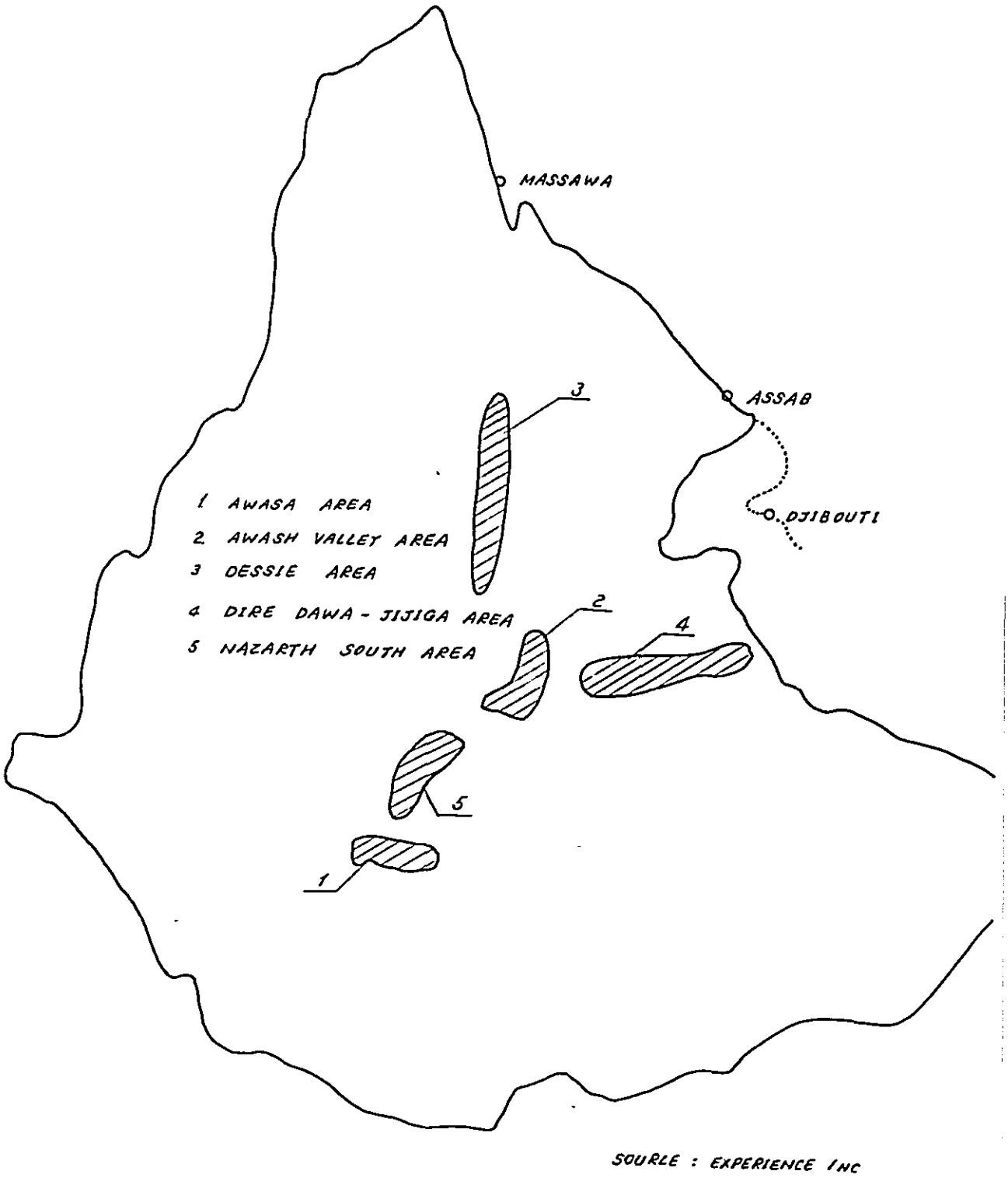


Figure IV-4 PROPOSED AREAS FOR PULSE PRODUCTION

(2)-4 Salt

Export of salt is handled at the port of Assab and Massawa both by the privatly owned loading facilities. Owing to the freight rate to the destination, estimation could not be so favourable to this item. SRI low estimate is adopted after adjustment by the actual figures of 1969.

Table IV - 6 Export of Salt

(unit: 1,000 M/T)

1979	1984	1994
205	220	250

Allocation between the two ports are made by the actual figures. Through the survey we find that certain amount of salt is transported from Assab to Addis Ababa via Djibouti at present. Improvement of road transport will shift this cargo to truck transport.

(2)-5 Copper

Exploitation of copper main in Asmara area shall come to the stage of export before 1979. We adopted tentative plan of Nippon Mining Co. with some modification as the estimate. Naturally, this cargo will be exported through Massawa.

Table IV - 7 Export of Copper

(unit: 1,000 M/T)

1979	1984	1994
60	97	251

(2)-6 Alpha-alpha

Plantation and processing of Alpha-alpha is now under study in Awash Valley. We adopt the figures of preliminary survey and extrapolate it with adequate annual growth rate. This cargo will be transported and handled in bulk through Assab.

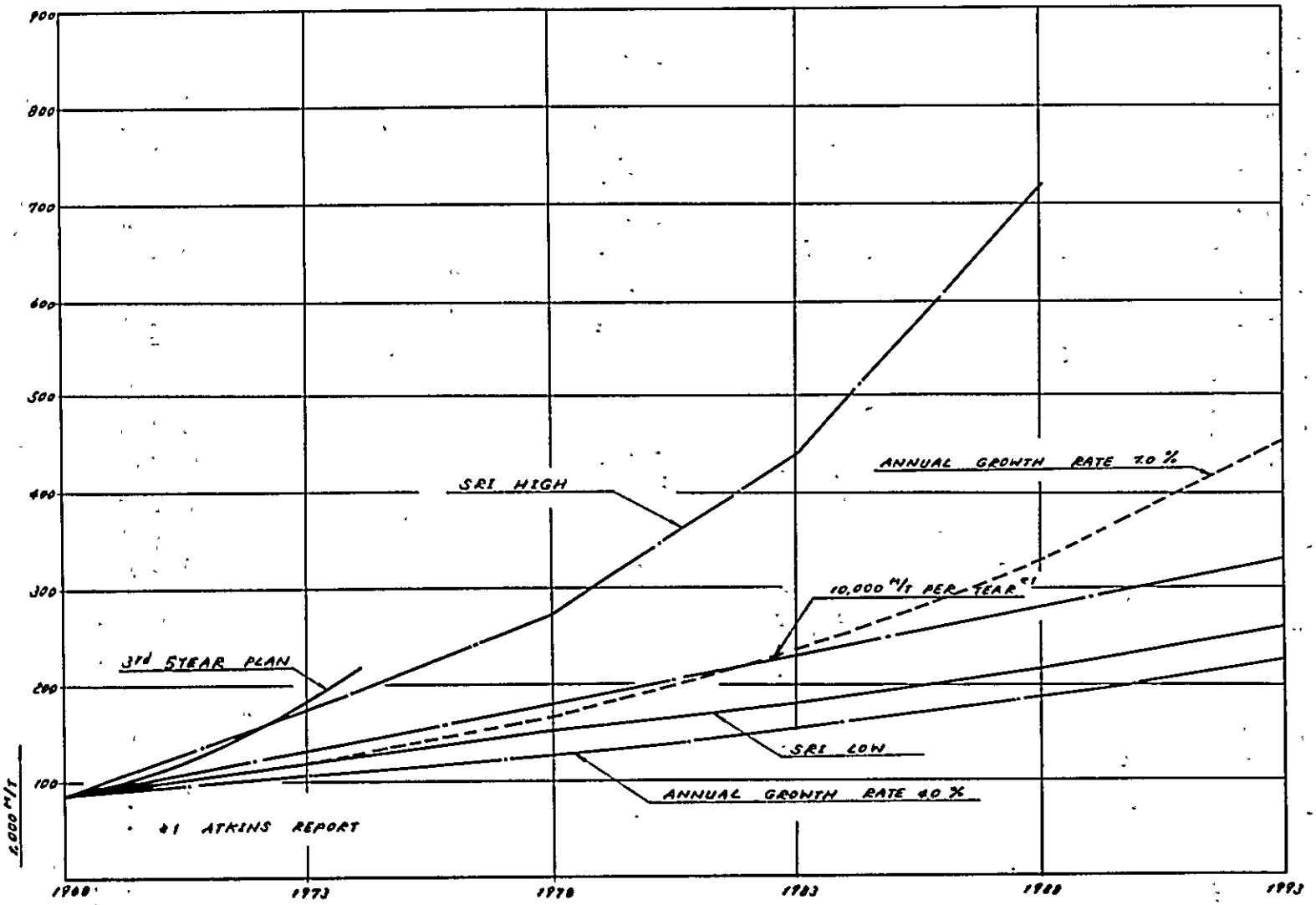


Figure IV-5 ESTIMATION OF OIL SEEDS EXPORT

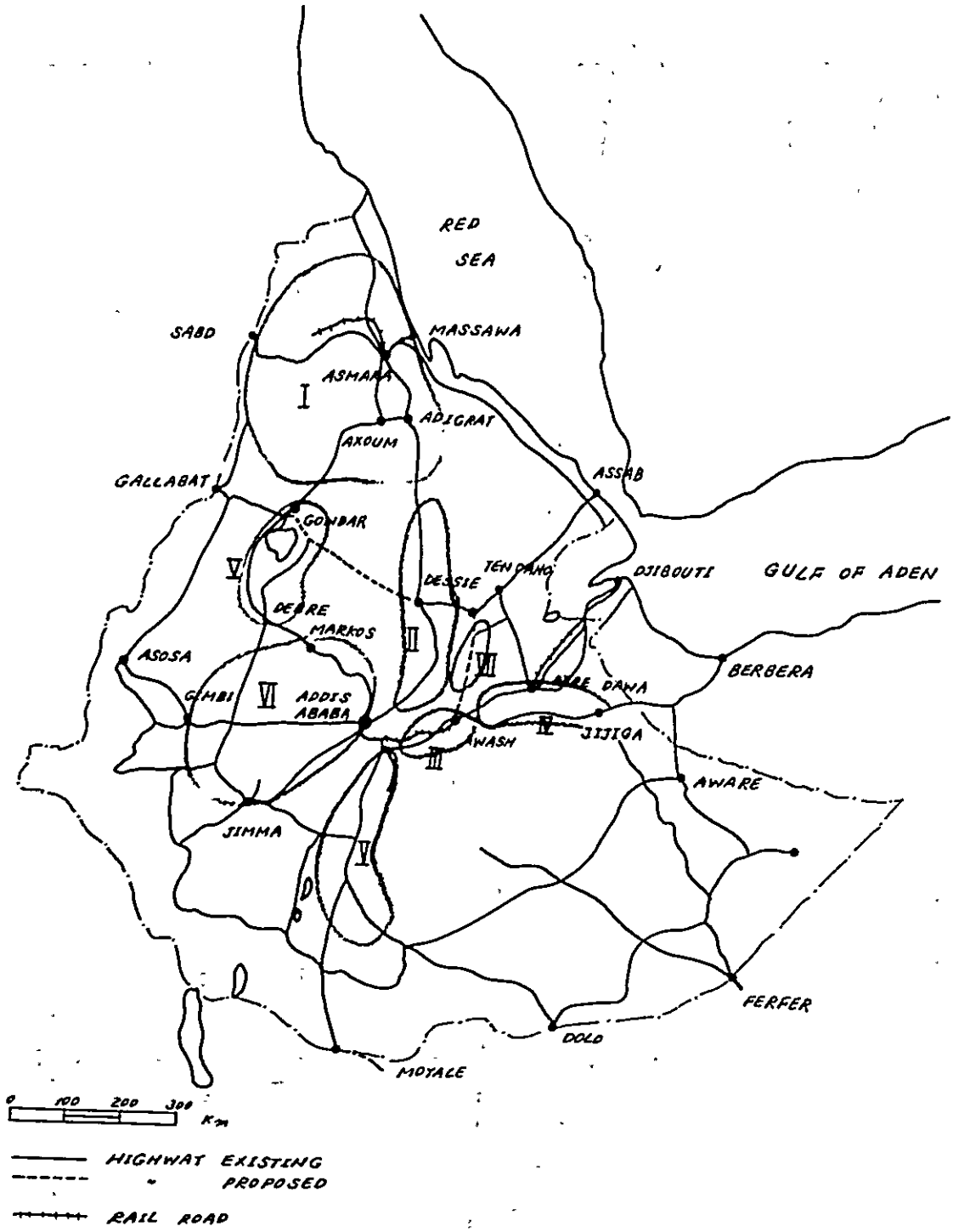


Figure IV-6 PRODUCTION AREAS OF OILSEEDS

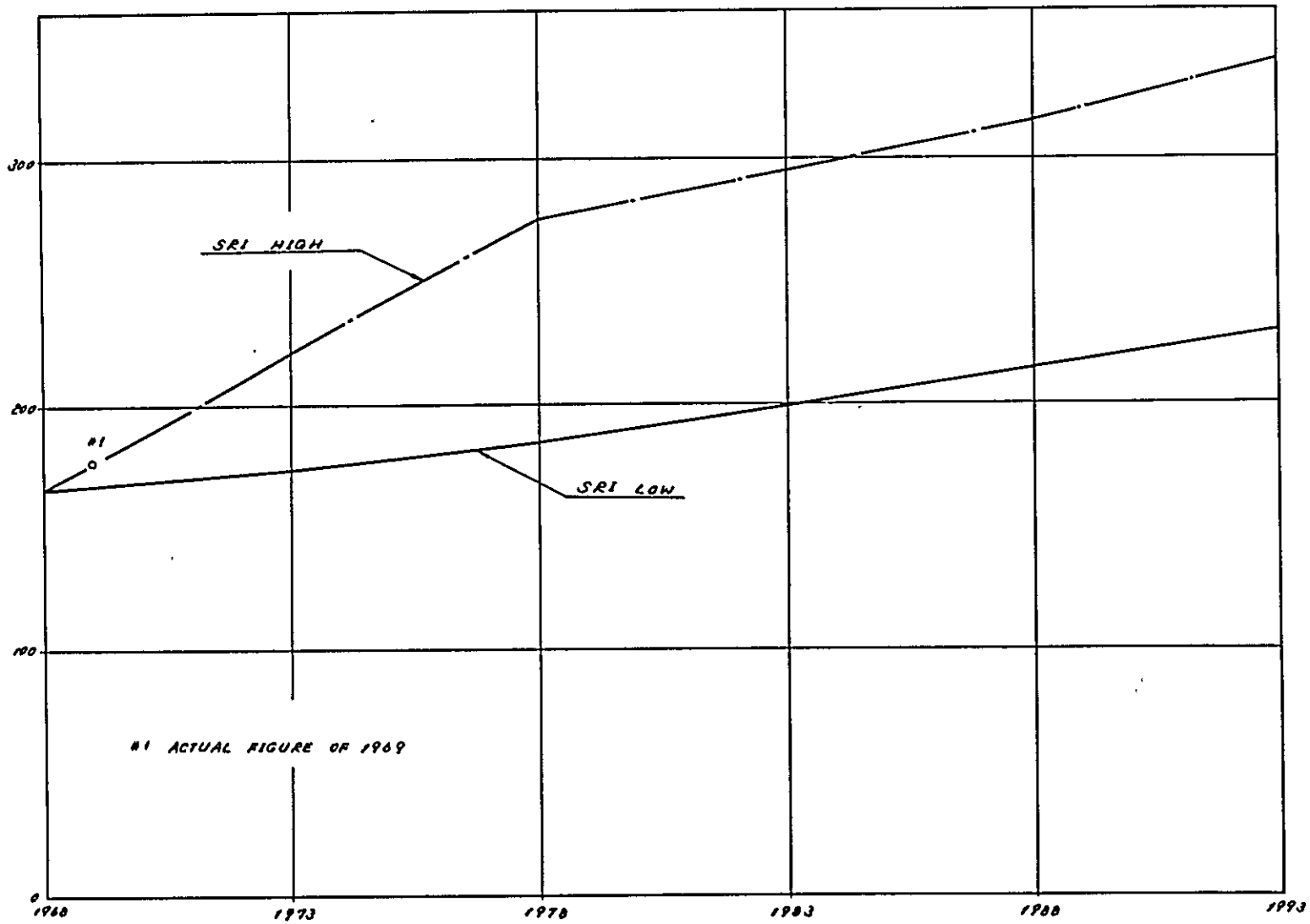


Figure IV-7 ESTIMATION OF SALT EXPORT

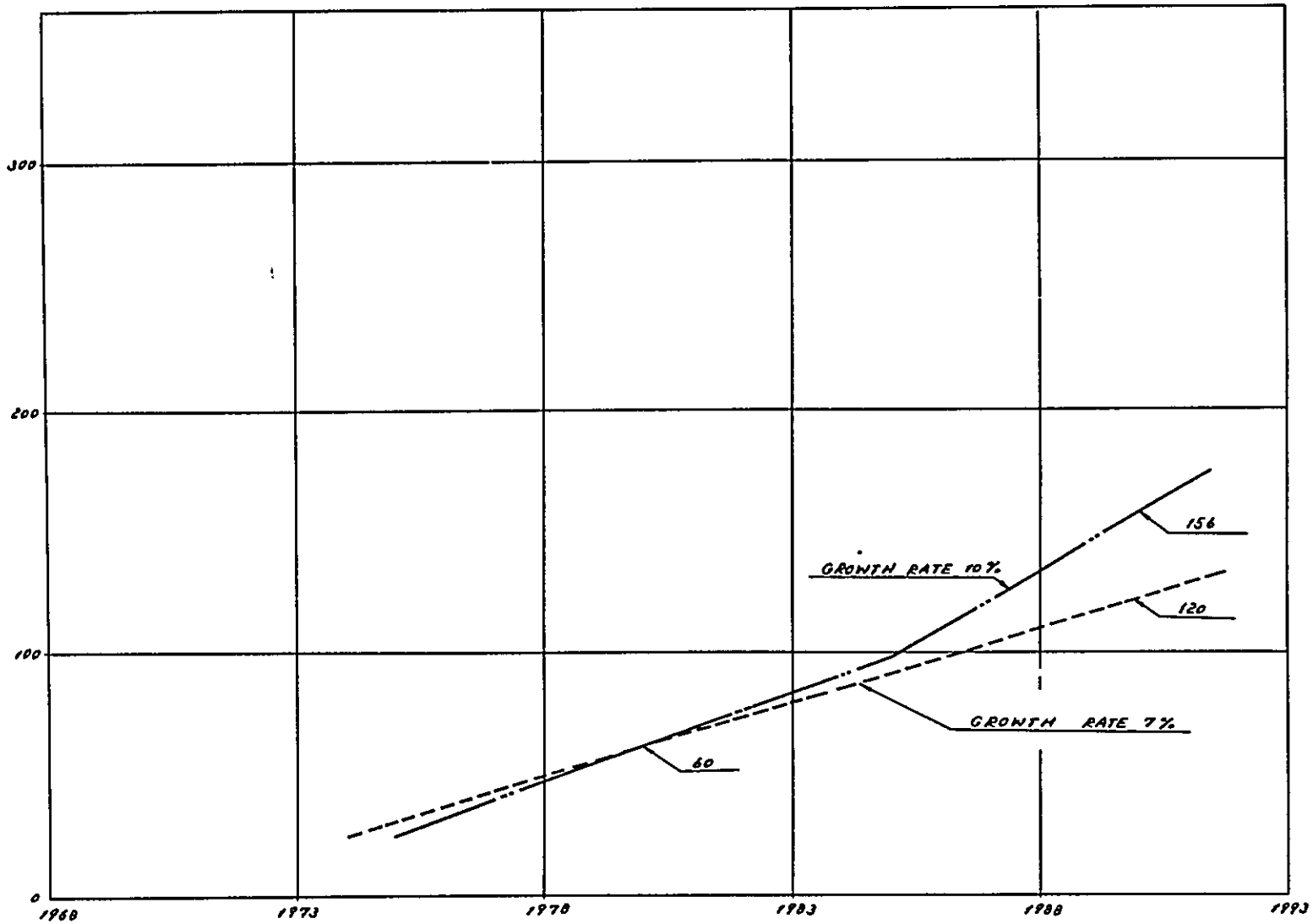


Figure IV-8 ESTIMATION OF COPPER EXPORT
(Through Massawa)

Table IV - 8 Export of Alpha-alpha

(unit: 1,000 M/T)

1979	1984	1994
100	140	276

(2)-7 Crude Oil

All of crude oil imported to this country is processed at Assab Oil Refinery. It is told that the refinery has the expansion plan to cope with increasing demand of refined oil. Capacity under consideration is said about 1.0 million M/T per year at 1976 and 1.5 million M/T per year at 1980.

This figure and statistics of previous years show fairly good coincidence around the average annual growth rate of 8.0%. Figures are calculated on this rate, but search for oil wells now undertaking is unknown factor so large that may change the situation.

Table IV - 9 Import of Crude Oil

(unit: 1,000 M/T)

1979	1984	1994
1,270	1,880	(3,800)

In any case, mooring buoy for unloading in Assab shall be shifted after 1980.

(2)-8 Others

For the export commodities other than listed above, annual growth rate of 4.45% is assumed which corresponds to the average of salt, oilseeds, coffee and puluses.

Table IV - 10 Export of Others

(unit: 1,000 M/T)

1979	1984	1994
202	267	406

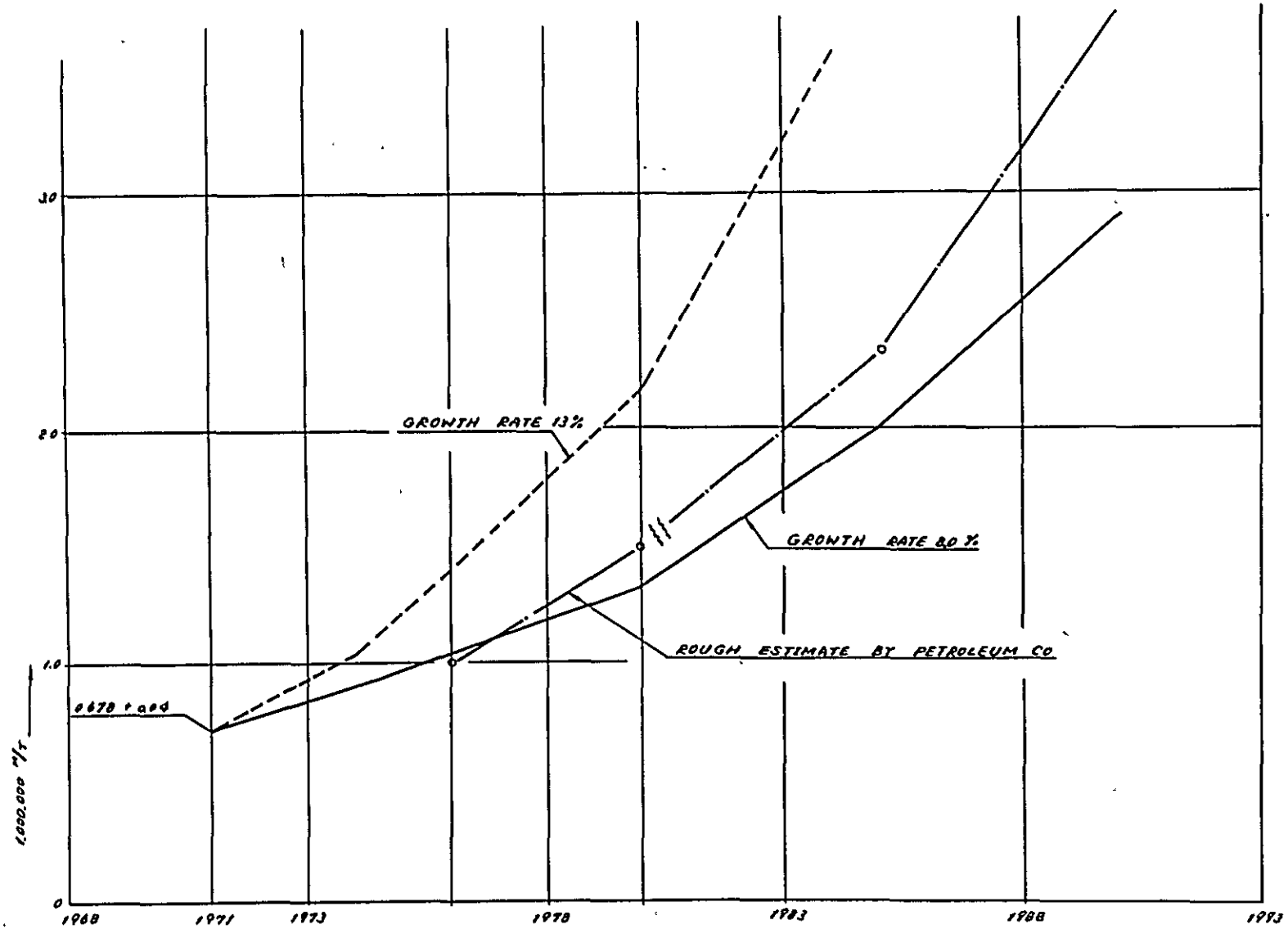
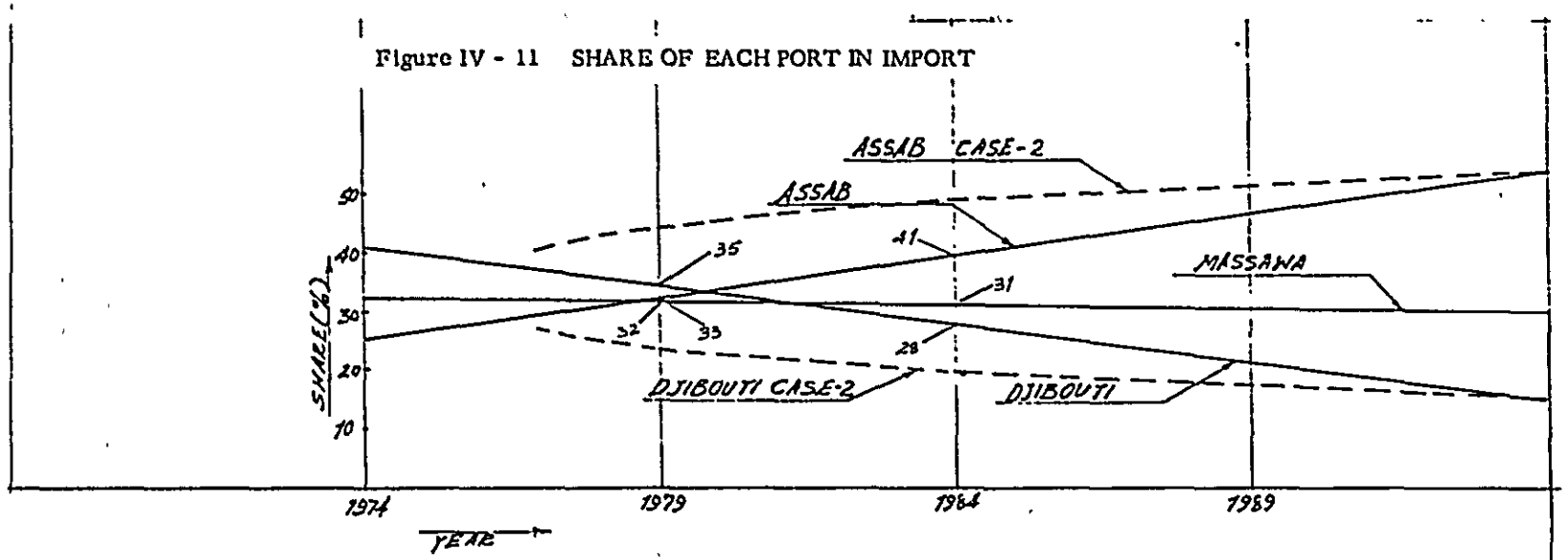
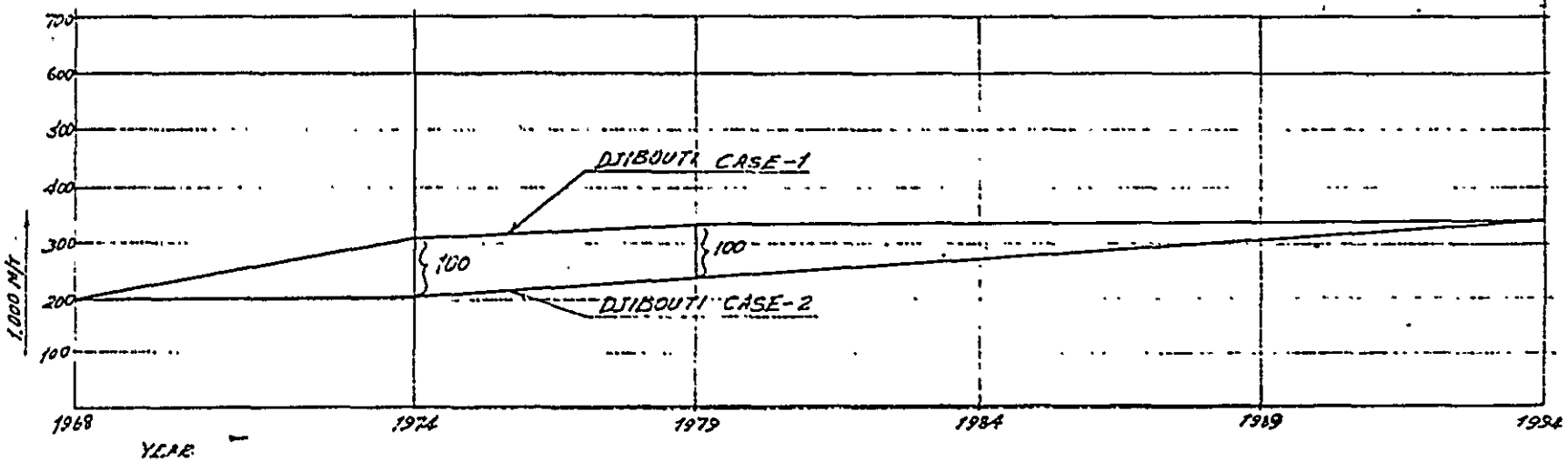


Figure IV-9 ESTIMATION OF IMPORT OF CRUDE OIL

Figure IV - 11 SHARE OF EACH PORT IN IMPORT



ESTIMATION OF IMPORT THROUGH DJIBOUTI



The allocation is done by the same method as import commodities which will be mentioned in (2)-10.

(2)-9 Potash

According to the information we received at Ministry of Mine, some of 600,000 M/T is expecting to export. The site of potash mines located in the area where transport to the existing port contains some difficulties. Therefore most probably handled by new loading site which will be construted somewhere between Massawa and Assab.

(2)-10 Import

Estimation of import commodities are made with the assumed average annual growth rate of 6.5%.

Table IV - 11 Import (Total)

(unit: 1,000 M/T)

1968	1979	1984	1994
460	865	1,180	2,220

Allocation to the port is made by the weight of population inhabited in assigned hinterland of each port. Assignment of the hinterland to the port are as follows:

i) Port of Djibouti will be served by Harar area and the center of commercial activities is in Dire Dawa.

ii) The most part of Eritrea, Tigre and Begemdir, and half of Wello and Gojam will depend on the port of Massawa. The center of commercial activities in this area is Asmara.

iii) The remainning regions where the capital Addis Ababa has direct control on business activities will be served by the port of Assab.

As the result, following figures are assigned to each port:

Assab: 55%
Massawa: 30%
Djibouti: 10%

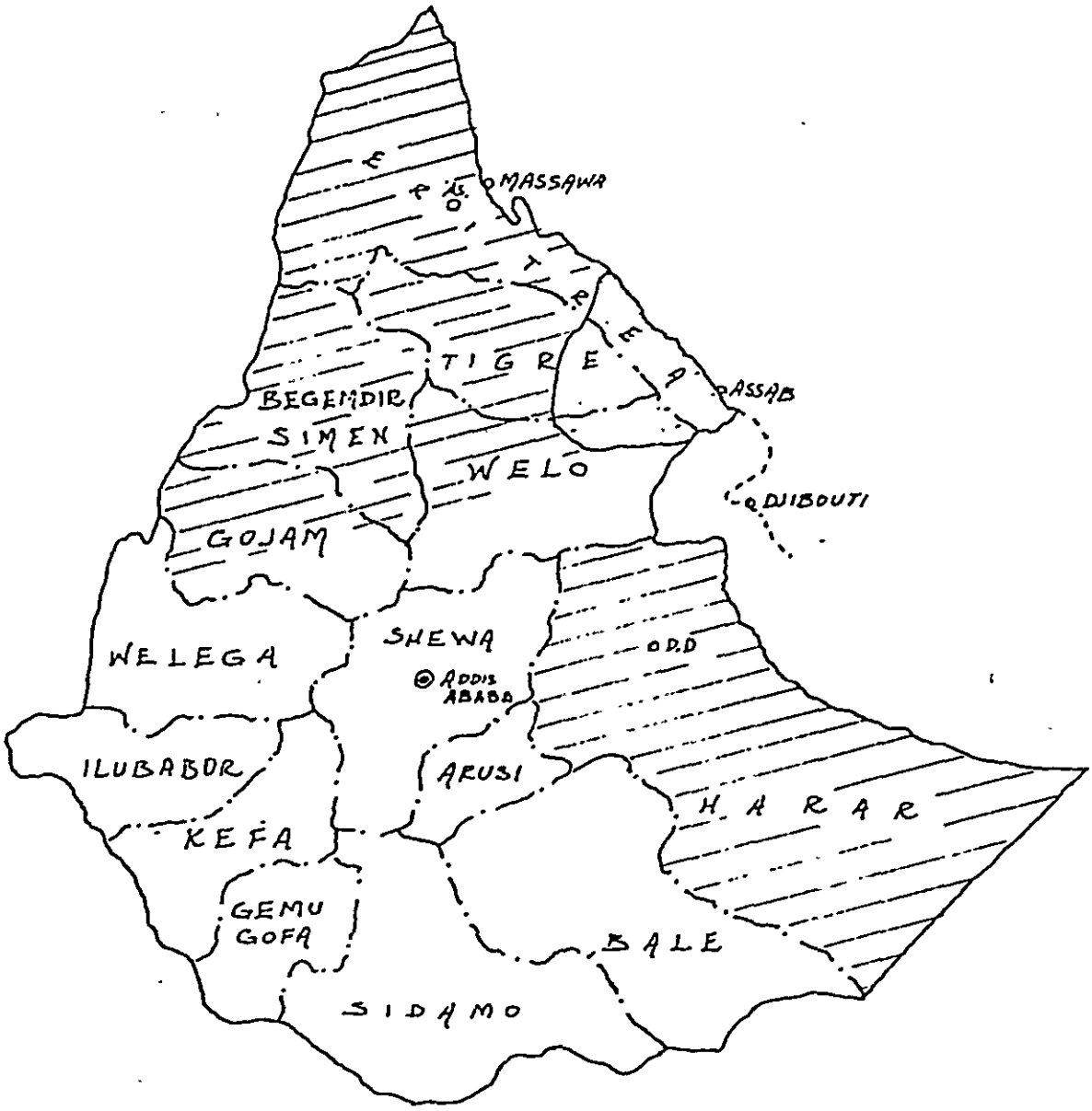


Figure IV - 10 ALLOCATION OF HINTERLAND TO EACH PORT

This regional assignment is consistent with the results of OD survey on cargo movement listed in "Ethiopia General Road Study".

It is not realistic way of thinking that the abovementioned figures must be realized immediately. So we assume the moderate transition from the actual figures to the ratio listed above. Only exception we made is the shift of some importing cargoes from Djibouti to Assab and the volume estimated is about 100 thousand M/T per year during the period of 1974 to 1979. This is essential to solve the persistent unbalance of export and import through Assab and is the key factor to the improvement of inland transport between Assab and Addis Ababa. In order to achieve the shift of import cargoes, certain efforts should be requested to the related governmental organizations.

These are the main items of sectoral study and regional allocation. There are still remaining certain amount of discrepancy between the two approaches, but it is satisfactorily small for the first stage, up to 1979 at least. The discrepancy for the period after 1980 should be considered as the residual terms which will be made clear by the studies hereafter.

V. TRANSPORT DEMAND TO EACH PORT AND EXISTING CAPACITY OF PORT

(1) Transport Demand to Each Port

Summerizing up the results of studies which explained in section IV, we fixed following figures as a tentative estimation.

Table V - 1 Transport Demand to each Port

(unit: 1,000 M/T)

		1979	1984	1994
Assab	Export	597 (219)	847 (268)	1,446 (421)
	Import	385	584	1,221
	Total	982 (219)	1,431 (268)	2,667 (421)
Massawa	Export	291 (146)	390 (189)	696 (356)
	Import	277	366	666
	Total	568 (146)	756 (189)	1,362 (356)
Djibouti	Export	105	117	131
	Import	203	230	333
	Total	308	347	464

*1. Import of Crude Oil is not included in this table.
*2. ( ) shows cargoes will be handled in bulk.
*3. Cargoes of transhipment is not included in the table.

Table V - 2 is the break down by major exporting commodities for each port.

Table V - 2 Break down by Major Export Commodities

(unit: 1,000 M/T)

		1979	1984	1994
Assab	Coffee	112	134	260
	Puluses	103	202	273
	Oilseeds	97	137	269
	Alpha-alpha	(100)	(140)	(276)
	Others	66	109	223
	Sub Total	478	719	1,301
	Salt	(119)	(128)	(145)
	Total	597	847	1,446
Massawa	Puluses	9	18	22
	Oilseeds	71	100	196
	Others	65	83	122
	Sub Total	145	201	340
	Salt	(86)	(92)	(105)
	Copper	(60)	(97)	(251)
	Total	291	390	696
Djibouti	Coffee	12	15	26
	Puluses	13	15	20
	Oilseeds	9	12	24
	Others	71	75	61
	Total	105	117	131

(2) Estimation of Existing Capacity of Ports

(2)-1 Methodology

Cargohandling capacity of existing public berths is estimated by queueing theory. To this aim, following characteristics are studied both for Assab and Massawa Port.

i) ships' arrival to the port
ii) ships' stay in port
iii) tonnage of loading and unloading per ship
iv) number of berths

As indicated in Figure V-1 and V-2 studies clearly show the applicability of M/M/S (∞) type queueing model to both ports.

(2)-2 Port of Assab

Abovementioned port characteristics of Assab are as follows:

tonnage loaded and unloaded per ship: 457 M/T/ship
average days of ships' stay in port: 1.86 days/ship
number of berths: 6

Port statistics show that seasonal fluctuation of transport demand exists and that for the busy period it is some of 20% up to the annual average. If we assume the level of service, berth occupancy, 0.6 and 0.7 during the busy period(*1) and 500 M/T/ship instead of 457 M/T/ship (expecting some improvement), existing capacity of port will be 350-400 thousand M/T per year.

(2)-3 Port of Massawa

Port characteristics of Massawa are as follows:

tonnage loaded and unloaded per ship: 572 M/T/ship
average days of ships' stay in port: 2.17 days/ship
number of berths: 6
seasonal fluctuation: 20%

Assuming the same service level of port of Assab, with 600 M/T/ship instead of 572 M/T/ship, we conclude existing capacity of the port will be 300-350 thousand M/T per year.

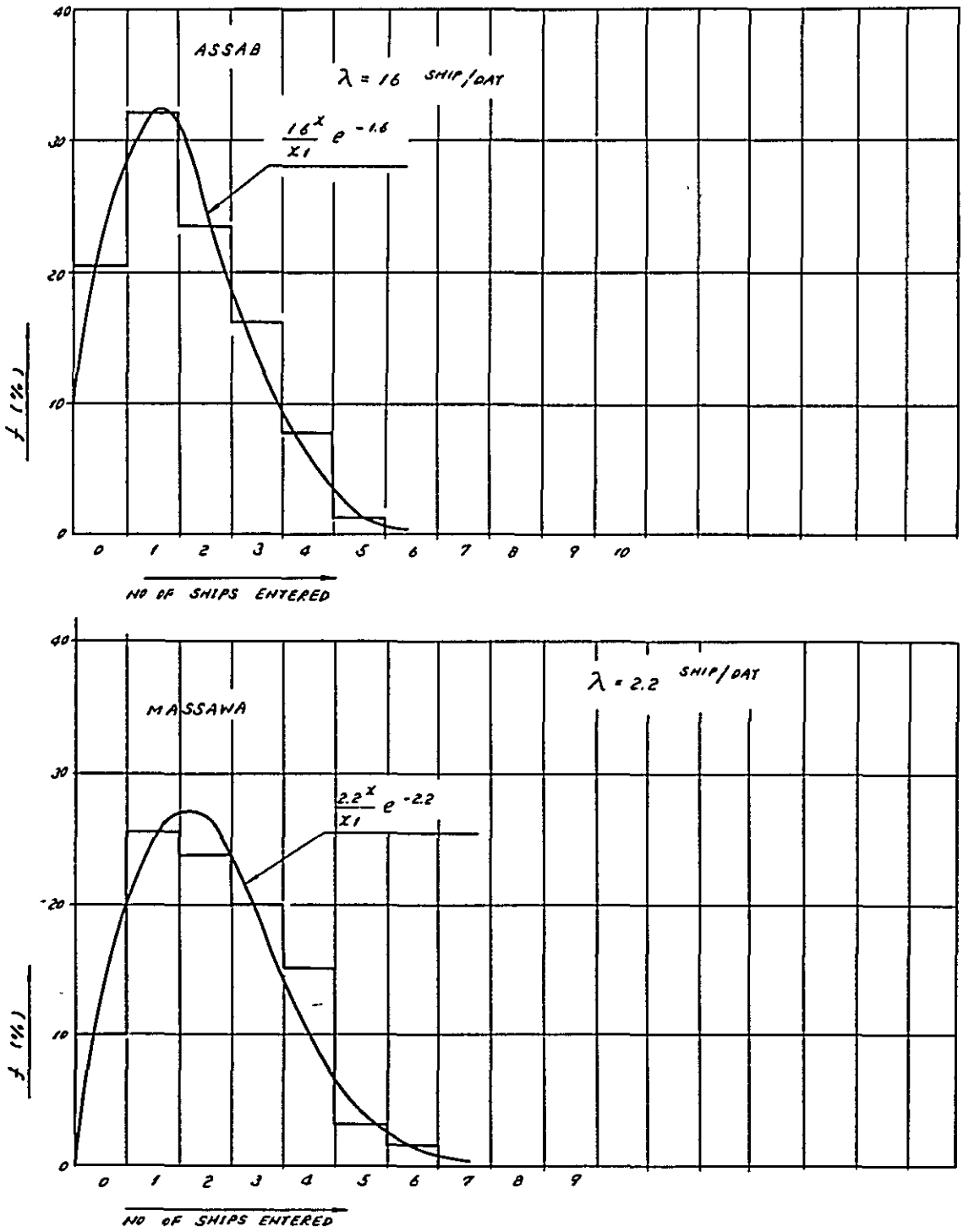
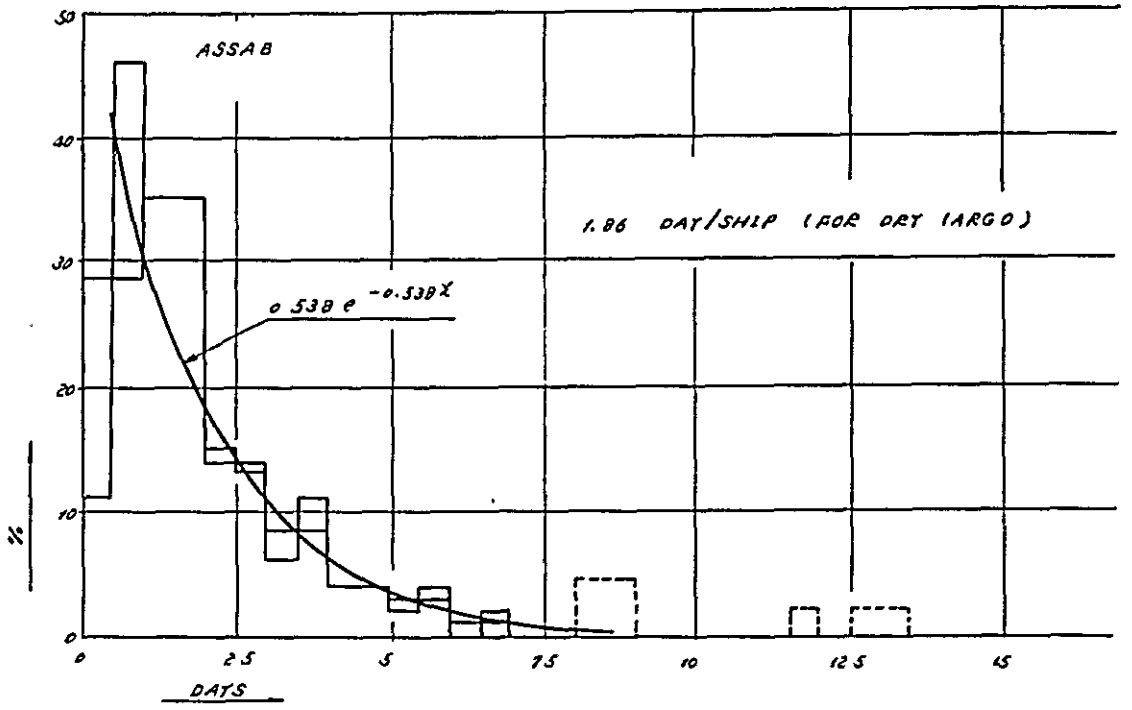


Figure V-1 SHIPS' ARRIVAL DISTRIBUTION OF ASSAB AND MASSAWA



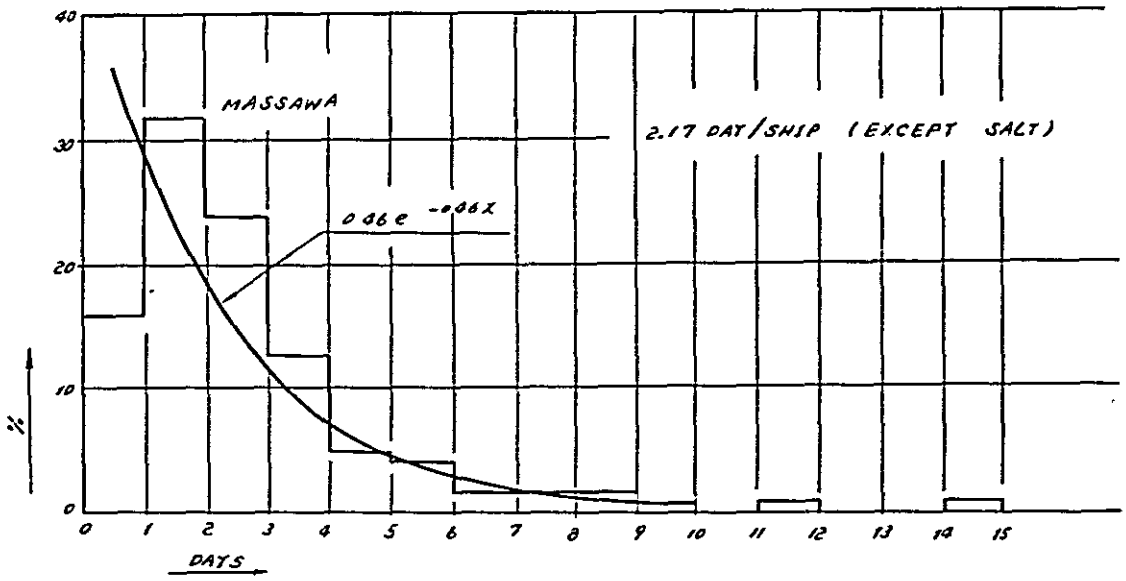


Figure V-2 CHARACTERISTICS OF SHIPS' STAY IN ASSAB AND MASSAWA (AVERAGE STAY IN PORT)

(*1)

Berth occupancy of 0.6 and 0.7 are corresponding to A.W.T./A.S.T. 0.1 and 0.2 respectively.

A.W.T. means average waiting time per ship and A.S.T. average service time per ship.

Case-1

A.W.T./A.S.T.: 0.1
Corresponding data are as follows;
S : number of berths 6
λ: average arrival rate (ship/day)
μ: (ships/day. berth) average service rate,
Assab 0.54 Massawa 0.46
ρ: berth occupancy 0.6 ($\rho = \lambda/\mu \cdot S$).

For bussy period, λ_1(Assab) and λ_2 (Massawa) become
λ_1: = S = 0.6 x 0.54 x 6 ≒ 1.94
λ_2: = S = 0.6 x 0.46 x 6 ≒ 1.66
20% shift down to the annual average make
(mean) ≒ 1.63
(mean) ≒ 1.38

Estimated capacities are

Assab 1.94 ship/day x 365 day x 500 M/T/ship ≒ 354,000 M/T/yea

Massawa 1.38 " " x 365 " x 600 " " ≒ 302,000 " "

Case-2

A.W.T./A.S.T.: 0.2

The only change against case-1, is berth occupancy 0.7 instead of 0.6. That gives about 17% increases to the estimated capacity.

Assab 414,000 M/T/year

Massawa 353,000 " "

VI. GUIDE LINE FOR MAKING MASTER PLAN

(1) Additional Capacity Required for Each Planning Stage

The two factors, transport demand and existing capacity, discussed in section V yield the need for additional capacity by planning stages. Followings are the needs of public berths.

Table VI - 1 Additional Capacity of Public Berth

(unit: 1,000 M/T)

	1974-79	1979-84	1984-94
Assab	363	300	1,183
Massawa	72	145	439

*1. In the 1st 10 years period, alpha-alpha will be handled at public berth. Figures are excluded from the table.

(2) Proposed Size of Construction (number of berths)

It is rather difficult to determine the adequate number of berths should be constructed during the each construction stage. The reasons are i) uncertainty of natural conditions, ii) unknown factors in future bulk transport, iii) impact of containerization to this region.

Therefore, following figures may be revised by further studies and the points of studies are listed above.

(2)-1 Assab

Tentatively proposed size of construction is;

up to 1979	1979-84	1984-94
4-5	3-4	6-8

One of the berths constructed up to 1979 should be equipped with bulk handling facility. This berth will be used both for bulk (exporting agricultural products) and general cargoes.

After 1980, some of berths will be constructed as berths for bulk cargoes. This will reduce the required number of berths because of their high performance in loading. There is no immediate need for improvement of existing salt loading facility.

Referring to crude oil berth, some adequate measures shall be taken to cope with increasing crude oil import, especially after 1980, most probably shifting the existing bouy berth to other appropriate site.

(2)-2 Massawa

Tentatively proposed size of construction is;

up to 1979	1979-84	1984-94
1-2	2	4-5

Bedides, construction of one loading berth for copper ore export and extention of existing berth no. 6 shall be carried out.

There is no immediate needs for improvement of loading facilities of salt and cement.

VII. CONCEPT PLAN OF PORT EXPANSION

(1) Natural Conditions of Each Port

(1)-1 Fetch

Both Assab and Massawa Ports are protected by the islands and reeves around the port areas against ocean waves, especially well sheltered against SE direction. Fetches of both ports traced on the marine charts are shown hereunder. (refer to Figure VII-1)

Direction	Assab	Massawa
N		ca. 100 km
NE	ca. 340 km	ca. 80 km
E	ca. 50 km	ca. 70 km
SE	ca. 40 km	ca. 22 km
S	negligible	negrigible

(1)-2 Direction & Velocity of Wind

There are observation records of direction & velocity of wind at both ports, Assab and Massawa, however, these records are treated on different way. Neverthless we can roughly recognize their characteristics from records.

Assab

Results of our analysis of the observation records at the Assab Port are shown in Table - 1, 2 and Fig. 2.

These records shows:

i) Wind from S. to E. predominating, 82%, especially wind of SE. occupies 42%.

ii) most frequent wind velocity is 3 to 10 m/sec. and strong wind of over 18 m/sec. is quite few, only 6 times in the year (1.4%).

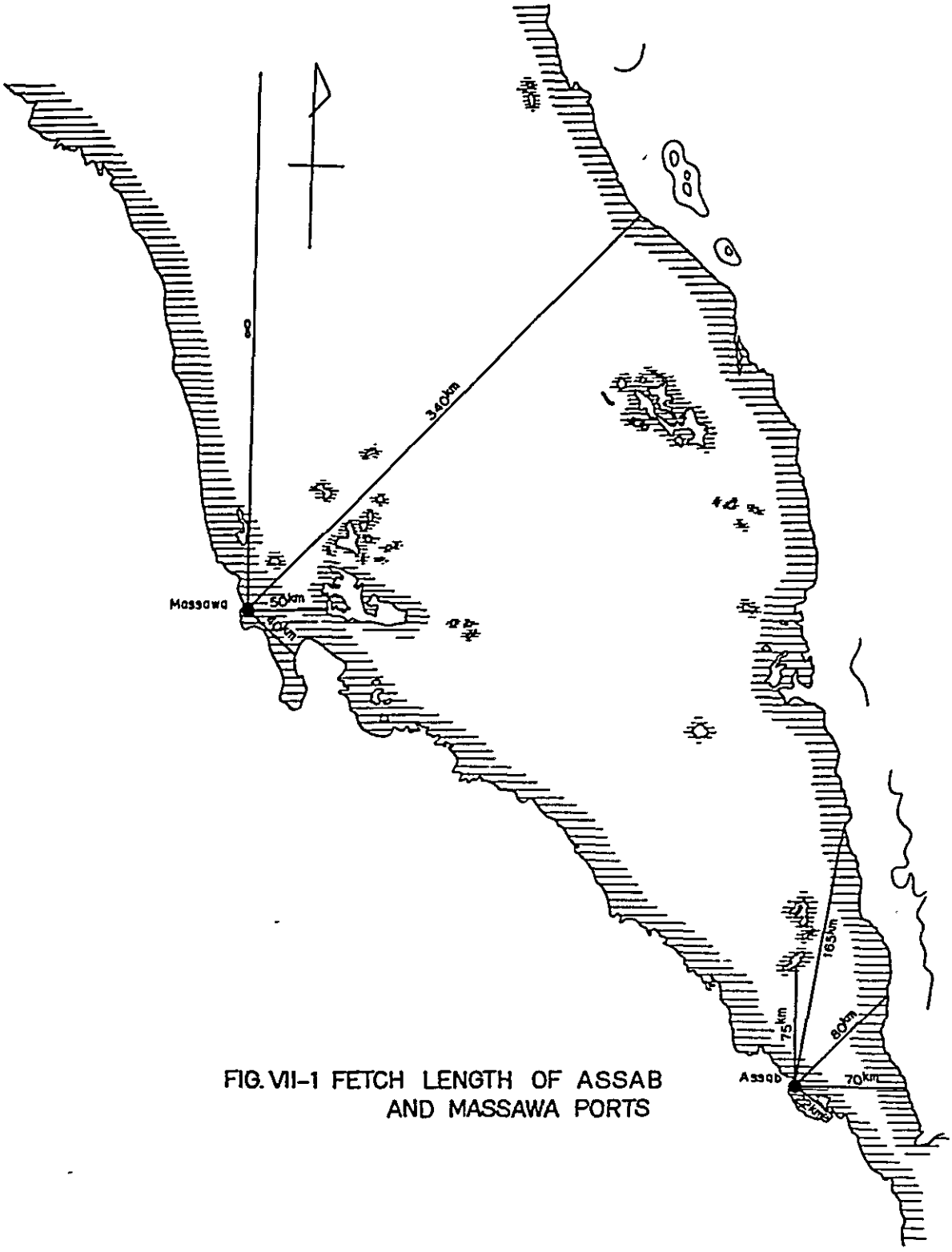


FIG. VII-1 FETCH LENGTH OF ASSAB AND MASSAWA PORTS

Table VIII - 1 Records of Wind Direction and Frequency in Assab

Month / Direction	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
N		5	7	6	10	20	34	36	17	1		2	138
NE				3	7	4	10	12	2	6			44
E	21	18	21	32	32	15	1	9	13	22	32	19	235
SE	86	59	65	57	11	10		2	5	50	78	99	522
S	33	47	39	35	10				7	28	34	27	260
SW		1	1		1				1				4
W			1				6	1	1				9
NW			1	2	8	2	9	3	2				27
Total	140	130	135	135	79	51	60	63	48	107	144	147	1239

Table VII - 2 Records of Wind, by Velocity & Frequency

Month \ (m/sec.) Velocity	0.5 - 2	2-4	4-6	6-8	8-10	10-13	13-16	16-18	18-	Total
Jan.	3	10	10	22	77	33	25	3	2	185
Feb.	1	8	11	19	49	42	30	5	4	169
Mar.	1	5	23	22	43	38	37	7	10	186
Apr.	1	4	15	25	55	43	19	14	4	180
May	1	8	37	61	49	17	10	3		186
June	3	20	47	59	41	5	5	1		180
July	3	5	31	55	42	11	6			154
Aug.	2	29	43	40	53	10				177
Sep.	2	9	63	67	40	8				189
Oct.	1	12	35	30	76	24	7			185
Nov.		2	14	19	66	57	16	2	5	181
Dec.		2	25	12	71	50	18	1	7	186
Total	18	114	354	431	662	338	173	36	32	2158

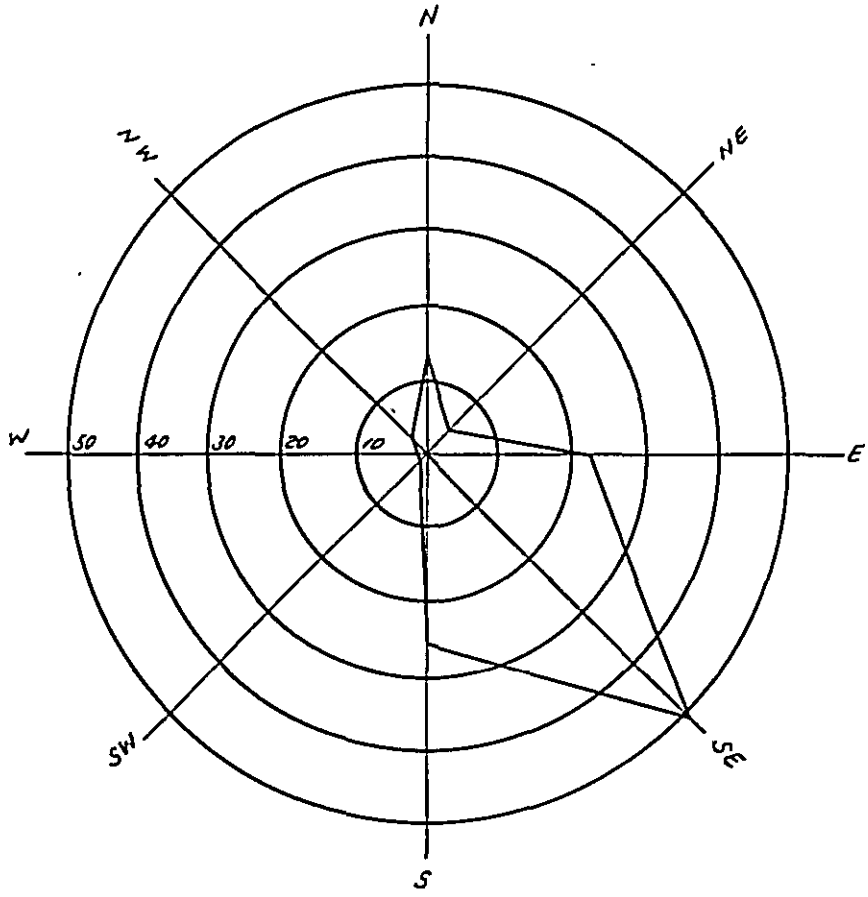


Figure VII-2 DIRECTION AND FREQUENCY OF WIND IN ASSAB RECORD FOR 1960 - 1965

Massawa

For Massawa there is a observation record for 1969 - 1971, from this we see direction and velocity of wind and its frequency as follows:

Direction	Velocity	Frequency
NE	10 m/sec.	1,224
N	15 m/sec.	783
calm		1,053

Note: 1) Observed at 6, 9, 12, 15, 18, 21 hours in local time each day

2) Record prepared by the Port Office of Massawa

Table VII - 3 Maximum Wind Velocity in M/sec. with Direction

Month	Direction	Velocity
January	060 degree	26 m/sec
February	030 "	22 "
March	030 "	24 "
April	030 "	24 "
May	020 "	24 "
June	360 "	26 "
July	330 "	25 "
August	360 "	25 "
September	360 "	24 "
October	060 "	23 "
November	080 "	23 "
December	360 "	25 "

(1)-3 Waves

Estimation of wave characteristics from the above record cannot be made accurately due to lack of data on wind duration and fetch width. As far as we learned at the both ports, the strong wind blew usually only 1-2 hours at maximum, then the fetch width cannot be very large.

Estimated characteristics of waves from wind record on frequency of stronger wind, velocity and direction will be sufficient for drawing up concept plan of port.

From the above we estimate the maximum wave height at the both ports as follows.

	wave height	wind direction
Assab	0.8 - 1.0 m	SE
Massawa	1.6 m	NE

To be noted that height, direction, profile, of existing breakwaters, records of wave overlapping and damages, if any, would be a valuable information for us to draw up a plan.

(1)-4 Tide

Assab

No reliable information on this item was available for Assab, however, we can roughly estimate on the basis of records at Massawa mentioned hereunder and those for C. Bole el Mandah as follows.

$$\frac{4 \text{ ft (Massawa)} + 5 \text{ ft (C. Bole el Mandah)}}{2} = \text{ca. } 4.5 \text{ ft.}$$

Massawa

Observation records of tide level at Massawa in 1972 have been analyzed and the following table on monthly highest and lowest tide level has been prepared. Mean tide levels are for high tide 3.48 ft or 1.06 m and for low tide -0.23 ft. or -0.70 m respectively.

Table VII - 4 Record of High and Low Tide for 1972 in ft.

	Jan.	Feb.	Mar.	Apr.	June	July	Aug.	Sept.	Mean
Max.	3.5	3.5	3.7	-	3.7	2.9	3.8	3.2	3.48
	-0.1	0.0	-0.2	-	-0.3	-0.8	-0.8	-0.8	-0.23

Spring rise at various ports on the Red Sea indicated on the Marine Chart is for Massawa approximately 4 ft, that is to say this figure coincides nearly with the value of the observation above.

For our planning 4 ft. would be sufficient practically.

Spring Rise at various ports on the Red Sea according to the Marine Chart.

Suez	7 (ft.)
Aden	7
Loheiya	3
Jiddah	2
Massawa	4
C Bole el Mandah	5

(2) Sites for Port Expansion

Selection of sites for expansion shall be decided under due consideration of natural and geological conditions, shape of town and arrangement of industrial area behind the port.

Sites for both ports, Assab and Massawa shall be therefore, chosen as follows.

(2)-1 Assab

New public berths shall be constructed in the southern water areas of the present port. Taking into consideration an increase of crude oil import and larger tankers operating, the sea berth for crude oil must be shifted to deeper off-shore area.

(2)-2 Massawa

As shore-lines are used for the existing facilities, large scale port facilities are hardly constructed within present port area. New public berths shall be planned in the new water area between the present commercial port and the Sheikh Said.

For copper ore export facilities shall be arranged either on adjacent area of the present salt berth or at the old jetty. Selection of site must be decided on due consideration of utilization of areas behind and space for berthing.

(3) Characteristics of Water Areas

(3)-1 Assab

The southern water areas of the existing port have the following advantages.

a) Waves caused by the prevailing wind of direction SE is sheltered by Umm-al-Dahar, lying 5 km off-shore

b) Depth and size are adequate

c) No obstacles against forming any plan of port facilities, as there are only oil refinery and salt field behind the proposal water area.

d) New port facilities function together with the existing as an integrated unit.

e) Addis Ababa-Assab road runs the southern part of Assab, land transport to the hinterland is very easy.

(3)-2 Massawa

Establishment of the new port facilities on the water areas between the existing port and Sheikh Said Island has the following advantage.

a) Prevailing NE/NNE wind can be easily sheltered.

b) The new port facilities are located directly adjacent to the existing facilities and both function as one unit.

c) Sheikh Said Island will be connected with the land and will be an integral part of town planning.

d) Connection with the existing railways and road is easy.

(4) Consideration on Traffic Demands and Storage Capacity

(4)-1 Traffic volume at the wharf

The valume of cargoes handled at Assab and Massawa will increase continuously every year. Accordingly annual increase of vehicles, incoming and outgoing, to both ports has to be taken in due consideration. Reasonable criterion of road capacity within the port areas should be necessarily established.

Volume of cargoes handled at the both ports except those treated at private berths such as crude oil, its refined products, cement, salt and mineral ores and cargoes for transhipment which have nothing to do with inland transport, is estimated as follows.

(in 1,000 T)

Year	1964	1979	1984	1994
Assab	252	863	1,303	2,522
Massawa	356	422	567	1,006

Massawa is connected to its hinterland with the Northern Railway, modal split between road and railway here will be changed in the future to the advantage of road, however, this problem is put aside assuming that all traffic be done by vehicles.

In order to get rough estimation of traffic volume the following formula is applied. Lack of basic parameter permits us only to estimate very roughly, it should be noted here.

$$\text{hourly traffic volume} = \text{annual cargoes volume} \times \frac{a}{W} \times \frac{\beta}{12} \times \frac{\gamma}{30} \times \frac{(1+\delta)}{} \times \gamma$$

α = ratio of transport by vehicles 1.0

β = monthly fluctuation ratio of cargo 1.5

monthly cargo volume at peak/ monthly average volume (1.2 in Japan)

γ = daily fluctuation ratio of cargo — 1.5
daily cargo volume at peak/ daily average volume — (1.4 in Japan)

W = load factor of truck — 12 t/per truck (assumed)

ε = utilization factor of truck — 0.4
number of utilized trucks/ number of total trucks — (0.6 in Japan)

δ = ratio of other vehicles to trucks — 0.5
numbers of other vehicles/ number of trucks — (1.2 in Japan)

ζ = fluctuation ratio per hour — 0.3
peak traffic volume/ daily average traffic volume — (0.15 in Japan)

From the above estimated numbers of operating trucks per hour may be as follows. (vehicle/hour)

	1964	1979	1984	1998
Assab	147	506	764	1,480
Massawa	208	247	332	590

The above figures may be a little over estimated as no accurate data are available. But they give us a rough idea that two lane road would be enough for accomodating the above traffic volume within port areas, considering actual traffic situation in the modern cities. However, to meet an additional traffic demands in connection with traffics between ports and cities and those between other cities due attention should be paid on road planning even within the port areas.

(4)-2 Warehouses

At both ports there are warehouses within port area for storage of general cargoes such as food, articles of daily use etc. which cannot be kept on the open storage. Figure VII-3, 4 shows how they are utilized. At both ports a heavy monthly fluctuation in cargoes stored in public warehouses is observed. A record of typical warehouse shows followings characteristics, monthly total of incoming and outgoing cargoes at Assab in annual average is something around 4,000 t with some 4,500 t in stock in the warehouse and at Massawa 1,400 t and 1,000 t respectively.

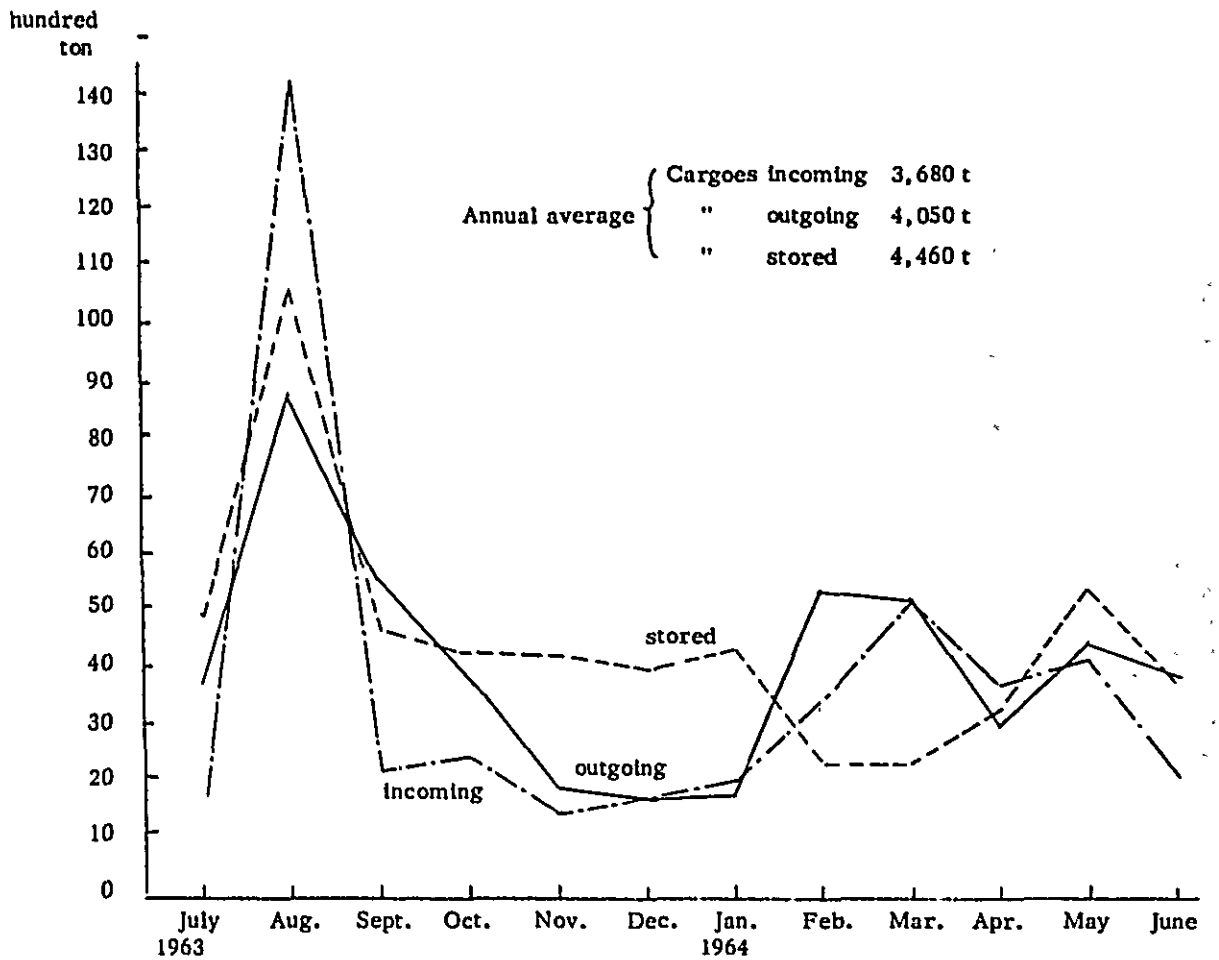


Figure VII - 3 MONTHLY VOLUME OF INCOMING & OUTGOING CARGOES OF ASSAB (WAREHOUSE)

The existing warehouses at both ports are apparently fully utilized, therefore, in drawing up the future expansion plan of port a due consideration should be given to the numbers of new berths and corresponding warehouses on the basis of more detailed studies.

Referring to the utilization of open storage Figure VII-5 shows how it is utilized at Assab. Here with total volume of outgoing and incoming cargoes of 4,000 to 5,000 t monthly, 14,000 t of cargoes remain always at the open storage, which seems now a little to narrow for the demand. As Figure VII-6 clearly shows most of export cargoes is loaded directly on ships which amounts to monthly in average to 45,000 t, it is necessary in our future planning to reserve sufficient space for open storage directly behind the berths to be constructed.

To get correct idea for the necessary space of open storage the detailed survey and investigation on such data as loading, storage, transport etc. of major cargoes by item is indispensable.

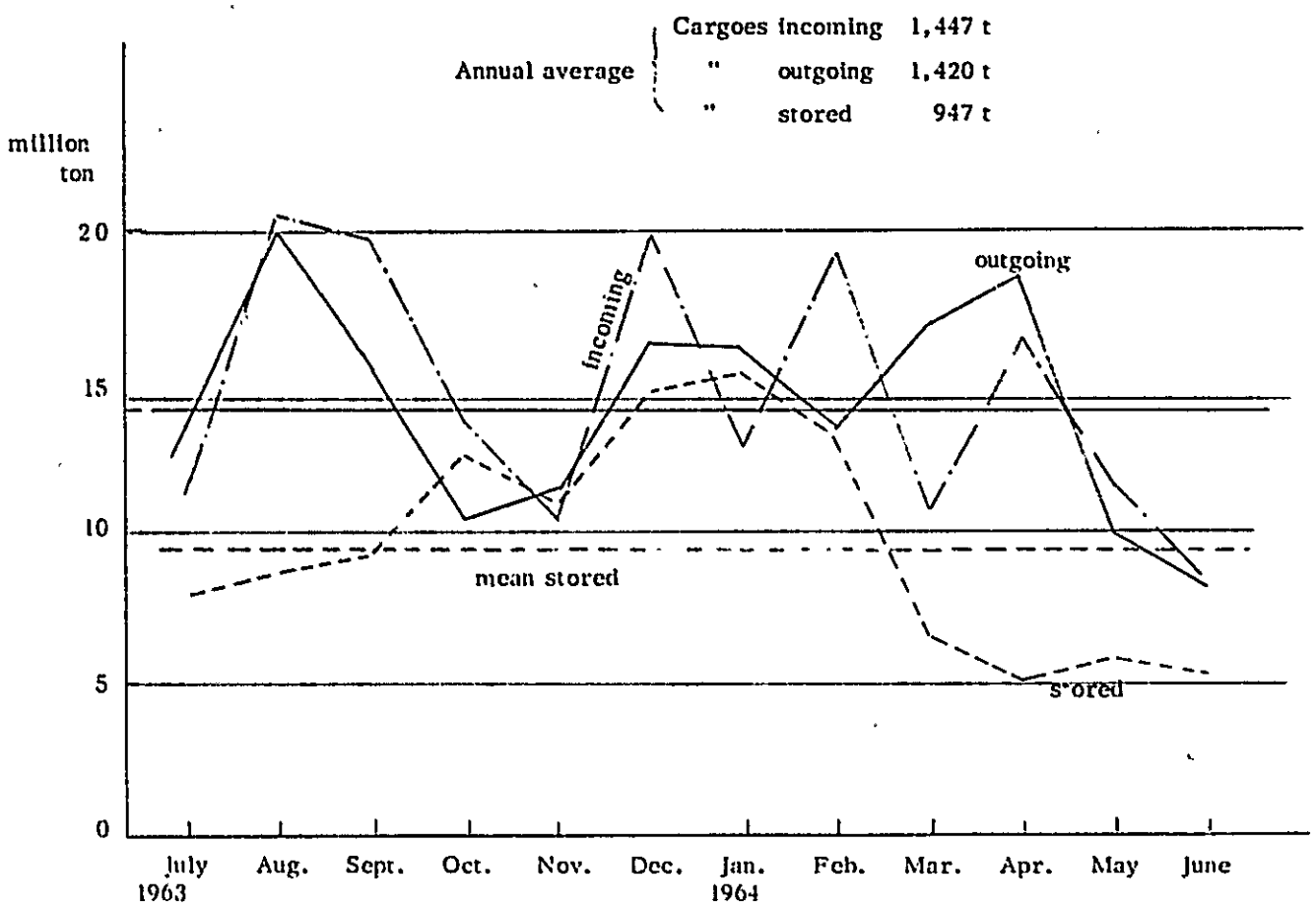


Figure VII - 4 MONTHLY VOLUME OF INCOMING AND OUTGOING CARGOES AT MASSAWA (WAREHOUSE)

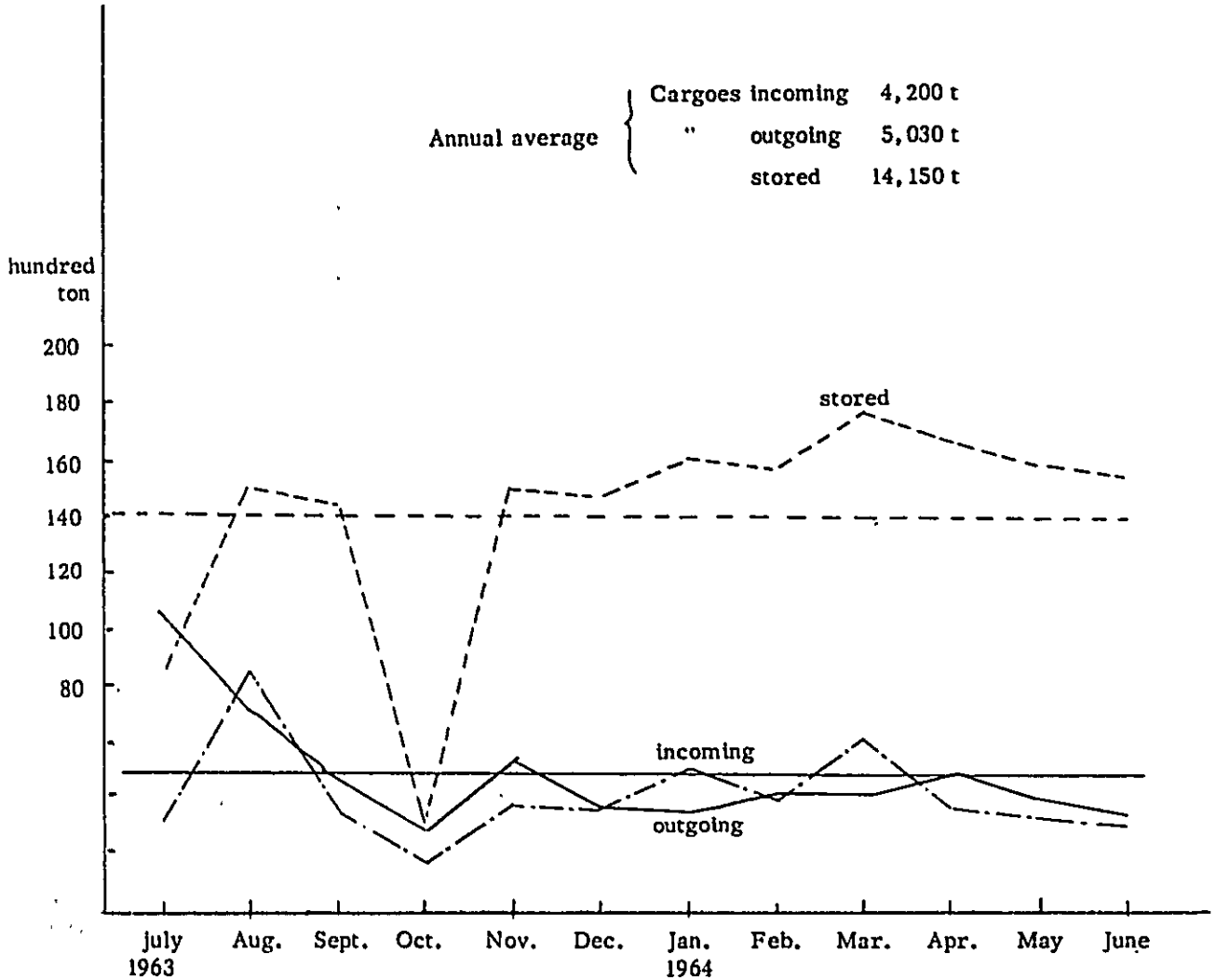


Figure VII - 5 MONTHLY VOLUME OF INCOMING AND OUTGOING CARGOES IN ASSAB (OPEN STORAGE YARD)

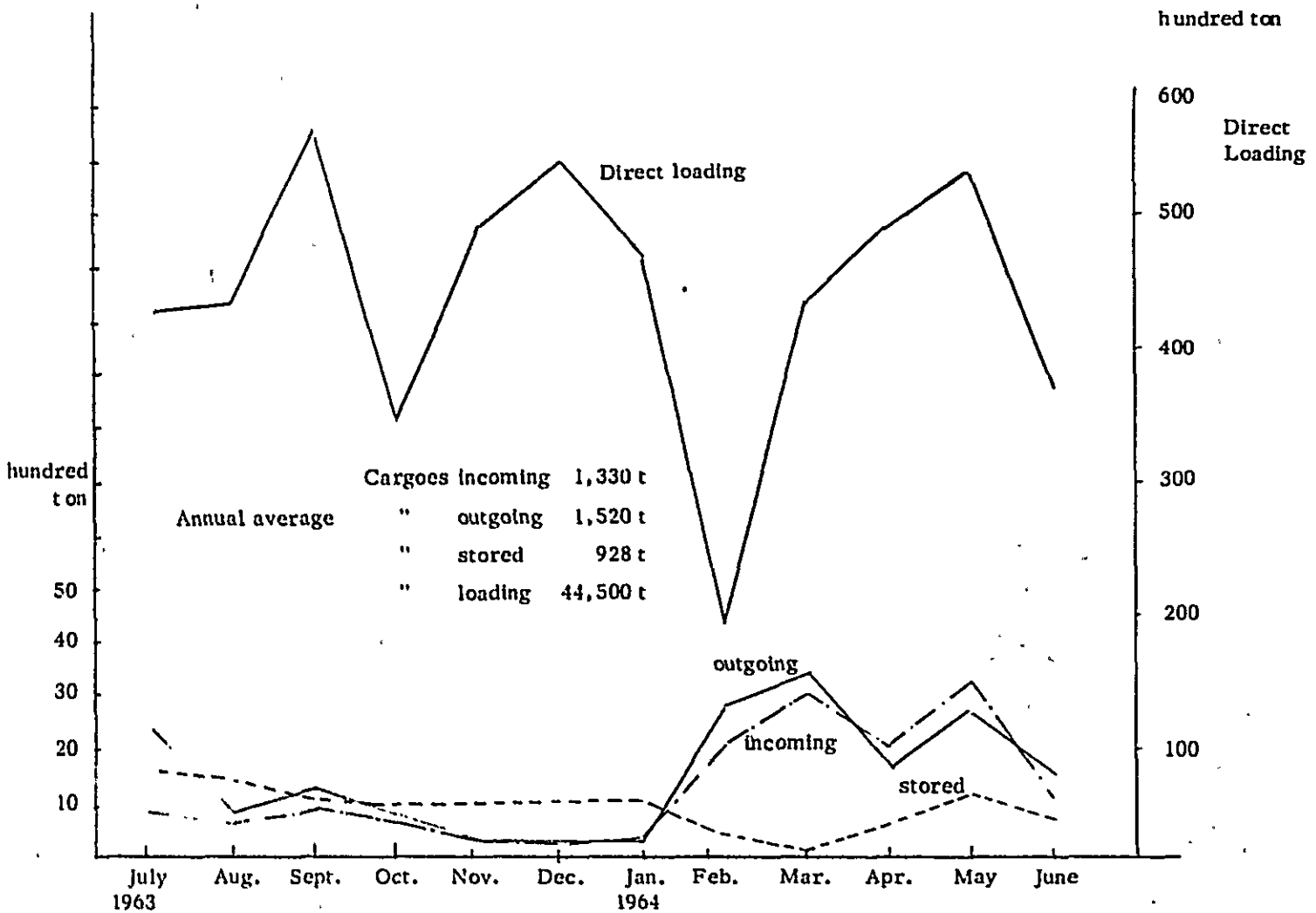


Figure VII - 6 MONTHLY VOLUME OF EXPORTED CARGOES IN ASSAB

(5) City Planning and Port Expansion Plan

(5)-1 Assab

Directly behind the present port a new town is developing, to the south some 2-4 km from the port, oil refinery plant and salination field are in operation, forming a kind of industrial zone. With the development of Port of Assab town areas behind the port would develop itself without fail.

Our concept plan is based on the assumption to expand the port to the south. In accordance with this port plan a city plan for the area directly behind the port shall be authorized in order to develop Assab as a well accomodated port city.

Taking into account present public facilities of the town behind the port and necessary port expansion program in the future the city planning should be carefully prepared in the following program.

A. area ----- commercial area adjacent to the port with proper public facilities and wellfare institutions

B area ----- housing area with recreation facilities to the north of A area or surrounding A area

C area ----- terminal with various facilities for cargo distribution and storage in port area or to the south of A area

D area ----- purely industrial area for oil refinery, salinator plants, shipyard etc.

Allocation of adequate space to green belts or public parks should not be neglected to develop Assab as a comfortable city with a good environment. Well established water supply system is indispensable for this purpose.

(5)-2 Massawa

The port and city have been developed as one unit. Accordingly the port expansion plan should be co-ordinated with the present city and its city planning. The new port should be built as a well accommodated port on one hand and comfortable city on the other.

In view of these requirements special care should be given to the following points.

A. allocation of public parks within the area

B. allocation of adequate space for distribution and traffic facilities and for urban re-development.

Further special care should be given to road system within the development areas so as no traffic congestion would occur in the future. Of great importance is an effort to plant trees as much as possible to make, as well as Assab, confortable city.

(6) Guideline for Port Expansion

Necessary expansion plans for the 4th Five-Year Plan and for the long-term 20 year plan shall be formulated as follows.

(6)-1 Assab

a For the 4th Five-Year Plan

Under the assumption that the total cargo volume will amount to 982,000 t by the end of 1979 of which 363,000 t will be handled on the proposed 4 public berths with -10 m depth.

Sites for new berths; with a view to use them immediately after construction, adjusting area to the existing facilities should be utilized as far as possible. Careful studies shall be conducted on extension of existing north pier and utilization of south side of the existing south berth.

Dredging of fairway and basin, construction of breakwater should be carried out to be coordinated with the construction of new berths.

Other facilities to promote function of expanded port such as warehouses, open storages and cargoes handling equipment etc. shall be added in due consideration of capacities and utilization of existing facilities.

Special berth(s) may be desirable for handling certain types of cargoes as grain and puluses, it should be examined on their quantities and handling systems.

To meet the containerization at least one berth shall have sufficient space directly behind the quay wall for handling containers.

Movable heavy duty crane(s) may be very advantageous for handling containers and other cargoes.

Some adequate facilities for smaller ships should be taken in consideration. The above is for the next 4th Five Year Plan.

b For 20-Year Plan

After the next 4th Five Year Plan further expansion will be necessary, according to our prospect at least 10 new berths of -10 m depth by the end of 1993 will be in need. Sufficient water areas for expansion should be reserved on the south side of the present port.

c Existing buoy berth of crude oil shall be kept untouched during the 4th Five Year Plan as far as possible, however, its removal or reconstruction may be inevitable if extension of existing breakwater may under circumstance take place. Lack of information on expansion plan of oil refinery enables us no guess on future demands for berth. Increase in demand for liquid fuel and in crude oil transport from abroad will force us to study this problem in due time. Some day we must check the construction of a jetty instead buoy berth to secure constant crude oil supply in quantity.

Anyhow it is necessary to give a clear location to the future crude oil berth within a frame of port improvement plan as its location has a great influence on the ships' fairway. As to the loading facilities the existing ones will be sufficient for next 10 years.

d Salt will be loaded on the present berth.

e Site of ship repair facility shall be chosen at the southern part of the present port considering function of port and future expansion plan.

f Sites for new berths

Two prposals are taken in consideration. Advantages and disadvantages of two proposals are listed hereunder.

(6)-2 Massawa

a By the end of 1979 the estimated volume of cargoes handled at the public berths will amount to 568,000 t of which some 72,000 t will exceed the existing capacity of berths. To meet this demand 2 berths are to be constructed. One berth shall be built as an extension of the existing berth No. 6 and another one shall be constructed on the extended area of the existing berth No. 1 or on some adequate area of the southern part of Massawa.

b For copper export which will amount to something around 60,000 t by the end of 1979 a specialized private berth shall be built either on the adjacent area of the present salt berth or the old jetty on the Khor Dakliyat Bay shall be improved and utilized.

The first proposal to build a new berth on Ghear Penninsula adjacent to salt berth is adventageous for port operation, however, from the standpoint of securing sufficient space for open storage behind the pier and of traffic connection with the city may have some difficulties.

In case of construction of the new berth on the Khor Dakliyat the detailed survey of depth of water and other factors, eventually dredging required.

c For salt export the existing facility should be fully utilized.

d Oil can be handled on the existing facility.

e To meet the requirements with the increase in cargoes volume after 1980 the southern part of Massawa water areas shall be reclaimed for new public berths.

For the further demand for expanded facilities the shoreline on the side of Sheikh Said Inland shall be reserved for this purpose.

f Container Yard, as mentioned for Assab due consideration shall be made for Massawa as well.

g Sites for the proposed berth other than the extended berth of No. 6 are to be checked hereunder.

(7) Problems for Further Study

For preparation of the proper and detailed future plan for both ports, Assab and Massawa, accurate surveys and investigations on the following it items are necessary.

a Typical examples of analysis of weather charts on days of strong wind for the entire Red Sea Areas for getting accurate information on wave characteristics at the two ports.

b More accurate information than given in marine chart on topography and depth of water for the water areas proposed for port expansion; Marine charts showing information on reeves, island lying within 4 km of the port areas.

c General geological data on the sea bottom within the areas for port expansion, as underlying rocks disturb the construction works enormously.

d Co-ordination of expansion plans with the co-relating city plannings at the both ports.

e Further specific data necessary for the planning.

a) Assab

i) Structure, capacity and frequency of repairing and days spent for repairing of existing buoy berth.

ii) Structure and capacity of salt jetty.

iii) Information on smaller ships and fishing boats which utilize the present port and it's future prospect.

b) Massawa

i) Structure and present utilization of old jetty on Khor Dakliyat and land use of adjacent area.

ii) Geographical, topographical data and information on land use of the Gherar Pennisula.

f Comparison of proposed sites for port expansion in Assab

	Proposal 1	Proposal II
for port operation	Extension of existing North Pier closes north Entrance: advantage: well protected against waves from the North disadvantage: berthing at the new berth a little difficult	Construction of the new breakwater on the south side against waves from SE is necessary. advantage: ships operation easier as northern entrance kept open.
time for removal of buoy berth	At beginning a removal not necessary. Actual removal may take place at the end of the 4th Five Year Plan	Immediate removal with commencement of expansion works necessitated.
for future expansion planning	No obstacles for future expansion planning	No obstacles for future expansion planning
Water polution	Attension must be paid to check sewage and refuse water from the town behind the port.	Easy circulation of sea water will keep the port clear.
Estimated cost for the 4th Five Year Plan	Cost will be saved as a part of the existing breakwater being utilized.	Sizable amount of investment for construction of breakwater is to be expected.
Summary of the plan for the 4th Five Year Plan	4 new berths are constructed with extension of existing North Pier in combination with the South Pier. Gap of new breakwater is to be located to the north of the existing buoy berth.	With reclaimed land together with the south side of the existing South Pier, 4 new berths will be constructed. Port entrances are located to the north of existing buoy berth and the present north entrance.

g Comparison of proposed sites for port expansion in Massawa

	Proposal I	Proposal II
Summarv of expansion plans for the 4th Five Year Plan	Construction of one new berth to the west side water area of No. 1 berth.	Construction of one new berth on the south side of Massawa.
Conditions of proposed site	Water depth being insufficient, with rocks or reeves being anticipated at shallow part of the water areas.	No detailed survey on bottom conditions, rocks or reeves, available, but the suitable location can be chosen for the project freely.
Condition for construction	Existing anchoring areas can be used and dredging of bottom around the new berth is required relatively little. A large lot of space behind the berth is not expected, only space for the berth being available.	Dredging for anchoring area and construction of breakwater is necessary. A sizeable lot of space behind the berth can be expected. The acquired area can be included in the new town planning.
Relation to the future expansion planning	Space for one new berth is available, but no space for further expansion is anticipated.	A lot of space for further expansion, layout for the expansion can be drawn up relatively easy.
Conditions around the site	Existence of the Palace should be taken in due consideration in regard to the future utilization of port facilities and port operation.	No specific problems to be considered.
Cost estimates	In case geological conditions consist of sand only, the construction cost is relatively inexpensive.	Construction of breakwater is necessary, a sizable amount of money is inevitable.

VIII ANNEX

FIG.VII-1 PRESENT STATE OF ASSAB PORT

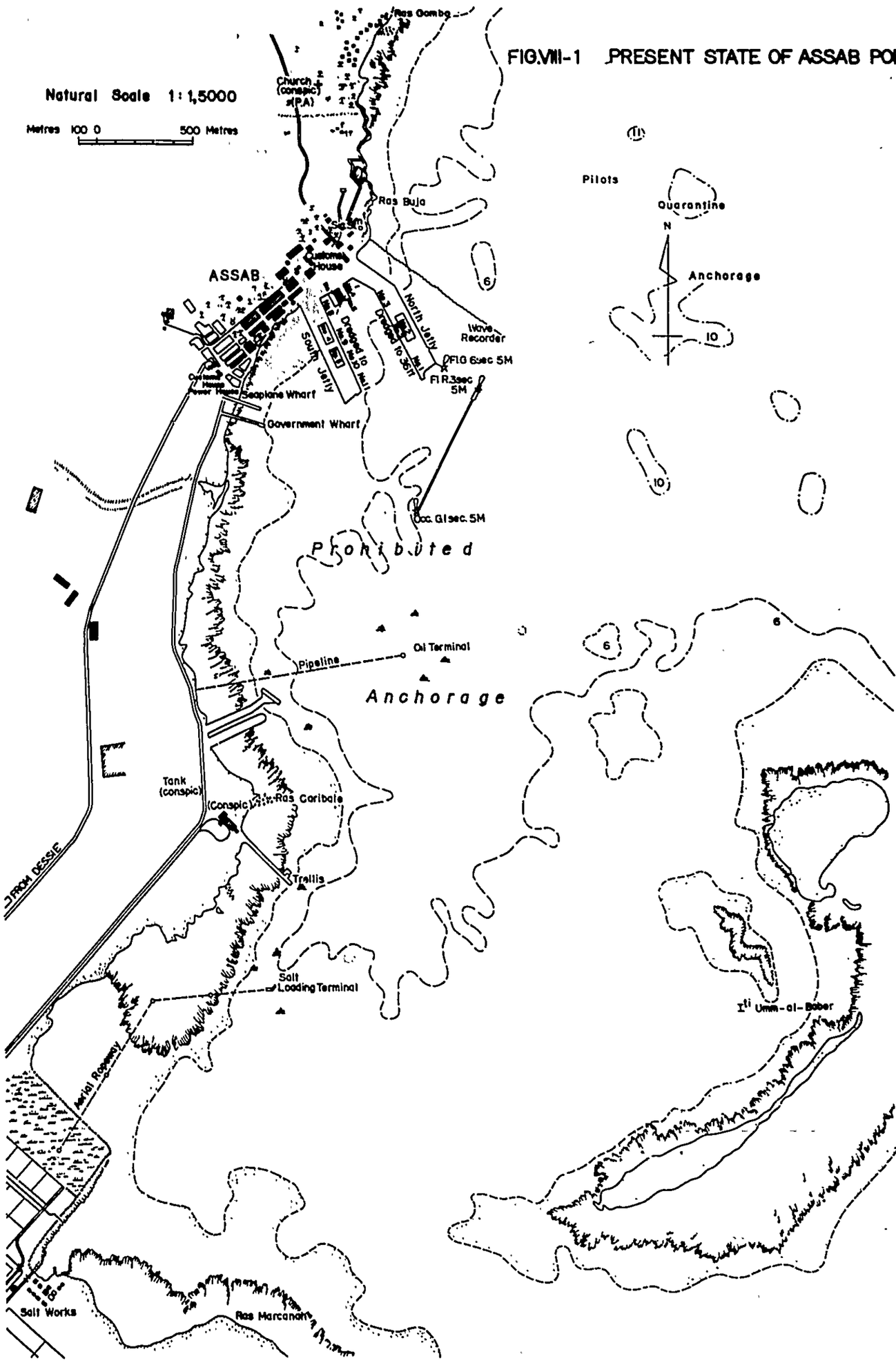


FIG.VIII-2 PRESENT STATE OF ASSAB PORT
BREAKWATER
CROSS SECTION

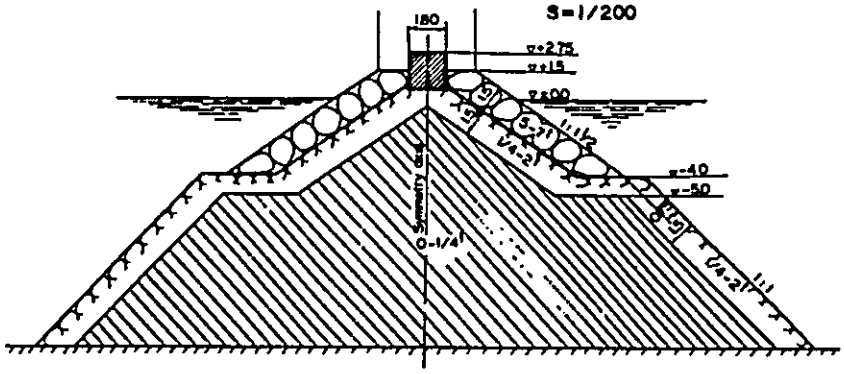


FIG.VIII-3 PRESENT STATE OF ASSAB PORT
QUAY WALL (NORTH JETTY)
CROSS SECTION

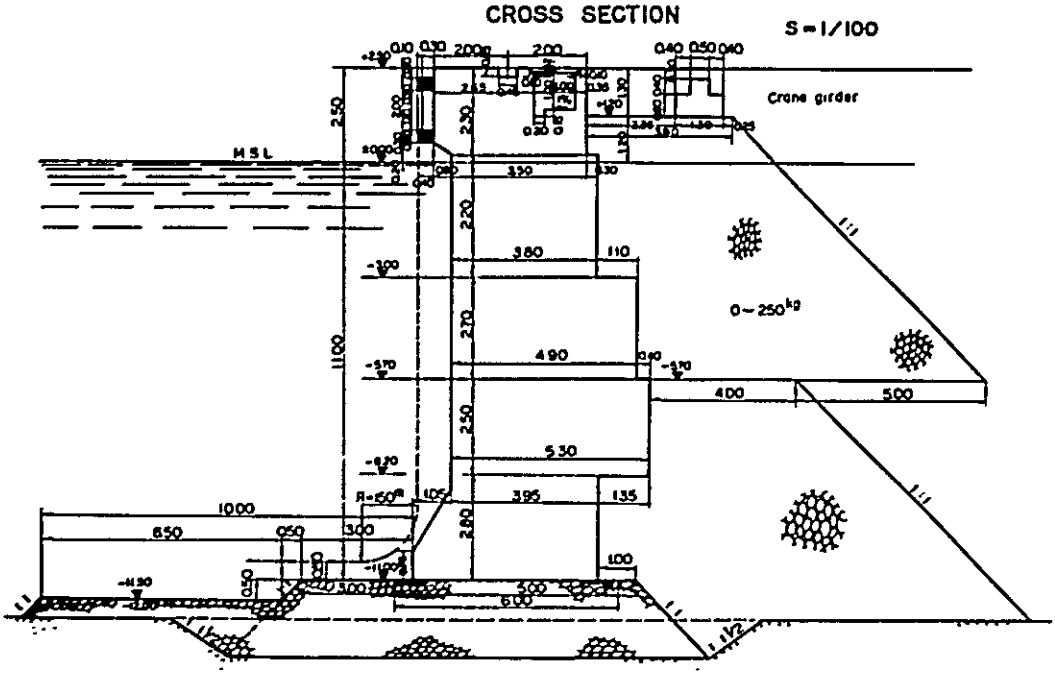


FIG.VIII-4 PRESENT STATE OF ASSAB PORT
REVETMENT (NORTH JETTY)
CROSS SECTION

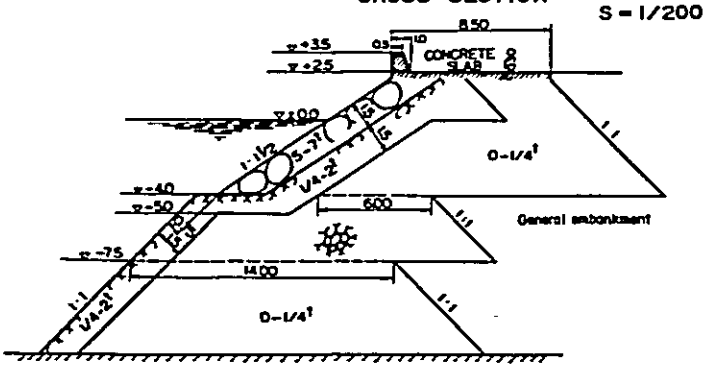
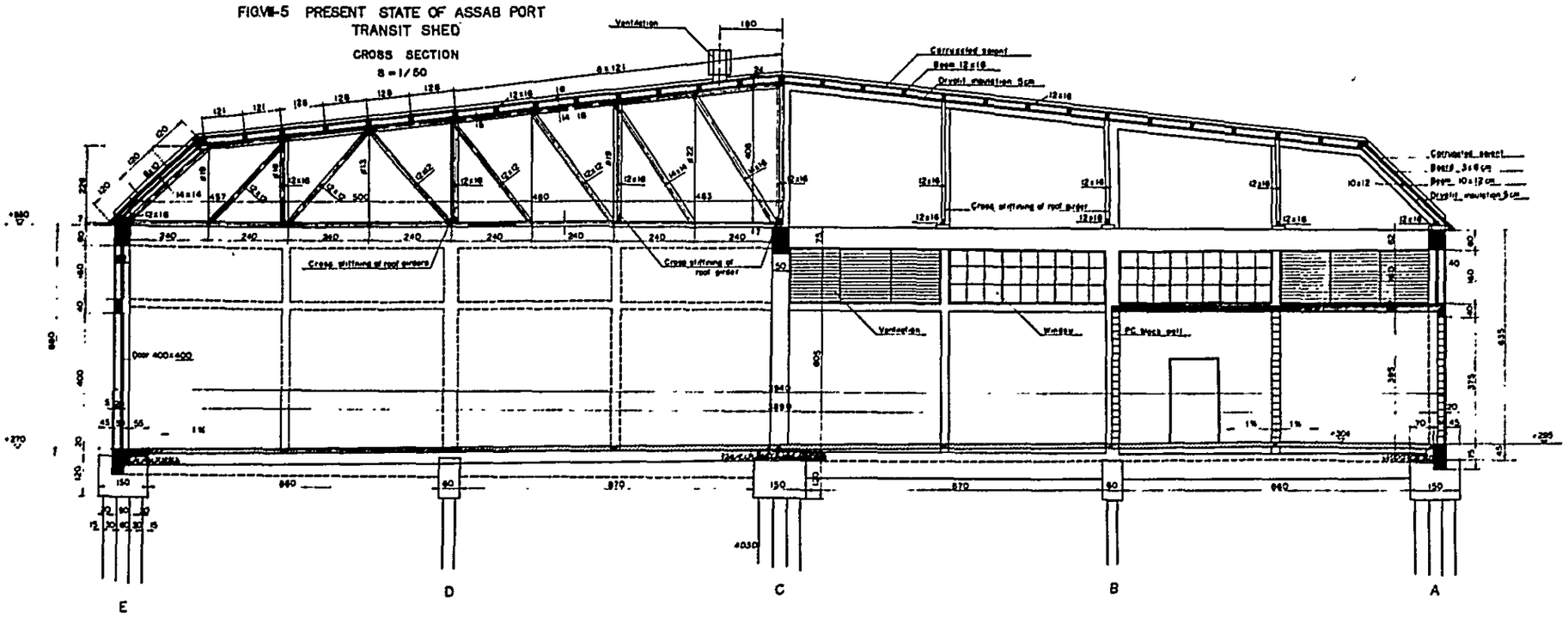


FIG.VII-5 PRESENT STATE OF ASSAB PORT TRANSIT SHED

CROSS SECTION

S = 1/50



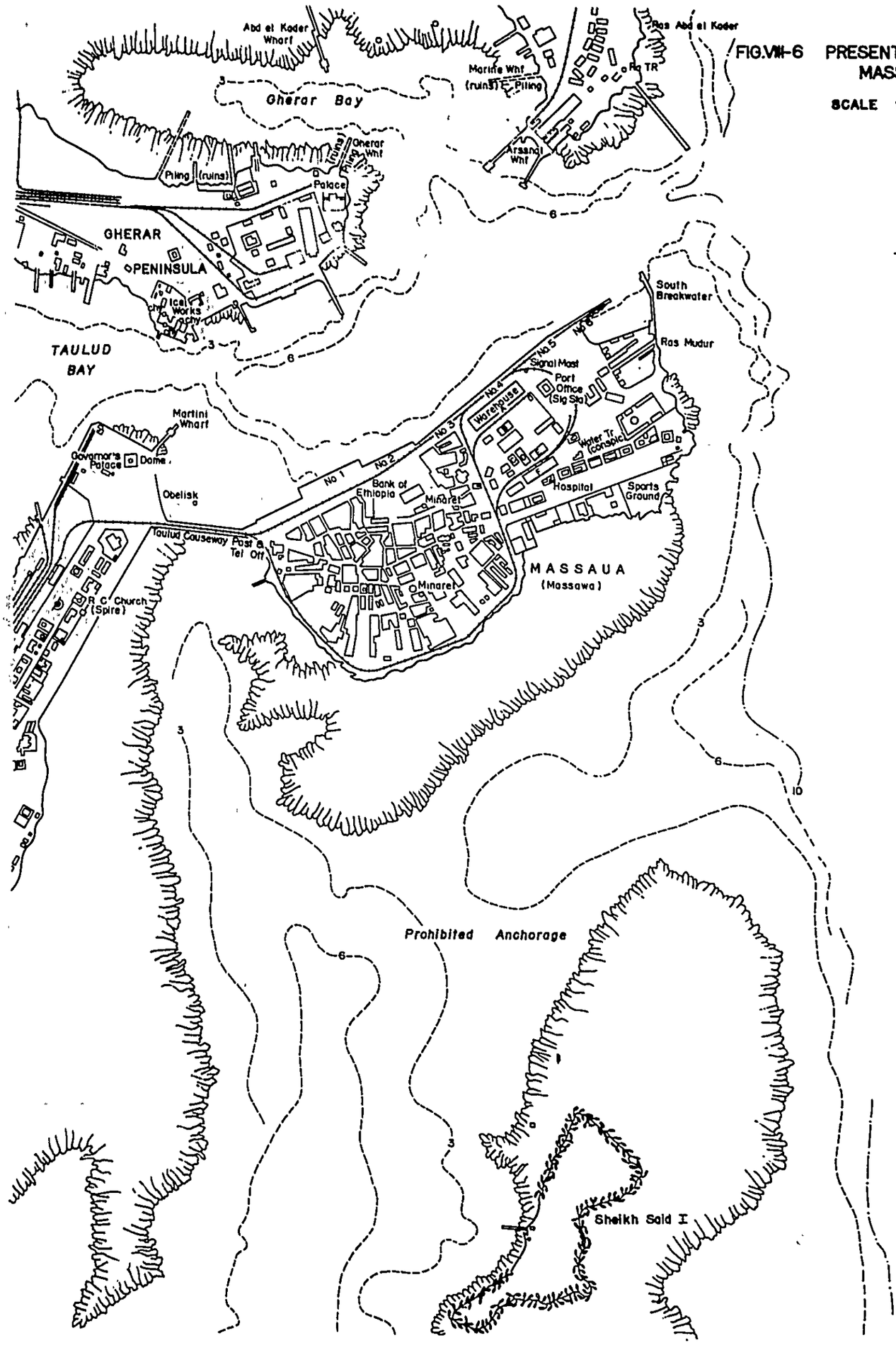


FIG.VII-6 PRESENT STATE OF MASSAWA PORT

SCALE 1 : 5,000

FIG.VIII-7 PRESENT STATE OF MASSAWA PORT

CROSS SECTION

S = 1/200

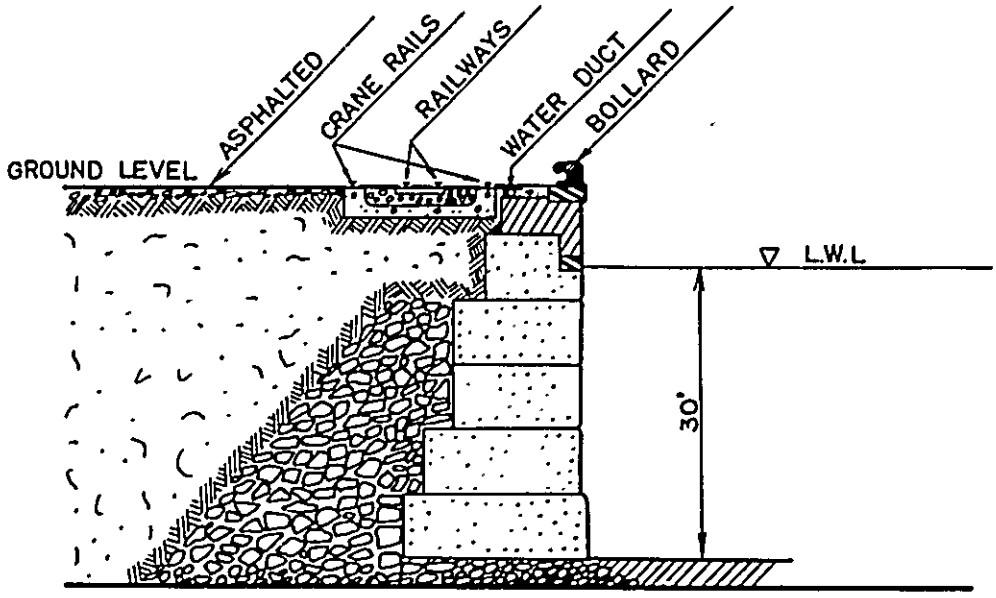


FIG.VIII-8 PRESENT STATE OF MASSAWA PORT SOUTH BREAKWATER

CROSS SECTION

S = 1/100

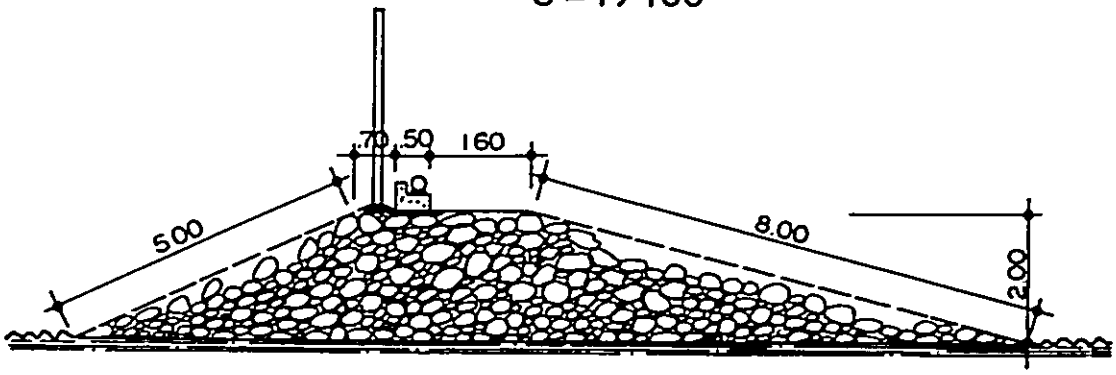


FIG.VIII-9 ALTERNATIVE PLAN I OF ASSAB PORT

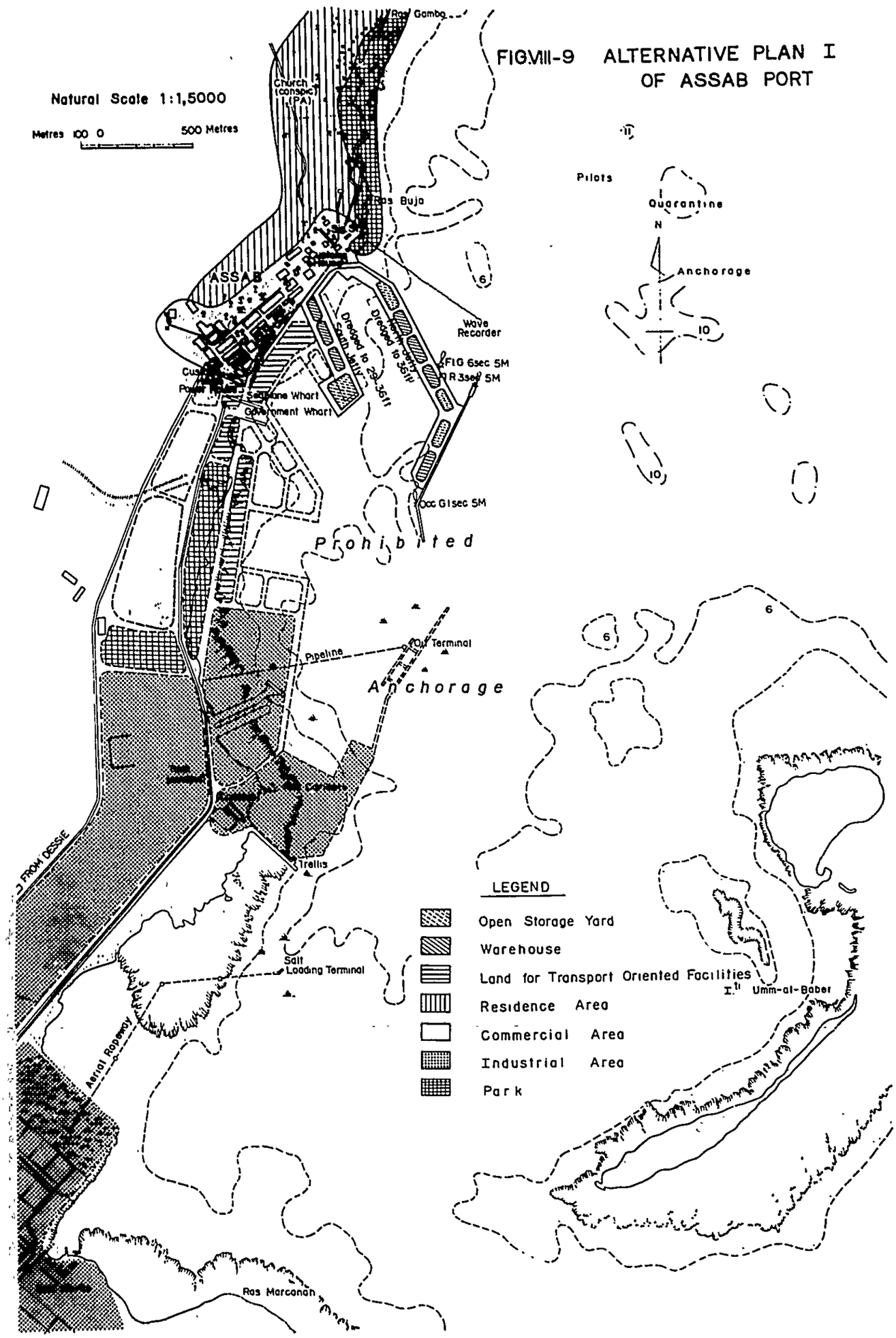


FIG.VII-10 ALTERNATIVE PLAN II OF ASSAB PORT

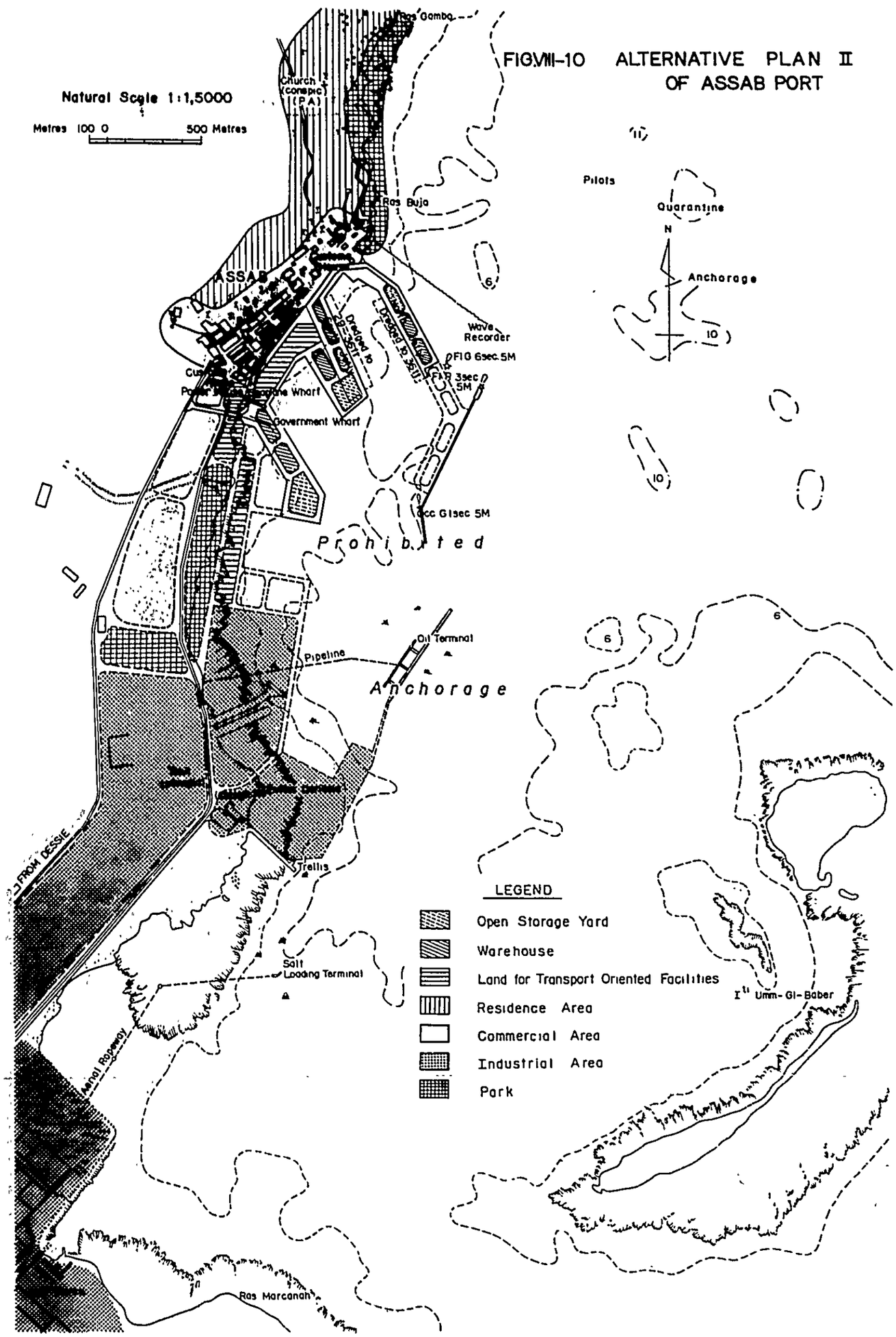


FIG.VIII-11 ALTERNATIVE PLAN OF MASSAWA PORT

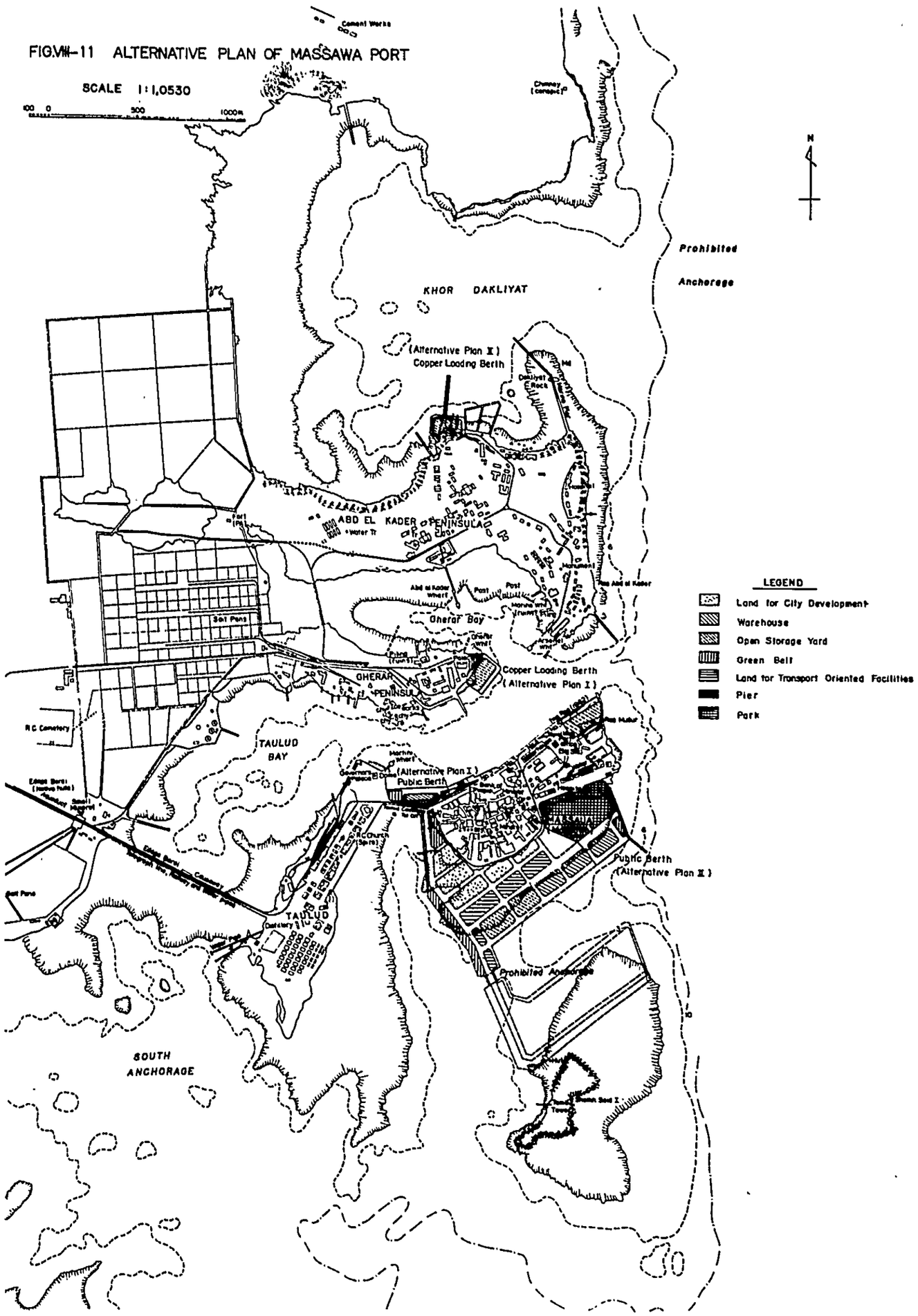


FIG.VIII-12 TENTERTIVE DESIGN OF BREAKWATER
(RUBBLE MOUND BREAKWATER)
CROSS SECTION
S : 1 / 200

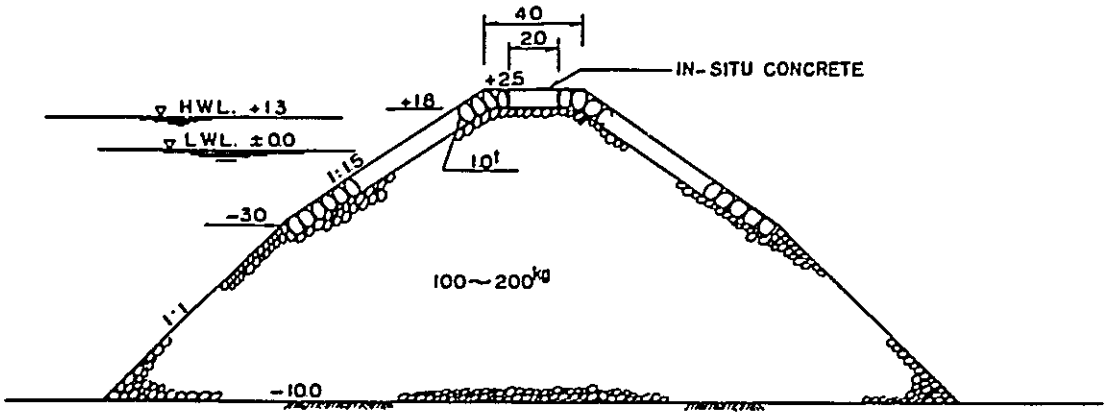


FIG.VIII-13 TENTERTIVE DESIGN OF -10M QUAY WALL
CROSS SECTION
S : 1 / 200

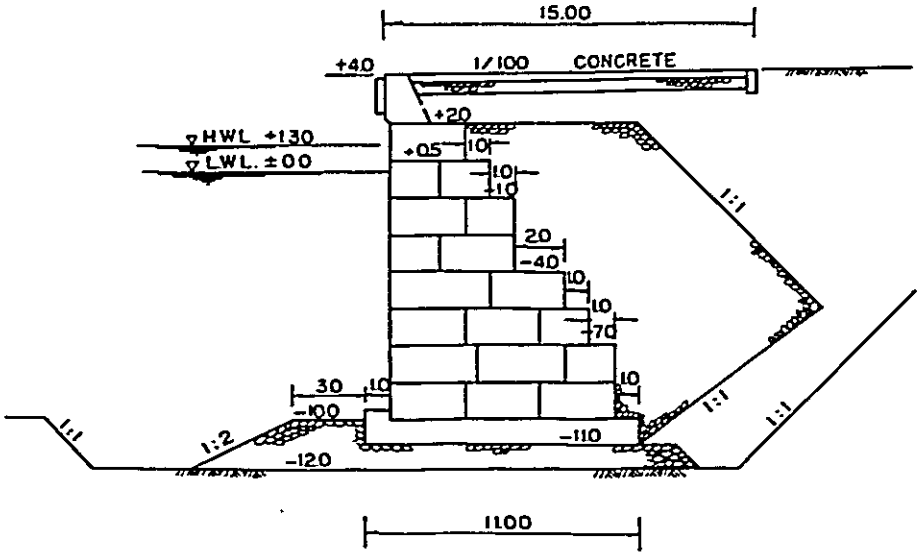
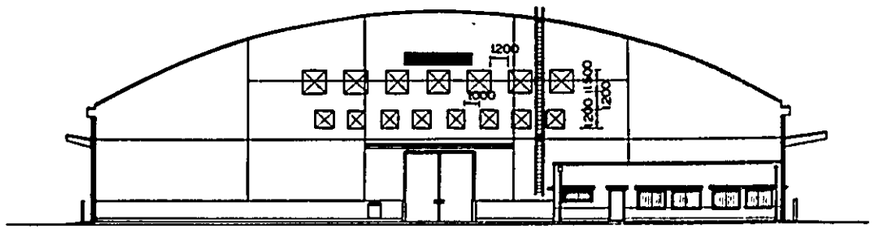
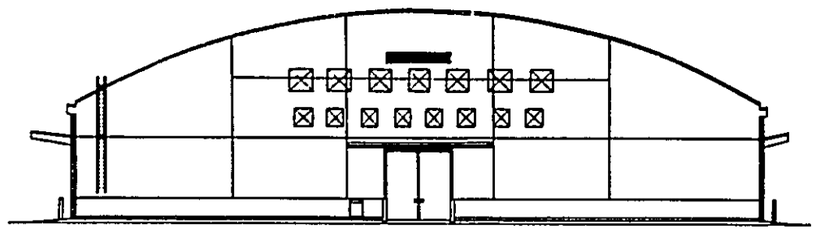
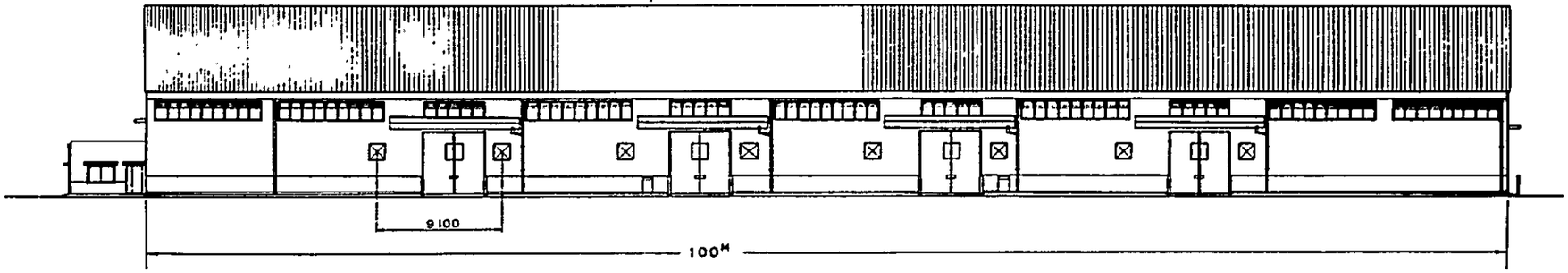


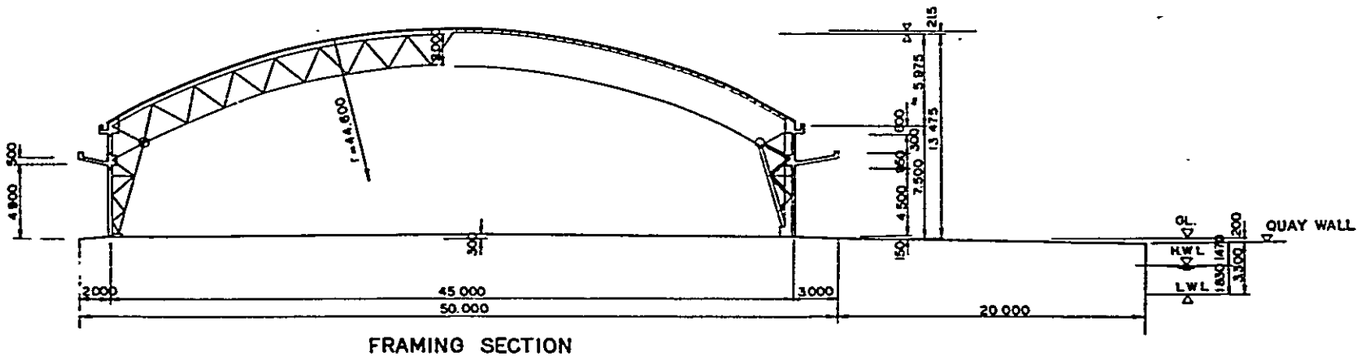
FIG.VIII-14 TENTERTIVE DESIGN OF TRANSIT SHED
SIDE ELEVATION

S : 1/200







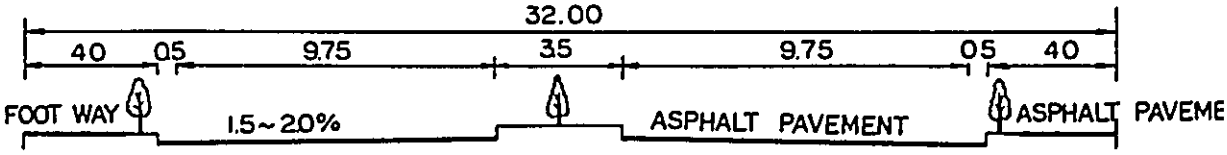


FRAMING SECTION

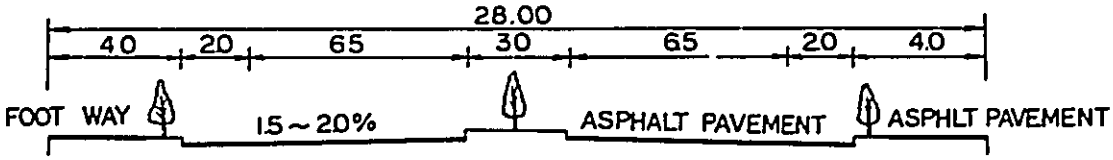
FIG.VIII-15 TYPICAL CROSS SECTION OF ROAD

S : 1/200

6 LANE ROAD



4 LANE ROAD



2 LANE ROAD