ENVIRONMENT CANADA
ENVIRONMENTAL PROTECTION

SHIPPING DENSITY STUDY

PROJECT 607-111 MAY 1977

CAPTAIN GEORGE A. VERES
MARINE ECONOMIST

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May 20, 1977

The Department of Fisheries and Environment,
Environmental Protection
Kapilano 100 - Park Royal
West Vancouver, B. C.
V7T 1A2

Attention: Mr. R. Sherwood,
Research Officer

Dear Sirs:

We have pleasure in submitting herewith our Report

"SHIPPING DENSITY STUDY"

prepared in accordance with our discussions and the Terms of Reference outlined in your letter of May 9, 1977 (File #4378-3).

Although the international stockpile of economic uncertainty has rendered the shipping density forecasts a somewhat hazardous undertaking, we have applied to our projections careful judgement, based on analysis of existing data, trends in international trade and the widely documented evidence of the influence of global economic slow-down on shipping.

We appreciated the opportunity of carrying out this brief assignment. Should you require any clarification in connection with this Report, we'll be pleased to respond to your enquiry.

Yours sincerely,

George A. Veres

GAV:jm

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1. INTRODUCTION

Energy demand is an outgrowth of human want. In modern society a high correlation exists between energy consumption on the one hand and economic activity and the ensuing well-being on the other.

Geographical disparity in supply and demand dictates the need for transporting oil. Ships are the most economical means by which large tonnages can be moved; whilst the use of large ships - supertankers - is necessitated by the economies of scale in transportation unit costs.

Considerable concern has been expressed not only about any supertanker traffic into Western Canadian ports, but even about supertanker traffic off the West Coast. Such concern is due to fear of the cumulative effects of operational pollution caused by tankers, as well as to fear of massive oil pollution risks arising from shipping casualties. Both operational and accidental oil pollution can have severely adverse effects on the health and aesthetics of the environment and on certain renewable resources, such as fishery.

2. OBJECTIVES

The Department of Fisheries and Environment has commissioned a study aimed to evaluate, inter-alia, the relative navigational risks that would be present if an oil-port were to be established at one of eight alternate port-sites on the British Columbia coast or at one of three alternate port sites in the Northern Puget Sound area.

This study does not deal with all components of the navigational risks. It is limited to an assessment of the current and projected future traffic densities along the shipping lanes leading to the alternate ports under consideration, with the principal objective of developing a shipping density index for individual route segments. Such index is intended to be incorporated into an overall navigational risk index, which would include meteorological, oceanographical and other navigational risk components.

3. METHODOLOGY

The activity series followed in this study consisted of the following:

- Data collection.
- Analysis of data collected and assessment of reliability.
- Projection of shipping densities for 1980, 1985 and 1990
  based on: growth of regular traffic
  projected oil-import traffic, and
  projected coal-export traffic
  along the principal and secondary shipping lanes as identified by the Department of Fisheries and Environment.
- Development of shipping density indices (for 1980).
- Tabulations and Shipping Density Maps.
- Report.

4. DATA SOURCES

In the course of investigations and data collection leading to the preparation of this Report, existing studies and reports containing relevant information and data on present and projected future shipping densities on the West Coast of British Columbia have been carefully perused; as well as a number of officials and other experts have been contacted.

4.1 Bibliography

a.) Fisheries and Environment Canada - "An Environment Risk Index for the Siting of Deep Water Oil Ports" December, 1976.

b.) Bureau of Management Consulting, Government of Canada - "Evaluation of Requirements for Vessel Traffic Management System (Area III) Prince Rupert" October, 1975.

c.) Transport Canada - "Vessel Traffic Management System, Western Region".

d.) Transport Canada, Coast Guard - "Vessel Traffic Management, Fraser River Sector" - March, 1977.

e.) U. S. Department of Transportation, Coast Guard - "Vessel Traffic System, Puget Sound" - September, 1974.

f.) Statistics Canada - "Shipping Report, Part II, International Seaborne Shipping (by port)", 1974 and 1975.

"Shipping Report, Part III, Coastwise Shipping", 1974 and 1975.

g.) Kitimat Pipe Line Ltd. - "Termpol Submission re. Marine Terminal at Kitimat, B.C., Volumes I - VII", December, 1976.

4.2 Personal Contacts

a.) Canadian Coast Guard Service

b.) Vancouver Vessel Traffic Management Centre.

c.) Puget Sound Vessel Traffic Service, U.S. Coast Guard

d,) Ministry of Transport, Regional Harbour Administrator

e.) Harbour Master, Kitimat

f.) Puget Sound Pilotage Service, Port Angeles

g.) B.C. Ferry Corporation, Victoria

h.) B.C. Hydro and Power Authority, Transit Division, Planning Department

i.) Teck Mining Group Ltd.

j.) National Harbours Board, Vancouver

k.) National Harbours Board, Prince Rupert

4.3 Data Deficiencies

Generally speaking adequate data was found to be available for a proper assessment of shipping traffic densities on almost all the shipping lanes leading to alternative ports/ port sites, as shown on the Traffic Density Maps 6.3 and 7.3. In most cases, the data has been cross checked between three and four different sources. Significant discrepancies have either been reconciled, or data source reliability factors assessed and weighted.

Notable exceptions are:

- West Coast of Vancouver Island. Regretfully, no readily available data is in existence at this point in time.*

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* Vancouver Vessel Traffic Management Centre advises that shipping density data in this area will not be available for about one year. The traffic density, however, is not considered to be of an order-of-magnitude that would represent appreciable navigational hazard to the envisaged new tanker traffic.

- Assessment of the shipping traffic in the Hecate Strait is based on one or two data sources only, instead of three or four. Whilst the reliability of the data sources is not questioned, the information available could not be cross checked and analyzed to the same extent, as has been the case with other shipping routes.

5. TRAFFIC DENSITY FORECASTS - ASSUMPTIONS

As a rule, forecasts and projections are inevitably subject to significant margins of error and there is always a possibility that they may be falsified by unforeseen (or unforeseeable) events. It is very important, therefore, that the assumptions on which the forecasts are predicated, be clearly stated.

5.1 Assumptions re. Growth of Regular Traffic

Except in cases where special circumstances or known factors indicate the need for projecting a higher growth rate*, the rate of regular traffic growth has been assessed on a modest scale, i.e. 2% compounded annual growth rate for the period 1977-1980, and 1½% during the following decade.

The following are the underlying reasons for the above assessment:

a.) The general trend towards larger transportation units and the ensuing economy of scale. A good example of this trend can be found in the traffic statistics of the Port of Vancouver, which port, in 1976, handled import and export cargoes 6.3% higher than in 1975, with only a 1% increase in the number of ships.

b.) Recognition of the widely accepted view that economic activity and world trade in general is likely to grow,

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* For instance, in the case of Prince Rupert, the opening of the new Fairview Terminal in 1977 and also the new resource development programs of the Federal and Provincial governments are expected to generate a higher growth rate of shipping traffic.

during the rest of the twentieth century, at substantially slower pace than was the case during the period 1960-1974; any thought of "normal circumstances" in shipping demand (i.e. demand increasing by 6%-8% per annum) was invalidated by the energy crisis.

c.) The projection of an annual 2% traffic increase during the period 1977-1980 reflects the view that it is reasonable to anticipate slightly higher growth rates during the years immediately following the recent recession.

It should be noted that the shipping density projections do not take into consideration potential surge movements of cargoes, such as a major pipeline construction project, or other undertaking of similar order of magnitude, would generate.

5.2 Assumptions re. Oil Tanker Movements

The projected oil tanker movements are predicated on the following assumptions:

a.) Whichever alternative port is eventually developed and designated to receive North Slope and offshore oil imports, it will be designed to handle the same quantities of oil as detailed in the Termpol Submission of Kitimat Pipe Line Ltd. This submission envisages an initial average flow-rate of 300,000 barrels (approx. 41,000 metric tons) per day, and an ultimate flow-rate of 500,000 barrels (approx. 68,000 metric tons) per day.

b.) 60% of the crude oil transported to the new oil port would originate from Alaska and 40% from Arabian, Iranian or Indonesian oil fields.

c.) The fleet characteristics and composition would be similar, or comparable, to the tanker fleet described in the Termpol Submission of Kitimat Pipe Line Ltd. (Volume VII, Section 21, pp. 2-3)

d.) Given the assumptions in a.) and c.) above, it follows that the number of round trips per annum would be the same for alternate ports.

5.3 Assumptions re. Coal Export Movements

For the Northern Area, the projected shipping movements are predicated on the forecast by the coal industry for the export of metallurgical coal via Prince Rupert (Riddley Island). For the Southern Area, they are based on the projections of the National Harbours Board in respect of incremental metallurgical coal exports via Roberts Bank and, to a limited degree, via Burrard Inlet Terminals.

It is anticipated that 50% of all additional coal exports (from both Northern and Southern areas) will go to Far Eastern destinations and that it will be transported in 120,000 DWT capacity vessels.

The other 50% is expected to be shipped to Atlantic Rim destinations, via the Panama Canal. The vessels employed in this service cannot exceed "Panamax" size (i.e. having beam and draft not exceeding the measurements allowed by Canal regulations). The average capacity of such vessels is 60,000 DWT.

The projected incremental metallurgical coal export tonnages are (in millions of tons):

	1980	1985	1990
via Northern Area	3.5	7.2	12.2
via Southern Area	9	24	24

(It should be observed that this Report considers both the above forecasts very optimistic. Whilst proven Western Canada coal deposits might well be able to sustain the incremental export tonnages projected, serious doubts exist as far as market potential is concerned in view of current excess global steel production capacity, various conservation measures and other related factors. However, the above coal export tonnage forecasts refer to metallurgical coal only and do not consider the thermal coal export potential. If thermal coal exports do materialize, the projected tonnage figures might well be of the correct order of magnitude; or even conservative.)

5.4 Traffic Density Index

As shown on Tables 6.2 and 7.2 and also on Traffic Density Maps, the Northern and Southern Areas differ substantially in shipping volumes and densities. In order to attain a reasonable index rating, which can be applied to both Northern and Southern shipping areas, a rating system of 1 to 10 has been adopted, i.e.

Index No.	Annual Movements	Daily Movements
1	Less than 500	Less than 1.4
2	501 - 1,000	1.4 - 2.7
3	1,001 - 2,000	2.7 - 5.5
4	2,001 - 3,000	5.5 - 8.2
5	3,001 - 5,000	8.2 - 13.7
6	5,001 - 7,000	13.7 - 19.2
7	7,001 - 10,000	19.2 - 27.4
8	10,001 - 15,000	27.4 - 41.4
9	15,001 - 20,000	41.4 - 54.8
10	over 20,000	over 54.8

Whilst the above index rating is subjective, it has been judgementally selected to highlight both low and high density shipping lanes. Weighting has been introduced only to reflect cross-traffic, by adding 50% of the cross traffic movements to the annual movements along the shipping lanes under consideration.

6. NORTHERN AREA TRAFFIC DENSITIES

6.1 Geographical Sector Code

The following alphabetical coding has been applied to sectors of the Northern Area Shipping Lanes, leading to and from alternative port sites.

SECTOR CODE		SECTOR LENGTH (miles)
A	Dixon Entrance, Western Sector (to Longitude 132° 12' W)	40
B	Dixon Entrance, Eastern Sector to Triple Island	40
C	Triple Island - Port Simpson	30
D	Triple Island - Riddley Island	30
E	Triple Island - Browning Entrance	40
F	Browning Entrance (Hecate Strait) - Lat. 53° 01' N	40
G	Lat. 53° 01 N - 52° 22' N (Hecate Strait)	40
H	Hunter Point - Chads Point	40
I	Chads Point - Flamingo Inlet	40
J	Flamingo Inlet - Cape St. James	40
K	Browning Entrance - Principe Channel to 53° 20' N	40
L	53° 20' N - Douglas Channel (via Nepean Sound and Squally Channel)	40
M	Camano Sound - Douglas Channel (via Whale Channel)	40
N	Douglas Channel - Kitimat	40
O	Camano Sound - 52° 38' N (Hecate Strait)	40
P	52° 38' N - 51° 40 N (Queen Charlotte Sound)	64
R	Cape St. James - 129° 59' W (Queen Charlotte Sound)	40
S	129° 59' W - 128° 57' W (Queen Charlotte Sound)	40
T	128° 57' W - Cape Caution	40

SECTOR CODE		SECTOR LENGTH (miles)
U	Cape St. James - 129° 58' W (Queen Charlotte Sound)	40
V	129° 58' W - 128° 55' W (Queen Charlotte Sound)	40
W	128° 55' - Kelp Head	40
X	Cape Caution - Kelp Head	10
Y	Kelp Head - Burke Channel	40
Z	Burke Channel - Bella Coola	40

6.2 Shipping Density Forecast - Alternate Oil Ports - Northern Area

Sector	No. of movements 1975/1976 ave.	Tugs/Barges incl. in previous column	Projection 1980 Regular traffic	Projection 1980 Oil	Projection 1980 Coal	Total Movmts. 1980	Density Index 1980	Projection 1985 Regular Traffic	Projection 1985 Oil	Projection 1985 Coal	Total Movmts. 1985	Projection 1990 Regular Traffic	Projection 1990 Oil	Projection 1990 Coal	Total Movmts. 1990	REMARKS
A	134	N. A.	251	208	29	488	1	408	312	60	780	681	312	100	1093	
B	433	N. A.	560	208	29	797	4*	707	312	60	1079	989	312	100	1401	N-S Cross Traffic to/from Alaska - 4408 movements p. a.
C	134	120	140	208	-	348	1	152	312	-	464	164	312	-	476	Port Simpson assumed as oil port.
D	1807	941	2114	208	87	2409	4	2546	312	185	3043	3068	312	300	3680	Riddley Island assumed as oil port.
E	5472	N. A.	5678	-	58	5736	6	5963	-	120	6083	6219	-	200	6419	Inside Passage and Hecate Strait traffic converge.
F	798	154	864	-	58	922	2*	993	-	120	1113	1070	-	200	1270	E-W Cross Traffic from/to Sandspit - 236 movements p.a.
G	798	154	864	-	58	922	2	993	-	120	1113	1070	-	200	1270	
H	777	N. A.	841	144	-	985	2*	906	215	-	1121	976	215	-	1191	E-W Cross Traffic Tasu to Japan - 22 movements p.a. Bella-Coola assumed as oil port
I	917	N. A.	992	144	-	1136	2	1068	215	-	1283	1150	215	-	1365	Includes traffic to/from Tasu.
J	917	N. A.	992	144	-	1136	2	1068	215	-	1283	1150	215	-	1365	Bella Coola assumed as oil port.
K	4675	N. A.	4881	208	-	5089	5	5166	312	-	5478	5422	312	-	5734	Kitimat assumed as oil port.
L	140	N. A.	152	208	-	360	1	170	312	-	482	230	312	-	542	
M	568	N. A.	662	-	-	662	2	821	-	-	821	929	-	-	929	
N	730	440	792	208	-	1000	2	884	312	-	1196	978	312	-	1290	Kitimat assumed as oil port.
O	55	N. A.	107	-	-	107	1	201	-	-	201	419	-	-	419	
P	55	N. A.	59	-	-	59	1	64	-	120	184	69	-	200	269	
R	222	N. A.	240	-	-	240	2*	258	-	-	258	278	-	-	278	
S	222	N. A.	240	-	-	240	2*	258	-	-	258	278	-	-	278	N-S Cross Traffic from Hecate Strait - 798 movements p.a.
T	222	N. A.	240	-	-	240	2*	258	-	-	258	278	-	-	278	
U	26	26	30	208		238	1*	32	312	-	344	35	312	-	347	Bella Coola assumed as oil port. Southern Route to Smith Inlet (Sectors R, S, T) discarded. N-S Cross Traffic from Hecate Strait - 798 movements p.a.
V	26	26	30	208		238	1*	32	312	-	344	35	312	-	347	
W	26	26	30	208		238	1*	32	312	-	344	35	312	-	347	
X	341	200	362	-	-	362	1	390	-	-	390	420	-	-	420	
Y	341	200	362	208	-	570	1	388	312	-	700	418	312	-	730	Bella Coola assumed as oil port.
Z	341	200	362	208	-	570	1	388	312	-	700	418	312	-	730	

* Index weighted for cross traffi

SHIPPING DENSITIES — 1980

OVERLAY FOR CANADIAN HYDROGRAPHIC CHART NO. L-3002

CAPTAIN G. A. VERES, MARINE ECONOMIST

PROJECT 607-III

LEGEND

LINE	1980 DENSITY INDEX
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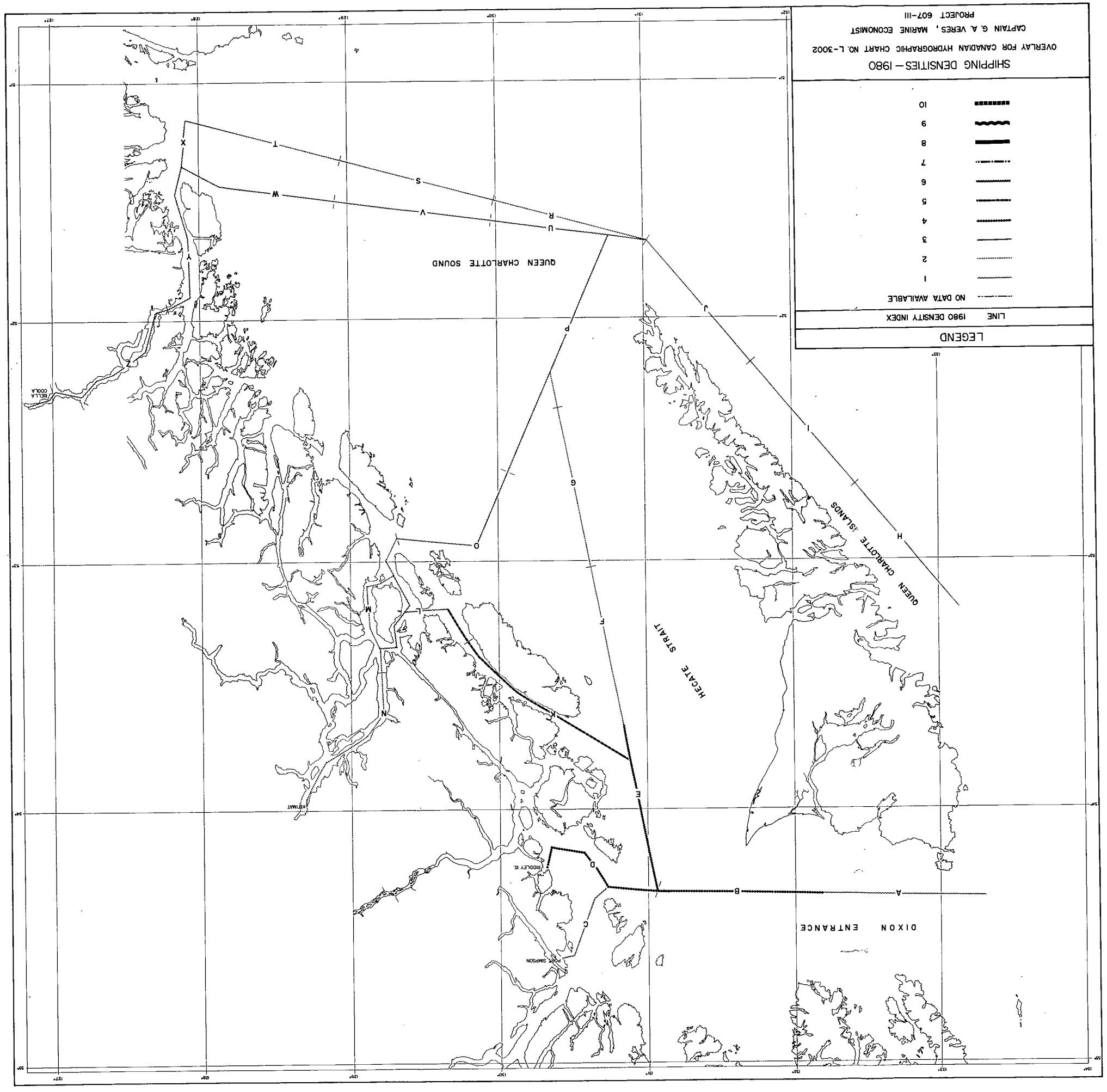


7. SOUTHERN AREA TRAFFIC DENSITIES

7.1 Geographical Sector Code

The following alphabetical coding has been applied to sectors of the Southern Area shipping lanes leading to and from alternative port sites.

SECTOR CODE		SECTOR LENGTH (miles)
A	Cape Scott - Quatsino Sound	40
B	Quatsino Sound - Kyuquot Sound	40
C	Kyuquot Sound - Nootka Sound	40
D	Nootka Sound - Clayoquot Sound	40
E	Clayoquot Sound - Barkley Sound	40
F	Barkley Sound - Port Renfrew	40
G	Port Renfrew - Race Rocks	40
H	Race Rocks - Port Angeles	10
I	Race Rocks - Esquimalt	15
J	Race Rocks - Constance Bank	10
K	Constance Bank - Hain Bank	10
L	Hain Bank - Burrough's Bay	20
M	Hain Bank - Cherry Point	40
N	Constance Bank - Patos Island	40
O	Cherry Point - Patos Island	10
P	Patos Is. - Roberts Bank	22
R	Roberts Bank - Burrard Inlet Entrance	22
S	Burrard Inlet Entrance - Port Moody	20
T	Burrard Inlet Entrance - Britannia Beach	20

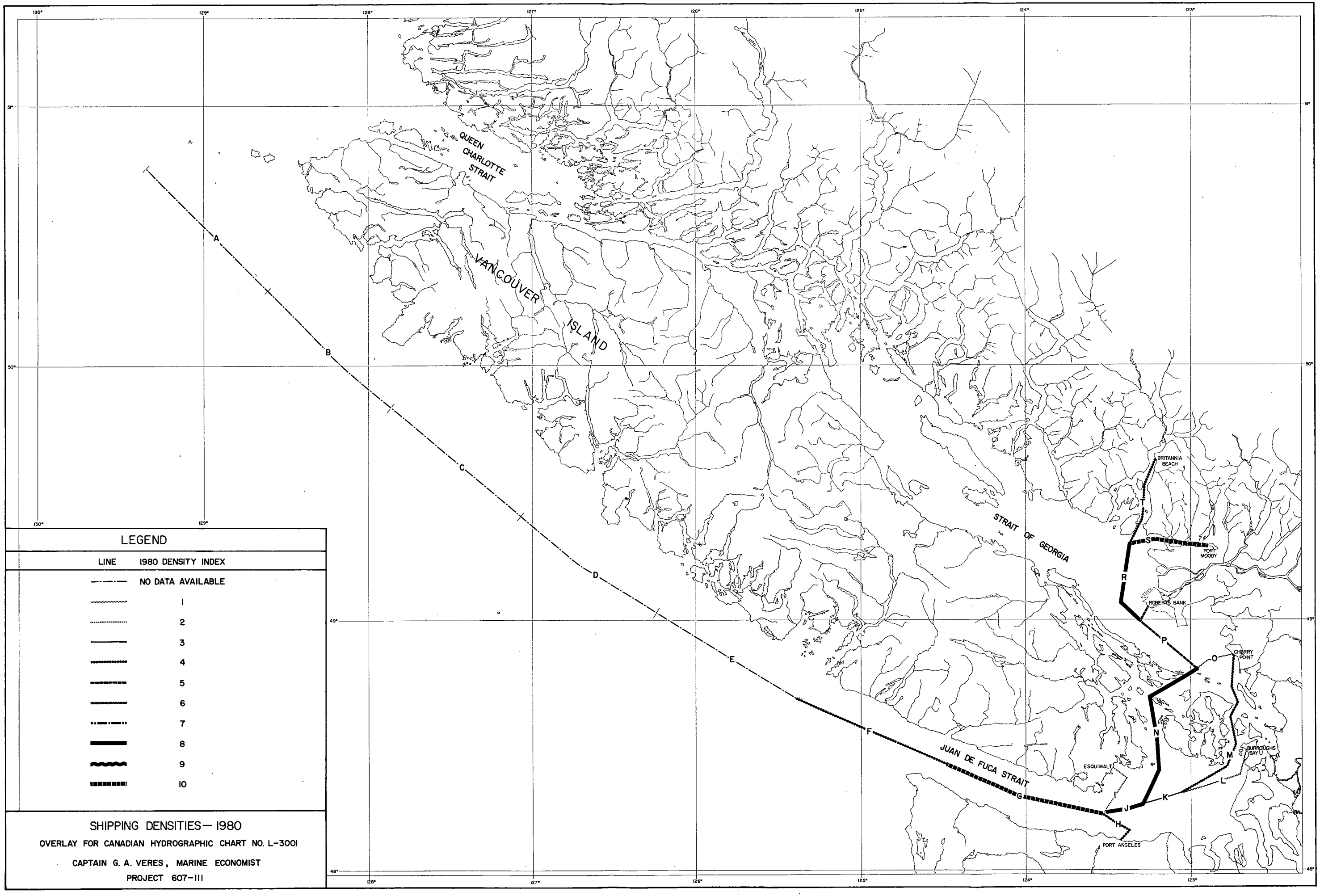
7.2 Shipping Density Forecast - Alternate Oil Ports - Southern Area

Sector	No. of movements 1575/1976 ave.	Tugs/Barges incl. in previous column	Projection 1980			Total Movmts. 1980	Density Index 1980	Projection 1985			Total Movmts. 1985	Projection 1990			Total Movmts. 1990	REMARKS
			Regular Traffic	Oil	Coal			Regular Traffic	Oil	Coal		Regular Traffic	Oil	Coal		
A	Data not available			144	-				215	-			215	-		
B				144	-				215	-			215	-		
C				144	-				215	-			215	-		
D				144	-				215	-			215	-		
E				144	-				215	-			215	-		
F	1818	N. A.	1968	208	112	2288	4	2120	312	300	2732	2464	312	300	3075	
G	18250	N. A.	19754	208	112	20074	10	21280	312	300	21692	22924	312	300	23536	
H	1800	1440	1948	208	-	2156	4	2098	312	-	2410	2260	312	-	2572	Port Angeles assumed as oil port
I	474	N. A.	474	208	-	682	2	474	312	-	786	474	312	-	786	No increase in regular traffic anticipated. Esquimalt assumed as oil port.
J	9060	N. A.	9086	208	112	10126	8	10563	312	300	11175	11379	312	300	11991	Victoria bound traffic included.
K	930	N. A.	1006	208	-	1214	3	1083	312	-	1395	1166	312	-	1478	Burrough's Bay and Cherry Point oil port alternatives.
L	- (1)	-	120	208	-	328	1	150	312	-	462	170	312	-	482	Burrough's Bay traffic proceeds both ways via Sectors K and L. Loaded Cherry Point traffic proceeds via Sectors K, L and M; traffic in ballast via Sectors O and N.
M	6024	4658	6520	104	-	6624	6	7024	156	-	7180	7336	156	-	7492	
N	9125	N. A.	9877	104	112	10093	8	10640	156	300	11096	11462	156	300	11918	
O	270	N. A.	292	104	-	396	1	314	156	-	470	338	156	-	494	Cherry Point assumed as oil port.
P	3418	N. A.	3700	208	112	4020	5	3986	312	300	4598	4294	312	300	4906	
R	3214	N. A.	3479	208	-	3687	8	3748	312	-	4060	4038	312	-	4350	E-W cross traffic (B.C. Ferries) 17,281 movements p.a.
S	44600 (2)	23556	48276	208	-	48484	10*	52006	312	-	52318	56025	312	-	56337	N-S cross traffic (commuter ferries) 38,584 movements p.a. Port Moody assumed as oil port.
T	2741	2470	2674	208	-	2882	4	3104	312	-	3416	3344	312	-	3656	Britannia Beach assumed as oil port. Squamish traffic included.

* Index weighted for cross traffic

(1) According to the U.S. Coastguard, at present there is no commercial traffic of any kind into Burrough's Bay.

(2) Based on 1976 NHB data. (Vancouver Vessel Traffic Centre gives 76,818 movements in Vancouver Harbour in 1976 which figure includes vessels shifting from one berth to another and tug/barge movements within the harbour, as well as arrivals and sailings.)



LEGEND

LINE	1980 DENSITY INDEX
	NO DATA AVAILABLE
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SHIPPING DENSITIES — 1980

OVERLAY FOR CANADIAN HYDROGRAPHIC CHART NO. L-3001

CAPTAIN G. A. VERES, MARINE ECONOMIST

PROJECT 607-111

8. CONCLUSIONS

The preferential selection of an existing port facility or a suitable port-site to serve as an oil port to handle large tankers is, inevitably, a function of several, properly weighted considerations. As outlined in Section 2, this Report deals only with shipping densities.

From this point of view, the desirability of an oil-port location in the Northern Area appears obvious, in order to avoid the very high density traffic sectors of the Strait of Juan de Fuca and of the approach route to Vancouver. It should be noted that each of the seven ports/port-sites considered in the Southern Area is affected by this high density shipping traffic, some to a higher degree than others.

In the Northern Area, the highest shipping density is encountered where the Inside Passage traffic and the North-South Hecate Strait traffic converge, on the way to/from the Pilot Station off Triple Island, with a 1980 density under 6,000 movements per annum/16.4 movements per day (Index No. 6). This compares with over 20,000 movements per annum/54.8 movements per day (Index No. 10) in the Strait of Juan de Fuca.

It should be repeated that the above assessment is based on shipping densities alone and it does not attempt to strike a balance between the various other quantities of the navigational risk and environmental equations.