ANALYSIS OF THE DROP TRAILER TRAFFIC BETWEEN THE B.C. MAINLAND AND VANCOUVER ISLAND

by

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B.Com., University of British Columbia, 1974

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN BUSINESS ADMINISTRATION

in the Department of COMMERCE AND BUSINESS ADMINISTRATION

We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

April, 1977

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Date May 2, 1977
This thesis provides an analysis of the drop trailer traffic moving between the B.C. Mainland and Vancouver Island. Drop trailers are semi trailers which are literally dropped at the ferry terminal to be transported across the Strait of Georgia without the accompaniment of the power unit and driver. This specialized service is provided only by the British Columbia Coastal Steamship Service, a subsidiary of C.P. Rail.

One objective of the thesis is to analyze the economics of shipping via drop trailer as opposed to a live unit, or one that includes the driver and tractor unit such as is provided by the B.C. Ferries. A second objective is to determine the size and importance of the market, and to forecast future requirements. A third objective is to analyze the physical facilities available to determine their capacity and possibilities for expansion. The B.C.C.S.S. facility in downtown Vancouver is under pressure from various groups to relocate to a more suitable location. Thus a final objective is an analysis of the benefits and costs of relocating the B.C.C.S.S. terminal to the north Richmond area.

Since the drop trailer industry is very specialized, and captive to the B.C.C.S.S., very little information is published or available concerning it. Thus the author has had to rely primarily on discussions with all the parties involved, namely the
B.C.C.S.S., City of Vancouver, and numerous carriers. One of the by-products of the thesis is a body of information and data pertaining to the drop trailer industry, that can be used for future research in related topics.

The analysis of the economics of shipping via drop trailer shows a substantial savings potential, even though the actual ferry cost is greater. The savings are generated by the elimination of idle driver and tractor time. This saving was estimated at $49.20 per one way trip.

During the past decade the volume of drop trailer traffic has been increasing steadily even though railcar traffic has been on the decline. This increase is causing the B.C.C.S.S. to approach the capacity of the present system. Political and physical pressures have raised the issue of relocating the terminal. A benefit-cost analysis of a particular alternative, a partial relocation to the north Richmond area shows there can be substantial benefits for carrier as well as the B.C.C.S.S.
ANALYSIS OF THE DROP TRAILER TRAFFIC
BETWEEN
THE B.C. MAINLAND AND VANCOUVER ISLAND

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ACKNOWLEDGEMENT

I thank my supervisor, Dr. W.G. Waters II of the Transportation Department, Commerce and Business Administration and Dr. T. Heaver of the same department for their patience and advice in the preparation of this thesis. I thank also R. Zerbst of the Urban Land Economics Department for his assistance. Finally I would also like to thank my wife Tina for her kindness and encouragement during the preparation of this thesis.
Chapter 1

Introduction Objectives and Organization
1.1 Objectives

This thesis examines an important component of the British Columbia Mainland-Vancouver Island transportation system: the drop trailer traffic. Drop trailers, or semi trailers that are sent to or from the island without the accompaniment of power units, now represent a large portion of commercial traffic. Equally as important, they represent the only alternative to driver-accompanied ("live") trucks, however their presence is banned on the government-owned B.C. Ferries.

The first objective of the thesis is an analysis of the economics of shipping via drop trailers as opposed to live units. This should produce a difference in ferrying costs that can be expressed in dollar terms. The second objective is to analyse the characteristics of drop trailer traffic. This will include the recent and current trends in the traffic in order to determine the size and importance of this market. A forecast of future traffic volumes is developed. The third objective is to analyse the physical facilities available to drop trailers. Particular attention is given to possible relocation and expansion of facilities in light of recent civic developments. The benefits and costs of such a decision are analysed.

Despite the size and economic importance of Vancouver Island, and the significant contribution of drop trailer trans-
portation to it, published information pertaining to this segment of the transportation industry is non-existent. This thesis provides an understanding of the structure and future prospects for this traffic, and provides a data base from which future research can be conducted.

1.2 Area of Interest

The main area of interest of this thesis is an examination of the services and facilities provided for the transport of drop trailer traffic between the B.C. Mainland and Vancouver Island. Since the British Columbia Government's involvement in ferry services in 1958, there have been several important changes to traffic using the ferry system, especially commercial traffic. The dramatic increase in ferry users prompted B.C. Ferries to change their policies regarding drop trailers, and to totally ban them in 1973. This resulted in all drop trailers being routed through C.P. Rails' British Columbia Coastal Steamship Service (B.C.C.S.S.) which is located in Vancouver. Thus of prime interest to this paper is the drop trailer traffic using B.C.C.S.S.'s ferry facilities.

The B.C.C.S.S. routes of interest are the downtown to downtown service between Vancouver and Nanaimo, and Vancouver to Swartz Bay. These routes are shown in Exhibit 1.1 along with the location of ferry terminals.
EXHIBIT 1.1

PRINCIPAL FERRY ROUTES

- - - - - British Columbia Coastal Steamship Service
- - - - - B.C. Ferries
- Ferry Terminal
Although B.C. Ferries main traffic is automobile and passenger they do carry commercial vehicles, but subject to certain restrictions. This commercial traffic is made up of "live units", or units where the driver accompanies the unit on the ferry. Since live trucks are the most common alternative to drop trailers, policies affecting B.C. Ferries' traffic, and in particular live trucks, will have an important impact on B.C.C.S.S.'s drop trailer traffic. Therefore all types of commercial motor carrier traffic will be of interest to this thesis.

The B.C. Ferry routes of interest in this regard are their main runs to and from the island, Tsawwassen to Swartz Bay, and Horseshoe Bay to Departure Bay. These are known as routes 1 and 2 respectively. They are also shown in Exhibit 1.1.

Other types of coastal transportation, such as tug and barge traffic, are of minor importance to drop trailers. Therefore, this thesis will only give them a cursory examination.

1.3 Importance of Thesis

During the past decade there have been several developments which have changed the structure of the ferry system between the B.C. Mainland and Vancouver Island. Some of these developments are:

(1) Since World War II operating costs economics of shipping has caused the consolidation of the ferry lines operating
along the B.C. Coast to a point where there are effectively two lines on the B.C. Mainland-Vancouver Island routes.

(2) Rapid increases in passenger and freight traffic has put severe strains on operating equipment. This has caused re-alignment of services to handle the traffic by the most efficient methods.

(3) The B.C. Ferries' operations have become oriented to automobile-foot passenger traffic, and as of 1973, totally banned drop trailer traffic.

As a result of these developments, all drop trailer traffic use the facilities of B.C.C.S.S., which are located in downtown Vancouver at the north foot of Burrard Street. Commercial traffic has experienced rapid increases in the past few years. This, as well as a general trend away from railcar to tractor-trailer units, raises a number of questions such as:

(1) What is the advantage of using drop trailers verses live units?

(2) Who are the main users of the drop trailer facilities and why?

(3) What are the anticipated future volumes of traffic? How adequate are the facilities for handling this traffic?

(4) What problems are created by the downtown location of B.C.C.S.S.' facilities? What are the benefits and costs of moving these facilities to another location?
1.4 Limitations

There are several factors which limit the scope and accuracy of this thesis. The most limiting factor is the scarcity of good information. This stems from both a reluctance of the private companies to divulge information, and from data being non-existent. Traffic data are available from both the B.C. Ferries and the B.C.C.S.S. only in aggregate form, which do not lend themselves to meaningful comparisons for the purposes of this study. Very limited financial data was available from each of the two ferry lines.

All private firms interviewed declined to specify origins and destinations of commodities moving by drop trailers. The competitiveness of the industry was the main reason for their reluctance. The question of a relocation has important political and economic ramifications for several parties and therefore difficulty was encountered in obtaining specific information about it, although a number of persons discussed it in very general terms.

These factors, as well as the finite time available served to limit some portions of this thesis.
1.5 Thesis Organization

The development and importance of the B.C. Mainland-Vancouver Island ferry service is the general theme of Chapter 2. This includes a discussion of the general problem of freight transportation to and from the Island, as well as an inventory of the services which are available.

Chapter 3 is an in-depth analysis of the drop trailer traffic. This examines the operations, advantages and disadvantages, and the economics of drop trailers compared to live trucks. Chapter 4 examines the overall characteristics of drop trailer traffic. This includes identifying the major commodities, users, volumes and traffic patterns. A forecast of future volumes is developed in this chapter which covers the next ten years.

Chapter 5 analyzes the present facilities with respect to future capacity requirements and constraints of the terminal area and vessels. A locational analysis deals with the problems and parties interested in the current location. Chapter 6 presents a benefit-cost analysis of a partial relocation of terminal facilities.

Chapter 7 concludes the thesis and offers recommendations for areas of future research.
Chapter 2

General Ferry System
2.1 Background to the Freight Problem

In order to appreciate the problems involved with the present system of freight transportation to and from the Island, an understanding of the physical and economic characteristics of the Island is necessary. People, the economy and the present transportation network on the island have played a crucial role in the shaping of the current ferry system, and will continue to exert such influence in the future. Therefore this section of the thesis reviews the relevant characteristics of Vancouver Island.

2.1.1 Vancouver Island

Vancouver Island lies off the southern coast of the British Columbia mainland. It extends 280 miles in a north-west-southeast direction, and has an average width of 50 miles, and a maximum of just over 80 miles. With a total area of just over 12,800 square miles, Vancouver Island is the largest island lying off the west coast of North or South America.¹

western coast. The western and northern portions of the island feature dense forests and several deep fiords. The ruggedness of this area makes travel difficult, which accounts for its sparse population. On the other hand, the lowlands, which extend from Victoria to Campbell River on the eastern coast are very much like the Fraser Valley on the mainland; -- fertile, accessible and provide excellent living conditions. This part of the island enjoys one of the most favorable climates in Canada. As a result, this area and Victoria in particular are extremely attractive as an area for retirement.

Population

The total area of Vancouver Island makes up something less than 3.7% of the total area of the province of B.C. However, the population, according to the 1971 census accounts for about 16% of the provincial total or approximately 375,000 persons². By far, the greatest concentration of people live in or around the capital, Victoria. Up until 1966 the Victoria area accounted for about one-half the island population. However in recent years this percentage has dropped somewhat as the central area of the island has experienced a rapid increase in population. The Nanaimo area, often referred to as "little Victoria", is the second largest population area on the island and has become the distribution center for the central island regions. This includes the cities of

Courtney, Port Alberni, Duncan and Campbell River. Exhibit 2.1 shows the concentration of development along the eastern seaboard.

Of the 10 census divisions in the 1971 census, the Vancouver Island division had the largest proportion of people over 65 years of age. This amounted to 12.4% of the population. Victoria and Oak Bay each had over 20% of their population in this age bracket, confirming the area as a prime spot for retirement.

2.1.2 The Economy

The chief primary industries on the island are forestry, agriculture, fishing and mining. In 1961 the labour force of Vancouver Island contained approximately 17% of the provincial total. The composition of this total was:

<table>
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<th>Industry</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Agriculture</td>
<td>2.3%</td>
</tr>
<tr>
<td>Forestry</td>
<td>7.4%</td>
</tr>
<tr>
<td>Fishing</td>
<td>1.3%</td>
</tr>
<tr>
<td>Mining</td>
<td>1.0%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>16.2%</td>
</tr>
<tr>
<td>Construction</td>
<td>4.9%</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>2.9%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>11.7%</td>
</tr>
<tr>
<td>Service Industries</td>
<td>49.4%</td>
</tr>
</tbody>
</table>

Source: Regional Index of British Columbia.
1. Greater Victoria
2. Duncan
3. Lake Cowichan
4. Lady Smith
5. Nanaimo
6. Parksville
7. Qualicum
8. Port Alberni
9. Ucluelet
10. Tofino
11. Comox
12. Courtenay
13. Campbell River
14. Kelsey Bay
15. Beaver Cove
16. Port Alice
17. Port Hardy
18. Port McNeill

Airports
Island Highway
B.C. Ferries
C.N. Rail
C.P. Rail
Restricted Use Roads
Forestry is by far the most important of these activities. More than 1/3 of the provincial labour force engaged in logging is located on Vancouver Island\(^3\). The main forestry areas are located near Alberni, Alert Bay, Campbell River, Ladysmith-Chenainus, Lake Cowichen, Port Alice, Nanaimo, Duncan, and the Zeballos-Thasis area.

Manufacturing is also very important to the island economy, and about two-thirds of it is related to the forestry industry in the production of pulp and paper, lumber, plywood and chipboard. Pulp and paper production on the island accounts for over 1/2 the provincial production, and is one of the islands' greatest sources of money income. Exhibit 2.2 shows the location of these industries.

Table 2.1 shows that by far the largest percentage of persons in any one industry work in the service industry. A very large portion of this figure is made up of civil servants, — a result of Victoria being the provincial capital and the home of the legislature. In terms of numbers, the civil service approximately equals the manpower of the forest industry.

Only a very small proportion of the island is directly concerned with agriculture. It is by no means self sufficient,

nor is it expected to become so, with little expansion due to limited first class soil and high land prices. Beef cattle is the most prominent primary product followed by dairy products. Over 80% of the acres under crop are for the production of hay and other fodder crops. Even so, feed must often be transported in from the mainland.

Although the basic component of the Nanaimo and Duncan economies is forestry, the bulk of the employment is provided by service industries. Services industries also rank first in the economies of Greater Victoria, Courtney-Comox, Parksville-Qualicum Beach, and Sooke-Jordon River. Much of this employment is directed at the ever-increasing tourist industry.

The economies of Ucluelet and Tofino are based primarily on commercial fishing with some logging and mining. The west coast, with the completion of the construction and paving of highway #4, is rapidly increasing their tourist industry in the area shown in Exhibit 2.3.

2.1.3 Transportation Network
At present it is impossible to drive the entire length of the island on public roads. On the east coast, a paved highway runs from Victoria to Kelsey Bay, a distance of 250 miles. The northern communities of Port Alice, Port Hardy and Beaver Cove are cut-off from the highway and the south. As a result shipping is
oriented from Vancouver rather than Victoria. This pattern will change when roads are built, but at present the northern popula-
tion does not warrant the very high cost of construction of such roads. Highway access to the west coast is limited to highway #4 to Tofino and Ucluelet. Use of private logging roads is permitted in some cases, but only on a restricted basis. The highway net-
work is shown on Exhibit 2.1.

Although the first scheduled flights started between Victoria and Vancouver in 1933, the popularity of air travel was a post war phenomenon.

"Until the appearance of an extensive air service after W.W. II as many as one hundred coastal commun-
ities had no transport facilities available to them except those supplied by the coastal carriers."\(^4\)

Today the air system is made up of three regularly scheduled carriers, and a number of smaller charter carriers. The bulk of the traffic using the system flow between Vancouver and several island points. Pacific Western Airlines, the dominant island carrier estimates that only 5% of gross revenues results from the carriage of air cargo. Of the air cargo carried, about 65% is destined to Port Hardy. The reason for this is the absence of a highway network to the northern communities. Tourist passengers are very important to the larger carriers, P.W.A. and Air Canada, especially during the summer months. As there is no service from

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Victoria north, all traffic must be routed through Vancouver.

2.2 General Problem of Freight Transport to and From the Island

The development of Vancouver Island with respect to its population, economy, transportation network and relationship to the rest of British Columbia, have had very important consequences on the transportation of freight to and from the island. In general terms, those factors which have been most important in development of the present system are:

(1) The large population of Vancouver Island, as well as its economic relations with the rest of British Columbia necessitates a high degree of communication between the two. Thus the ferry system has always been a politically sensitive issue, especially since the provincial legislature is located in Victoria. Consequently the ferry system has been more oriented to a rapid throughput of passengers and autos than for the provision of freight services.

(2) The importance of the tourist industry to the Island economy, as well as the government's efforts to promote it intensifies the orientation of the ferry system to passengers of autos. Furthermore, the different operating and handling characteristics of tractor-trailers and autos tends to accentuate the need to separate them. This is particularly true during the summer months when severe peaking of demand occurs. This problem has led to various restrictions being placed on certain commercial truck
traffic by B.C. Ferries.

(3) The primary industries of the Island are extractive in nature and transportation of their products require bulk movements by either barge or railroad. On the other hand, traffic moving to the island is primarily general merchandise and foodstuffs, and therefore oriented to motor carrier transport. Accordingly there is an imbalance in eastwest movements by each mode, which has been estimated for railcar as 6 to 1 in favour of eastbound movements, and 4 to 1 for truck traffic, favouring westbound movements.\(^5\)

(4) The distance to the island from Vancouver is not great -- in the neighbourhood of 25 miles. However to move goods to a point on the island involves routing it through one of the greater Vancouver terminals to one of two terminals on the island. Therefore, even though the distance is not great, the cost is substantial due to ferry costs, idle time, waiting time, access time, ferry schedules, and unavoidable congestion in Vancouver.

2.3 The Ferry System in British Columbia -- A Brief History

2.3.1 Pre 1958

Up until 1958 ferry service was provided entirely by private enterprise. The Union Steamship Company of British

\(^5\)Personal interview with Mr. Jim Yates, Manager, British Columbia Coastal Steamships, Vancouver.
Columbia was the major carrier, and at the height of its existence, served the B.C. coast extensively. Canadian Pacific Navigation Company began service between west coast ports and between Vancouver and Victoria in the late 1880's. In 1901 Canadian Pacific Railway purchased this company and began the "triangle run" -- Victoria-Vancouver-Seattle. The Black Ball Ferry Line was the third largest line, connecting Departure Bay in Nanaimo and Horse-shoe Bay on the mainland.

During World War II, several ferries involved in B.C. coastal service were commissioned for war uses such as hospital ships and transportors. The reduced number of ferries in the post war period were faced with a rapidly increasing demand for the transport of highway vehicles, including both trucks and passenger vehicles. This presented severe capacity problems as the ferry fleet was, for the most part, made up of small ocean liners, quite inadequate for the transport of vehicles. With the new demands being placed on it the fleet had become obsolete.

The post war period was also characterized by rapidly increasing operating costs as well as replacement costs. Stiff competition was experienced on the main cargo routes while

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traffic was being lost to the airlines on the longer runs. These factors all contributed to the downfall of the Union Steamship Services. In 1956 Black Ball replaced it on the Bowen Island run. In January, 1959 the Union Company finally sold its assets to its competitor, Northland Navigation.

2.3.2 1958 Government Involvement

The operating difficulties of Union were also felt by the Black Ball Line and Canadian Pacific Railway's British Columbia Coastal Steamship Service, (B.C.C.S.S.). In 1958 the employees of B.C.C.S.S. struck for higher wages. They were supported by the employees of Black Ball. The B.C. Cabinet under W.A.C. Bennett evoked the Civil Defense Act which allowed the government to take possession of and use the property of the Black Ball Line. The employees of the company struck again in defiance of the order and ignored an injunction to return to work. As a result, the Premier announced that the government would establish its own ferry system to the island so that ferry connections between the island and mainland would "not be subject to either the whim of union policy nor to the indifference of federal agencies." 8

The government started by letting two tenders for one ferry each to two B.C. shipbuilding companies, the Victoria

Machinery Depot and Burrard Dry Dock. The MV Sidney (later renamed Queen of Sidney) was completed on October 6, 1959 and the MV Tsawwassen (later renamed Queen of Tsawwassen) was completed on November 28, 1959.

In 1959 Swartz Bay was named as the Vancouver Island terminal and Tsawwassen for the south Vancouver terminal. These two points were chosen for the short route crossing and the fast turnaround. Construction was started immediately. The new system offered a two hour service.

The rationale for the government's decision on the location of the terminals at Tsawwassen and Swartz Bay is based on C.P.R.'s operations. In 1959 the C.P.R. had withdrawn its night steamers from the Victoria-Vancouver run and reduced its winter service. After commencement of the Government Service, C.P.R. abandoned this run altogether. In 1962 C.P.R. further reduced its service by withdrawing two of its three ships from the Vancouver-Nanaimo run.

Since the inauguration of the Government Ferries on June 15, 1960, the system has experienced a tremendous increase in travellers. To meet the demand, B.C. Ferries carried out an ambitious expansion programme of purchasing and building ferries. In September, 1961, the Gulf Island Service was purchased by the B.C. Ferry Authority. In October, 1961, the Black Ball Ferries Ltd., which operated ferries from Horseshoe Bay to Nanaimo as well as
the Sunshine Coast was purchased. From 1962-1965 the B.C. Ferry Authority had another ten ships built for them. In 1966 the Federal Government shipbuilding subsidy was cut from 40% to 25% and eventually to 17%. This, combined with the rapidly increasing costs of construction, made the purchase of new ships prohibitive. From 1966 to 1974 no new ferries have been built for the fleet.

As a result, the Authority turned to purchasing ferries from other sources. From 1966 to 1974 six of these ferries were acquired and put to duty on the B.C. coast as part of the "Dogwood Fleet".

In 1974 the government announced that tenders were let for the construction of three new ferries. Although the hulls are all the same, one ferry's superstructure is designed as a trailer ferry. The total program will cost in the neighbourhood of 50 M. and the scheduled delivery date is mid 1976.

2.4 Ferry Services

A wide range of services are provided by the ferries operating between the B.C. Mainland and Vancouver Island. These services include passenger, automobile and commercial vehicular traffic. The purpose of studying these services is to identify the interrelationships of each, and the market segmentation by the carriers. The policies followed by one carrier may have serious implications for the other carrier. Thus, to under-
stand the drop trailer traffic in particular, a general background knowledge of the whole ferry system is necessary.

2.4.1 Passenger and Auto

In total, five carriers supply direct service to the Island: B.C. Ferries; B.C.C.S.S.; Washington State Ferries; Black Ball Transport; and the B.C. Department of Highways. Washington State Ferries and Black Ball Ferries serve Victoria and Swartz Bay from the State of Washington points of Port Angeles, and Anacortes. The B.C. Department of Highways makes one run between Powell River and Comox. However on the routes of interest to this thesis, the lower B.C. mainland to Vancouver Island, the only two carriers are B.C. Ferries and C.P.'s British Columbia Coastal Steamship Service. Since passengers and automobile traffic cannot be separated as they require a joint service, they will be discussed together in this section.

B.C. Ferries

Although both B.C.C.S.S. and B.C. Ferries carry passengers and autos, B.C. Ferries is by far the larger. B.C. Ferries operates four ferries on each of its two major routes, Tsawwassen to Swartz Bay, and Horseshoe Bay to Departure Bay.9 During the summer months this is increased to five on each route.
These two routes (out of 12) account for over 2/3 of all Government carried traffic to the island. B.C. Ferries system features a modern fleet, passenger conveniences, and a sailing time of less than two hours. Their system of loading, unloading, and terminal location are all designed for rapid turnaround. The ferries on this route have a car capacity of 192 and a passenger capacity of 1200. The ferries usually sail with excess passenger capacity as vehicle capacity is reached much sooner.\textsuperscript{10} One reason for this is that over 50\% of all vehicles have two or less passengers.\textsuperscript{11} The average number of passengers per car is 2.3. There are sixteen sailings per day offered at each terminal. The schedule differs slightly during the winter months.

The B.C. Ferries experience severe peaking during the summer months which often causes long delays for the users. The British Columbia Ferry Study found during the summer months that routes one and two have an average utilization in the neighbourhood of 85\%.\textsuperscript{12} During the popular daytime hours, the

\textsuperscript{10}Mr. B. Bouchard, Assistant Traffic Manager, B.C. Ferries. This situation could change if an abnormal number of buses arrived for onesailing. As a result, buses are limited to 9 per sailing.

\textsuperscript{11}\textit{S.P.E.C. and U.B.C. Transportation Centre, British Columbia Ferry Study, 1973.}

\textsuperscript{12}\textit{S.P.E.C. and U.B.C. Transportation Centre, British Columbia Ferry Study, 1973.}
effective utilization is 100%. The study further found that the main cause of peaking are tourists, which account for 75% of the trips. 36.6% of the users during the summer months are from outside B.C. This gives an indication of the importance of the tourist industry to Vancouver Island.\footnote{The British Columbia Ferry Study made a rough calculation of the gross economic impact on Vancouver Island by ferry users for August, 1973 which turned out to be $10,206,000.}

The ships built during the 1960's for B.C. Ferries originally had a capacity of 100 cars. This capacity was increased to 144 cars in 1967-1969 by the addition of platform decks. These decks fold down over the regular lanes of vehicles. There is a problem however, in that the deck or flaps cannot be lowered if there are any vehicles in excess of six feet six inches in height in the first two lanes.\footnote{Personal Interview with Mr. B. Bouchard, Assistant Traffic Manager, B.C. Ferries.} This means that most commercial trucks, buses, and recreational vehicles\footnote{Includes mobile homes, campers, trailers, etc.} cannot be placed under the "flaps". During the summer months recreational vehicle traffic increases substantially, yet in order to lower the flaps, they must be restricted from those lanes.

From 1970 to 1974 capacity was further increased to 192 cars on these sister ships by "stretching them". This process in-
volves literally cutting the ferry in half and adding a new mid section. This process, completed by Burrard Dry Dock of North Vancouver increases the length of the ship by 84 feet.16

As summer peaking causes serious delays, methods of either expanding capacity or decreasing the peaks are being explored. Two new car and passenger ferries were placed in service in 1976. As well a trailer ferry with a capacity of 64-40 ft. trailers began service in the summer of 1976. This is used for all types of overheight vehicles.17 Terminal facilities at all four locations are being expanded.

Four methods of dealing with the peaking problem are discussed in the British Columbia Ferry Study. The first involves expanding the present schedules to include night sailings. This idea, which has received much publicity for a number of years, is generally favoured by the public and trucking companies, but receives much criticism from the Government as well as B.C. Ferries, mainly due to increased costs and labour problems. A second alternative involves the installation of a reservation system. This still has several financial and technical difficulties to be worked out.


17 Personal Interview with Mr. B. Bouchard, Assistant Traffic Manager, B.C. Ferries.
The third alternative is to set up a priority system based on residency. This would give Island residents, then lower mainland residents first priority in loading. This idea would create very poor public relations, especially to out-of-province tourists, who are important to the island economy. The last alternative would institute a differential pricing scheme with respect to time and users. Once again it would lead to poor relations with tourists as well as to B.C. residents using the ferry on a regular basis.

Regardless of method or policy used to alleviate the summer capacity problems, there could be serious consequences for all ferry traffic, not just those using B.C. Ferries. For instance, since trucks and overheight vehicles cause problems with the B.C. Ferries there may be new policies to limit, or totally ban them except for the new trailer ferry. Such an action may cause traffic to move to C.P.'s ferry system. In any case, since ferry traffic is not homogeneous, especially in their operating characteristics, the effect of any new policies are likely to be felt throughout the system.

British Columbia Coastal Steamship Service

Unlike B.C. Ferries, B.C.C.S.S.'s operation is not oriented to the carriage of passengers and automobiles. The major portion of their traffic carryings is the movement of, first,
drop trailers from Vancouver to Swartz Bay and Nanaimo, and second, railcars from Vancouver to Nanaimo. Under normal operations, only one of five ships operated carries passengers. This ship, the "Princess of Vancouver" sails three times daily, seven days a week between Vancouver and Nanaimo. During the week it carries 35 reserved automobiles on its top deck. On the weekends, all space not occupied by railcars is available for passengers and autos.

During the summer season the "Carrier Princess" is placed on the Vancouver to Nanaimo run for one sailing per day, in addition to her regular schedule. In addition to railcars and trailers, she carries about 70 autos plus foot-passengers. This enables the "Princess of Vancouver" to increase her load to 100 autos.

Thus B.C.C.S.S. provides only a very limited passenger and automobile service. This traffic, being secondary to trailers and railcars are usually carried only if and when space is available. B.C.C.S.S. carry only a very small proportion of this traffic compared to B.C. Ferries, however they do provide a reservation system for all traffic.

2.4.2 Commercial Traffic

Commercial traffic moving to and from the island can be divided into three groups -- railcar; highway carriers; and
bulk commodities. The present ferry system between the B.C. mainland and Vancouver Island is involved with only the first two, railcar and highway motor carriers.

**Railcar**

The requirement for water carriage of railcars comes from three sources, MacMillan Bloedel Ltd. (M.B.), Canadian National Railways (C.N.R.), and C.P. Rail (C.P.R.). Although they differ in organization, each of these three entities provide their own self propelled ferry operation.

MacMillan Bloedel, through its subsidiary transportation company Kingcome Navigation Co. Ltd., leases equipment from Seaspan International Ltd. for its railcar movements. This consists of one sailing per week using Seaspan's 26-railcar self-propelled barge, the "Hiada Transporter". The movement involves lumber from M.B.'s Harmac mill near Nanaimo to Burlington Northern Inc.'s Burrard Inlet slip at Vancouver. The eastbound movement usually moves at full capacity, while the westbound railcars are usually empty.

C.N.R. requires a single daily sailing to the Island to meet its needs. Four or five days a week sailings are direct to Victoria, while on other days drops and pickups are made at Rocky Point, James Island and Cowichan Bay. To meet this need, C.N.R. contracts the 24-railcar self-propelled barge
"Greg Yorke", and operators from Seaspan. This rail ferry makes the trip to Victoria in eight hours, and longer when making intermediate stops. C.N.R.'s slip on the mainland is located on Tilsbury Island, in the south arm of the Fraser River.

The average payload on the "Greg Yorke" is about 20 railcars, 17 loaded and 3 empty on the eastbound trip, and 3 loaded and 17 empty on the westbound trip. The eastbound trip, like M.B. is made up almost entirely of forest products. The westbound traffic includes canned goods, plastic pipe and soda ash.

Railcar traffic of C.P.R. is transported across the Strait of Georgia by British Columbia Coastal Steamship Service, a separate cost centre of C.P. Rail. Unlike the strictly railcar barging operation of M.B. and C.N.R., B.C.C.S.S.'s operations are more complex. Historically B.C.C.S.S. has provided a railcar-footpassenger-bulk commodity ferry which later evolved into a railcar-automobile-livetruck ferry. With the establishment of B.C. Ferries, and their restrictive policies regarding drop trailers, B.C.C.S.S.'s system now specializes in carload and drop trailer commercial traffic.

18 Jurczynski, C., Rail Barge and Trucking, Commerce 444, 1975 student paper in Commerce faculty. This would include specialized rolling stock such as temperature controlled cars for foodstuffs, etc., which cannot be used for transporting forest products.
B.C.C.S.S. operates 5 vessels, 3 B.C.C.S.S.-owned and two leased from Seaspan. The Seaspan vessels, the "Seaspan Doris" and the "Hiada Transporter" are leased for one night time sailing each day. Railcars are carried on the "Princess of Vancouver" and the "Seaspan Doris" between Vancouver and Nanaimo. As C.P.R. and C.N.R. actively compete for rail oriented traffic, their traffic composition is very similar. However, C.P. ships a much greater volume; in the order of two times that of C.N.

Commercial motor carrier traffic is carried by either B.C.C.S.S. or B.C. Ferries. Motor carrier traffic is made up of two types: live trucks and drop trailers. Live trucks are those units which are accompanied on the ferry by the driver. Drop trailers are those units where the trailer is detached from the power unit and loaded on the ferry by other means. The trailer is unloaded at the other terminal and picked up by another power unit. Because mobile homes and some construction equipment have these same characteristics, they are sent as "drops" as well.

Since drop trailers have much different handling characteristics than automobiles, they have been banned on B.C. Ferry runs. Therefore, essentially all drop trailer traffic moves via B.C.C.S.S. from Vancouver to Victoria or Nanaimo.19 Live

19During 1973 and part of 1974 Tilsbury Island Terminals operated a drop trailer facility, but this was terminated in October of 1974. Personal interview with John Cosulich, Manager Tilsbury Island Terminals.
truck movements on B.C.C.S.S. are restricted to leftover space, and usually limited to unpopular sailing times. Therefore live trucks are usually carried by B.C. Ferries.

B.C. Ferries offer frequent daytime sailings which are attractive to live trucks, whereas B.C.C.S.S. offers basically an overnight service, with only one sailing during business hours. B.C.C.S.S. offers a reservation system as well as specialized equipment for handling drop trailers, therefore this business is essentially "captive". Presently there is in the neighbourhood of 350 trailers moving daily by this service.

Unlike the railcar movement, motor carriers have a traffic imbalance in favour of westbound movements, in the order of 4 to 1 over eastbound movements. The preponderance of westbound truck traffic between Vancouver and the island is made up of General Merchandise. This includes groceries, food-stuffs, beer, hardware, appliances, fertilizers, and building products. Eastbound movements include lumber and forest products, government materials and fish (seasonal). The flow of mobile homes, which has been growing rapidly, is entirely westbound.

20 Jim Yates, Manager, B.C.C.S.S., Personal Interview, Vancouver, British Columbia.
2.4.3 Bulk Commodities

As mentioned earlier, the ferries operating in British Columbia do not handle bulk commodities. These are moved mainly by tug and barge along the B.C. coast. By far the most important commodity, in terms of value and tonnage are forest products. This includes pulp and paper products as well as lumber products. Gravel and limestone contribute significant tonnages to coast-wise shipping. Services are provided by a number of tug and barge companies such as Seaspan, Gulf of Georgia Towing, Rivtov Straits and Northland Navigation, as well as many smaller companies. A number of large shippers, such as MacMillan Bloedel and Imperial Oil own their own barges.
Chapter 3

Nature of Drop Trailer Traffic
Introduction

Published information pertaining to ferry operations specializing in commercial highway traffic is extremely limited. The purpose of this chapter is to analyze the operations of B.C.C.S.S., including the facilities and special equipment provided for the carriage of drop trailers. The advantages and disadvantages of drop trailers are studied from the point of view of the shippers, the motor carriers and the ferry companies. The chapter concludes with an analysis of the economics of shipping via drop trailer rather than live truck.

3.1 Drop Trailers' Operations

3.1.1 Facilities

As Chapter 2 pointed out, B.C.C.S.S. is presently the only company to offer a facility for the handling of drop trailers. The handling and loading characteristics of drop trailers are very different than automobile and passenger oriented traffic. Mixing them on a passenger-auto oriented ferry causes loading problems and delays. Therefore, an efficient drop trailer facility requires specialization of traffic handling methods. In previous years drop trailer transportation was provided by two other sources.

Prior to 1968, B.C. Ferries handled drop trailer
traffic, but on a much less specialized basis. It was in that year that the government announced drop trailers would only be handled on a restricted basis.\(^1\) In 1973 it was announced that drop trailer traffic would be banned altogether.

In 1971, Tilsbury Island Terminals Ltd. initiated a drop trailer facility from their terminal on Tilsbury Island to Cowichan Bay on Vancouver Island.\(^2\) They used a tug and barge to provide the transportation. This service was discontinued in 1974. Several problems were cited, including operating problems with the tug and barge and it was only a marginally economic venture.\(^3\) Tilsbury still operate a drop trailer service to Prince Rupert and the Queen Charlotte Islands, transporting 16-18 40 foot trailers per week of general freight.

B.C.C.S.S. provide their ferry service at the downtown terminal from two berths, known as Piers A-1 and A-3. Both piers are capable of handling all types of rolling stock; e.g.: railcars, drop trailers, autos, mobile homes and industrial equipment. Pier A-3 is an all weather pier, whereas Pier A-1 cannot handle

\(^1\)From 1968 until 1973, drop trailers were handled only during the evening runs of the winter months.

\(^2\)Tilsbury Island Terminals Ltd. is a subsidiary of Rivtov Straits Limited.

\(^3\)Personal Interview with (Capt.) John Cosulich, Manager, Tilsbury Island Terminals Ltd.
railcars at extreme high or low tides.\textsuperscript{4} Pier A-3 also has facilities for handling foot passengers.

One of the prime features of the drop trailer concept is the ability of the motor carriers to literally drop their trailers at any time during the day of the sailing. Therefore, the facility must provide adequate space for the parking of trailers. Space is also required for trailers unloading from Nanaimo or Swartz Bay. These arrive mainly in the late evening or early morning and must be picked up during that day, due to the limited area of parking.

Unlike B.C. Ferries, B.C.C.S.S. provides a reservation system for its customers. For this service, a traffic office was set up with a Traffic Supervisor. This person is in touch with the dispatchers of the major users to determine their space requirements that day. These spaces, on each particular sailing, are reserved for that customer. In addition the traffic supervisor is in daily communication with C.P. Rail officials for their railcar requirements.

After reservations have been taken and allocated for drop trailers, the traffic supervisor will accept reservations for handling live (driver accompanied) units. These are given on

sailings where space is available. This is usually limited to the not so popular sailings, such as the 0145 to Swartz Bay, or the noon to Vancouver. Reservations are available for passenger cars through the Wharf Ticket Office. That office is assigned spaces in line with the requirements of the Traffic Supervisor.\(^5\) Thus the reservation system is based on certain priorities, but set up such that maximum utilization of space is achieved. The B.C.C.S.S., though specializing in drop trailers requires all three types of traffic in order to maintain its current operation of five vessels.\(^6\)

3.1.2 Special Equipment

Prior to 1973 drop trailers were loaded onto the ships by the tractors and drivers of the companies who delivered them. Larger companies with several trailers would assign only a few tractors to perform the loading function. This system was unsatisfactory as it required the driver and tractor to wait at the piers until loading, resulting in idle time. Loading was not completed in the most orderly fashion due to congestion caused by the number of units waiting to load. The longer time spent loading and unloading increased turnaround times.

In July, 1973, B.C.C.S.S. adopted the "Hostling" concept

\(^5\)Ibid., p. 6.

\(^6\)Personal Interview with Mr. Jim Yates, Manager, B.C.C.S.S., Vancouver.
for handling drop trailers. Under this system, trailers are loaded and unloaded by a special 2 axle tractor equipped with a hydraulic "5th wheel". This unit can hook up to a trailer, hydraulically lift it, and move it into place, without having to perform the time-consuming task of manually raising and lowering the trailer's parking legs. This system allows the trucking companies to use their drivers and tractors for other purposes after dropping off the trailer. It also provides time savings and reliability to the loading and unloading function.

The drivers and hostlers are provided for under an agreement with three trucking companies, Johnston Terminals, Capital Freightways, and C.P. Transport. Under the agreement these companies provide the service in turn for an hourly wage as well as a guarantee of 15 hours per day. B.C.C.S.S. recovers the cost of the hostlers through the current tariff. The rate charged is $6.75 per unit loading or unloading.

There are presently five hostling units operating in Vancouver, one in Swartz Bay and none in Nanaimo. Vancouver has the largest facility as it handles traffic from both Island terminals.

8B.C.C.S.S. Tariff No. 8.
9Both C.P. Transport and Johnston Terminals are located in the immediate vicinity of B.C.C.S.S.'s parking lot in Nanaimo, therefore a hostling service is not provided.
B.C.C.S.S. currently operates five vessels on its two main routes to the island. These are:

"Princess of Vancouver"
"Carrier Princess"
"Trailer Princess"
"Seaspan Doris"
"Hiada Transporter"

The first three ships are owned by B.C.C.S.S., the remaining two by Seaspan, but under contract to B.C.C.S.S. Until the mid 1950's B.C.C.S.S. operated six towed barges serving three island points. The "Trailer Princess", built during World War II, was the first self-propelled ferry to be put into service. The "Princess of Vancouver" was subsequently built specifically for B.C.C.S.S. The newest vessel, the "Carrier Princess" was put into service in 1973.

The following table and diagram present details regarding the ships, their capacities, routes and schedules.

**TABLE 3.1**

<table>
<thead>
<tr>
<th>Ship</th>
<th>Railcars</th>
<th>Trailers</th>
<th>Autos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Princess of Vancouver</td>
<td>28</td>
<td>30</td>
<td>35 (top deck)</td>
</tr>
<tr>
<td>(2 decks)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier Princess</td>
<td>28</td>
<td>40</td>
<td>--</td>
</tr>
<tr>
<td>(1 deck)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer Princess</td>
<td>8 (loaded)</td>
<td>28</td>
<td>--</td>
</tr>
<tr>
<td>(1 deck)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seaspan Doris</td>
<td>24</td>
<td>45</td>
<td>--</td>
</tr>
<tr>
<td>(2 decks)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hiada Transporter</td>
<td>--</td>
<td>32</td>
<td>--</td>
</tr>
<tr>
<td>(1 deck)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: B.C.C.S.S.*
# EXHIBIT 3.1 B.C.C.S.S. SCHEDULE

## Routes (a)

### Ex Vancouver

<table>
<thead>
<tr>
<th>Time</th>
<th>Ship</th>
<th>To</th>
<th>Sailing Time</th>
<th>Arrive Vancouver</th>
</tr>
</thead>
<tbody>
<tr>
<td>0145</td>
<td>CP</td>
<td>SB</td>
<td>3 1/2 hrs.</td>
<td>0800</td>
</tr>
<tr>
<td>0400</td>
<td>PV</td>
<td>N</td>
<td>2 1/2 hrs.</td>
<td>0830</td>
</tr>
<tr>
<td>1200</td>
<td>PV</td>
<td>N</td>
<td>2 1/2 hrs.</td>
<td>0845</td>
</tr>
<tr>
<td>1730</td>
<td>CP</td>
<td>SB</td>
<td>3 1/2 hrs.</td>
<td>1030</td>
</tr>
<tr>
<td>2000</td>
<td>PV</td>
<td>NAN</td>
<td>2 1/2 hrs.</td>
<td>1830</td>
</tr>
<tr>
<td>2100</td>
<td>TP</td>
<td>SB</td>
<td>5 hrs.</td>
<td>0230</td>
</tr>
<tr>
<td>2315</td>
<td>SD</td>
<td>NAN</td>
<td>3 1/4 hrs.</td>
<td>0400</td>
</tr>
</tbody>
</table>

### Distance
- Van. to Swartz Bay
  - 47 miles.
- Van. to Nanaimo
  - 36 miles.
Notes:

(a) During the summer season the Carrier Princess is placed in service between Vancouver and Nanaimo, leaving Vancouver at 10:00 a.m. and returning at 1:30. This sailing is in response to heavy tourist traffic.

Exhibit 3.1 shows that there is only one daytime sailing from Vancouver. This leaves at noon, bound for Nanaimo. Thus the service B.C.C.S.S. provides is basically overnight, which is that required by its major customers, the trucking companies. These companies advertise a next day delivery service from Vancouver, thus B.C.C.S.S.'s schedule of late night crossings suits them well.10

3.2 Advantages/Disadvantages of Drop Trailers

3.2.1 Motor Carriers

The use of the drop trailer system of moving trailers to Vancouver Island has proved to be advantageous to both the supplier of the service, as well as to the users. For the user of this facility, arrangements must be made for the delivery and pickup of the trailer at each side. Thus the service is most attractive to trucking companies or private shippers who have substantial operations on both the mainland and Vancouver Island, and

10 Personal Interview, with Mr. Chubb Bawa of Johnston Terminals.
ship volumes of tractor and semi-trailer size.

The main advantage to the user of the facility is the elimination of idle time for the power unit and the driver during waiting and sailing time. Under the drop trailer concept this idle time is eliminated by simply dropping off the trailer prior to sailing, and going about other business.

The reservation system allows the users to schedule their hauls to the terminal. Since space is guaranteed on certain sailings, they can deliver the trailer to the terminal at their convenience. This gives their operation added flexibility. The reservation also eliminates the chance of having to wait for a ferry - a distinct possibility for live trucks on B.C. Ferries.

One final advantage is the priority given to commercial trailer traffic over passengers and automobiles. For B.C.C.S.S., the major portion of their traffic is the movement of drop trailers between Vancouver, Swartz Bay and Vancouver. Live trucks, passengers and autos are taken on sailings only where space is available.

For some users of the facility, the downtown location is very convenient to their operations. Johnstons, Capital Freightways and C.P. Transport would all fit into this group. A trip to Horseshoe Bay or Tsawwassen would add close to an hour on to
their delivery time. For other companies, the location is not so convenient. These companies are usually located on the periphery of Vancouver. Access to the terminal requires a trip through the heart of downtown Vancouver. This involves a time consuming trip often in heavy traffic on restricted truck routes.

Drop trailers also provide several advantages for B.C.C.S.S. over other types of traffic. First, in order for a company to take advantage of the economics of drop trailers, they must ship enough regular traffic to support having at least one tractor and driver on each terminal. Thus the service appeals to a small number of users who account for large volumes of traffic. This makes for easier communication between B.C.C.S.S. and its customers.

The reservation system allows for careful planning and scheduling of sailings. Spaces not reserved for commercial vehicles are assigned for passenger cars and live trucks. As a result of this system, maximum utilization of available space is made on all vessels.

On the vessels the "Hiada Transporter" and the "Seaspan Doris", no passengers are carried at all. Thus vessel crews are kept to a minimum, and customer services need not be provided. The "Carrier Princess" (on regular runs) and the "Trailer Princess" limit passengers to drivers of live units. Again this enables B.C.C.S.S. to maintain small crews and limit services.
Since the service provided (and required) is overnight, and regular passengers are not carried on four out of five vessels, B.C.C.S.S. is able to make use of older and slower vessels such as the "Trailer Princess". In a fleet such as B.C. Ferries which is geared to passenger car transport and rapid turnarounds such a vessel would be uneconomic to operate.

One of the problems with this traffic however, is the large amount of space which is required for parking the trailers before loading, or awaiting pickup. The Vancouver facility must handle the combined volumes of Nanaimo and Swartz Bay. Due to the size of trailers, handling is cumbersome, and loading and unloading is much slower than passenger cars, even with specialized equipment such as hostlers.

3.3 Economics of Drop Trailers

The ferry system is an important and vital link in the Island-Mainland transportation system. This system has been viewed by many as an extension of the highway system. In this regard the demand for ferry transportation of commercial drop trailers can be viewed as an intermediate demand, as is the demand for truck transport, which is derived from the demand for the final product.

3.3.1 Economic Advantages
Rather than individual segments of the transport function, the ferry and trucking service can be viewed as elements of a total distribution system. This system would include all the costs and functions of moving goods to the final consumer.

Distribution costs have been rapidly increasing over the past decade or so, especially on consumer goods. Thus any significant reduction in the distribution costs would generate substantial savings in the cost of the final product. In this regard, drop trailer ferry service has provided a definite advantage over live truck transport on the total distribution costs from Vancouver to the Island for several users. This cost advantage is achieved without any loss in flexibility or reliability of service.

The economic advantage to trucking firms of using drop trailers can be measured in dollar terms. This is achieved by means of a comparative analysis of the costs associated with shipping by drop trailer, as well as the costs with the alternative -- shipping by live truck.

### 3.3.2 Time Savings

The main advantage to a user of the drop trailer service is the elimination of idle truck and driver time. Thus the first step in the analysis is to construct the trip times via each method. For the purposes of this analysis travel time to the
ferry terminals will be assumed to be equal. In reality, this may not be true, as it would depend on the location of the shipper's terminal, the routes taken, the time of the trip, and the level of congestion at that time of day. By setting the delivery times equal, the analysis is restricted to the ferry voyages, and the economies of drop trailers per se, and not a choice of routes. Thus the analysis begins at the time of delivery to the facility. As well it is assumed the delivery of the trailer will be made to the shippers facility in Nanaimo or Victoria. This simplifies the analysis by ignoring deliveries to various locations and trailer unloading. However, since the major trucking firms haul mainly from their Vancouver Terminal to their Island terminals, this assumption is realistic. The analysis therefore, confines itself strictly to ferry portion of the trip, so the same location of terminal facilities is assumed.

The times used in Table 3.2 are based on normal trip times experienced by trucking companies and of ferry schedules. They are representative of the time it would take for each step under normal conditions.
**TABLE 3.2**

**COMPARISON OF TRIP TIMES TO VANCOUVER ISLAND**

**FOR DROP TRAILERS VERSUS LIVE UNITS**

<table>
<thead>
<tr>
<th></th>
<th>Live Unit (min.)</th>
<th>Drop Trailer Tractor</th>
<th>Drop Trailer Driver</th>
<th>Drop Trailer Trailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waiting Time</td>
<td>45</td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Time</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sailing Time</td>
<td>110</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unloading Time</td>
<td>10</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting Time</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery to Co. Dist. Center</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Return to Ferry Terminal</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Waiting Time</td>
<td>40</td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loading Time</td>
<td>20</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sailing Time</td>
<td>110</td>
<td>180(^1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unloading Time</td>
<td>10</td>
<td></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Total Minutes</strong></td>
<td><strong>425</strong></td>
<td><strong>60</strong></td>
<td><strong>60</strong></td>
<td><strong>930</strong></td>
</tr>
</tbody>
</table>

**Note 1.** Combined sailing time between Swartz Bay and Vancouver would be 1 hour longer.

The above calculations do not include time for lunch breaks, etc. Nor does it include provision for extra charges such as meals and subsistence, since these would vary considerably according to each company. Thus the difference in costs will be limited to those attributed to idle time of the tractor and driver due to crossing as a live unit.
The results contained in Table 3.2 are very significant. This table shows that for a typical trip to the island, a live unit requires an additional 6 hours and 5 minutes of tractor and driver time over and above that required by a drop trailer. On the other hand, the use of drop trailers requires an additional 8 hours and 25 minutes of trailer time. These times are used in Section 3.3.4 in the determination of the net benefits of drop trailers. Before that calculation can take place, the cost of using each facility must be included as they vary between carriers. This is the subject of the next sub-section.

3.3.3 Rate Schedules

The rates for live units are contained in the tariff published by B.C. Ferries, and those for drop trailers in B.C.C.S.S.'s tariff. B.C. Ferries Tariff is a complex publication containing over 65 pages of rules, regulations, fares and charges. B.C.C.S.S.'s tariff is much shorter, containing only 8 pages. The rates contained in these tariffs are:

### TABLE 3.3

**FERRY CHARGES**

<table>
<thead>
<tr>
<th>A. B.C. Ferries</th>
<th>To Nanaimo</th>
<th>To Victoria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucks, Trailers (commercial)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>minimum charge up to 20 feet; $26.00: over 20 feet; $1.10 per foot thereafter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- rates include driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- units over 65' must obtain special permission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- commercial units are those over 12,000 GVW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. B.C.C.S.S.</th>
<th>To Nanaimo</th>
<th>To Victoria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucks, Trailers: up to 20'</td>
<td>$39.00</td>
<td>$48.00</td>
</tr>
<tr>
<td>21 to 26'</td>
<td>$48.00</td>
<td></td>
</tr>
<tr>
<td>27 to 31'</td>
<td>52.00</td>
<td>69.00</td>
</tr>
<tr>
<td>32 to 36'</td>
<td>59.00</td>
<td>79.00</td>
</tr>
<tr>
<td>37 to 41'</td>
<td>63.00</td>
<td>85.00</td>
</tr>
<tr>
<td>41 to 45'</td>
<td>69.00</td>
<td>94.00</td>
</tr>
<tr>
<td>over 45' - each additional foot</td>
<td>1.47</td>
<td>1.78</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobile Homes</th>
<th>Nanaimo</th>
<th>Vancouver</th>
<th>Swartz Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 - 40' (12' wide)</td>
<td>$98.60</td>
<td>$124.60</td>
<td></td>
</tr>
<tr>
<td>over 40' per additional foot</td>
<td>1.55</td>
<td>2.30</td>
<td></td>
</tr>
<tr>
<td>Handling Charges</td>
<td>Load</td>
<td>Unload</td>
<td>Load</td>
</tr>
<tr>
<td>Trucks &amp; Trailers</td>
<td>7.25</td>
<td>7.25</td>
<td>6.75</td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>12.50</td>
<td>12.50</td>
<td>12.50</td>
</tr>
</tbody>
</table>

---

12. B.C. Ferries offers a discount for major customers, known as "commercial script". This is available for minimum purchases of $200 and amounts to a 10% discount.

13. B.C.C.S.S. offers a discount to major users of 10%.
For comparative purposes, these rates are graphed in Exhibit 3.2. A number of observations should be noted with respect to these rates:

(1) B.C. Ferries use the same rate for their routes 1 and 2. B.C.C.S.S. use different rates for each route.

(2) The B.C.C.S.S. rate for a 45 foot trailer on the Vancouver to Swartz Bay route is $23.00, higher (30%) than on the Vancouver-Nanaimo run.

(3) The rates are considerably higher on B.C.C.S.S. than on B.C. Ferries. For example, a 45 foot unit on B.C.C.S.S.'s Vancouver-Nanaimo run would cost $69.00 and $48.50 on B.C. Ferries. This amounts to a difference of 42.3 percent. The difference is $94.00 vs. $48.50 on the Vancouver-Swartz Bay run, or 94% higher on B.C.C.S.S.

(4) All rates are based on the length of the unit rather than GVW. Vehicle space capacity is reached much sooner than weight capacity.\(^{14}\)

(5) At the time Crilly did his analysis, the rates in effect (July, 1972) were close for both carriers, with B.C.C.S.S. moderately higher.\(^{15}\) Since that time B.C.C.S.S. has increased their rates by approximately

---

\(^{14}\) Personal Interview with Mr. B. Bouchard, B.C. Ferries.

EXHIBIT 3.2
COMMERCIAL FERRY RATES

LEGEND:

B.C.C.S.S.
1. Vancouver-Swartz Bay
   (includes loading/unloading)
2. Vancouver-Nanaimo
   (includes loading)

B.C. FERRIES
3. Commercial Truck Rates
   Routes 1 and 2
4. 1971 Drop Trailer Rates

Source: B.C. Ferries, Passenger and Ferry Tariff No. 1
        B.C.C.S.S., Tariff No. 8
70% while B.C. Ferries' has had one increase in June 1976 of about 23% on traffic 60' in length. The 10% script is still in effect.

(6) Exhibit 3.2 also contains the rates for drop trailers when they were permitted on B.C. Ferries. At that time, they were higher than B.C.C.S.S.'s rates to Nanaimo, and much higher than B.C. Ferries' truck rates. The rate was doubled if B.C. Ferries were to perform the loading and unloading.

From Table 3.2 an estimate of the time savings for shipping by drop trailer rather than live truck was 6 hours and 5 minutes for the driver and tractor unit. The trailer however, incurred a longer trip time of 8 hours and 20 minutes, due to longer waiting times and overnight delivery. The difference of 6 hours and 5 minutes is very significant. Because of its magnitude the tractor and driver could use this time for other hauls. Similarly, if there were a number of trailers moving to the island, then some tractors or drivers could be eliminated from this haul altogether.

For example one current user of the facility ships an average of 12 trailers to the island daily. Six of these go to Victoria and six to Nanaimo. The Victoria ones are delivered locally, but the Nanaimo trailers are delivered to Central Island region. Thus two drivers and tractors are stationed in Victoria, and three in Nanaimo. All shipments originate in the central Vancouver warehouse, therefore approximately 3 units are
required to move the trailers to the ferry terminal. A total of eight drivers and tractors are required to move these 12 trailers during a normal workday. If live truck movements were used, then each load would require a driver and tractor for a total of 12. Therefore by using the drop trailer facilities, this user cuts his driver and tractor requirements by one third.

In the case of trailers the reverse is true. Due to the longer waiting times, overnight service, and longer sailing times, each one way movement takes one day. Thus a carrier has to double the number of trailers he would need for live units. Thus the cost of carrying extra trailers will be reflected in increased trailer cost for drop trailers as opposed to live trucks.

3.344 Trip Costs

In order to determine the dollar value of the time savings resulting from the elimination of idle time on the ferry, the cost of the trip from the time the unit reaches the ferry terminal until it returns is estimated. The costs used are those given by various trucking firms. Since the movement involved city delivery, hourly rates are given. For a further discussion of line haul costs, refer to the appendix to this chapter.

In the area of transportation costing, one is often faced with the fundamental question of which costing method is more appropriate. Should fully distributed costs be applied, or
marginal costing? In this case, and the trucking industry in
general, the question has little meaning since the two are virtually
the same. There are several reasons why fully distributed costs
are appropriate in the trucking industry where they may not be in
other industries such as the railroad.

The first, and most important reason is the nature of
trucking costs. Unlike the railways which have a high degree of
long term fixed costs, trucking costs are for the most part vari­
able. The trucking industry has very little invested in long
term assets. The assets of the industry also turnover rapidly.
This makes for a very high operating ratio. Secondly, most costs
are traceable in the trucking industry. Much of the overhead costs
such as billing, interest and insurance costs, could be traced,
and do indeed vary with the level of production. Thus a profit
margin cannot be ignored in the costing of services. In the case
of drop trailers, the potential time savings are very substantial.
For the major users of the facilities these savings could repre­
sent the elimination of a number of tractors. Thus the use of
fully distributed costs finds its justification even though in this
case, they are approximately equal to incremental costs.\(^\text{16}\)

The vehicle operating costs used in calculating a dollar
value of the time savings of using a drop trailer rather than a
live unit are as follows:

\(^{16}\) Bowersox, Amykay, LaLonde, Physical Distribution Management,
TABLE 3.4

TRUCK COSTS

<table>
<thead>
<tr>
<th></th>
<th>$/Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractor (driving)</td>
<td>6.90</td>
</tr>
<tr>
<td>(non driving 3.38)</td>
<td>.68</td>
</tr>
<tr>
<td>Trailer</td>
<td>9.62</td>
</tr>
<tr>
<td>Driver</td>
<td>3.17</td>
</tr>
<tr>
<td>Overhead</td>
<td></td>
</tr>
<tr>
<td>Profit</td>
<td>2.26</td>
</tr>
<tr>
<td></td>
<td>$22.63</td>
</tr>
</tbody>
</table>

Source: Appendix to Chapter 3.

The tractor costs are made up of depreciation, fuel, maintenance and repairs, license, insurance and miscellaneous costs such as special equipment and cleaning. The trailer costs cover depreciation, cleaning, license and insurance. The driver wage is based on the contract with the Teamsters Union and would be the same for most companies. This would be the basic wage plus fringe benefits. The overhead cost is taken at 14% of revenue which is close to the industry average. This would cover those costs which are common to all the hauling of a company. Included would be management, clerical and supervisory salaries, billing and accounting, sales expenses, terminal costs, interest on equipment, etc. The profit figure is based on an operating ratio of 90%.

Using the results from Table 3.4, the figure for the value of the time savings can be easily determined. However, this would not be totally correct since the cost of using the different
facilities varies. Thus the difference in the trip costs for the live units and drop trailers can be determined using the previously determined trip times. Since the ferry charges for drop trailers vary for the two routes, the Swartz Bay and Nanaimo routes, calculations are shown separately. When the tractor is idle on the ferry no fuel or repair charges are included.

Live Units

Vehicle Costs (operating) (2 hrs.) $ 45.26  
Vehicle Costs (non-operating) (5.08 hrs.) 97.09  
Driver Overtime 8.02  
Ferry Costs 136.70  

$ 287.07

Drop Trailer (To Nanaimo)

Vehicle Costs (60 min.) $ 22.63  
Extra Trailer Time (14.5 hrs.) 9.86  
Ferry Costs 137.25  

$ 169.74

Drop Trailer (To Swartz Bay)

Vehicle Costs (60 min.) $ 22.63  
Extra Trailer Time (15.5 hrs.) 10.54  
Ferry Costs 181.83  

$ 215.00

The cost of shipping a trailer as a live unit as opposed to a drop trailer results in a weighted average cost of approximately $99.20.\(^\text{17}\) Thus for firms who ship a large number of

\(^{17}\)As shown in the next chapter, drop trailer traffic exhibits a 60:40 split in favor on the Nanaimo over Victoria routes.
trailers, and have operations at each terminal, shipping via drop trailer can represent very substantial savings. The savings of $117.33 by drop trailer to Nanaimo represent 40.87% of the live unit cost.

The higher cost of sending a unit by B.C. Ferries than by B.C.C.S.S. must be borne by the shipper of the goods, and ultimately by the final consumer. These extra costs may even be higher as in the case where a shipment is made to a point outside Nanaimo or Victoria. This type of trip would incur extra driver overtime. Therefore the $99.20 weighted average savings is a low estimate.

Summary

This chapter reviews the operations of drop trailers between the Island and the B.C. Mainland. The advantages of this type of service are outlined. The main advantage is found to be the elimination of idle tractor and driver time which made it a lower cost method than live truck. Other advantages were the convenience and flexibility of the service. The disadvantage is the greatly increased trailer times for a return trip.

Finally, the advantage in dollar terms is estimated for a firm using the drop trailer facility rather than live trucks via B.C. Ferries. This was calculated at approximately $99.00 which is a very substantial saving indeed. It represents 40% of
the cost of shipping by live truck, or 58% of the cost of shipping by drop trailer to Nanaimo, and 46% to Swartz Bay.
The purpose of this appendix is to outline the method of calculating vehicle operating costs. These costs may vary somewhat depending upon several factors such as the carrier's type of operation; annual utilizations, area of operation, and type of products hauled. Thus these costs are representative only and should not be considered precise for a particular haul to the Island.

I Methodology

The costs developed in this appendix are based on using a tractor only for local hauling (as opposed to line hauling) and a van trailer. The reason for this is that physically, a tractor hauling only local hauls (including Vancouver Island) will differ from a line haul tractor whereas the line haul tractor's costs are mainly distance related and expressed as a per mile cost, the local tractor's costs are time related and expressed as a cost per hour. The van type trailer is used in this analysis as it is the most common type using the drop trailer facilities.

The utilization of equipment is based on 5000 hours per year, which requires basically a 24 hour operation by a carrier. However, this type of operation is common to those carriers using the drop trailer facilities.
II Operating Costs

A. Tractors

(1) Depreciation: The depreciation charge for tractors is based on a useful life of 5 years, or 600,000 miles, and a residual value of 20%. The capital cost of the tractor was taken as 45,000 including all provincial taxes. Based on the concept that periodic recovery of an investment over its life is comprised of both principle and interest, the following depreciation formula is used:

\[
\frac{C.C - R.V}{(1+i)^n} = \text{annual charge}
\]

where:
- \( C.C \) = Capital Cost
- \( R.V \) = Residual Value
- \( n \) = Years of Life
- \( i \) = Interest Rate
- \( ani \) = Present Value over \( n \) years at \( i \) rate of interest

(2) Drivers Wages: These are based on the current Teamsters contract. For trips of under 100 miles drivers are paid on an hourly basis. This was $8.02 per hour for regular time. Overtime up to 10 hours per day is $4.01 per hour and fringe benefits are calculated at 18% of gross salaries.

(3) License: Calculated at an annual rate of $1200 per year.

(4) Insurance: Insurance costs are difficult to determine as they will vary with each carrier depending upon their
safety record, insurer, etc. In this case a figure of $3450 was taken as it represents approximately 3% of revenue which is typical of the industry.

(5) **Fuel**: Fuel was calculated at 72¢/gallon, and an average consumption figure of 4 gallons per hour for city driving used.

(6) **Tires**: Annual tire costs for a tractor was taken as $2400 which is the approximate cost of equipping a tractor once per year.

(7) **Miscellaneous**: This cost category includes repairs, daily maintenance, cleaning and extra equipment such as tarps, etc.

**B. Trailers**

(1) **Depreciation**: The useful life of the trailer for depreciation purposes is eight years with a residual value of 10%. The capital cost of a new trailer used in this example is $10,000 and the formula used in the calculation of the annual charge is:

\[
\frac{C.C - R.V}{(1+i)^n} = \text{annual cost}
\]

Table A contains the breakdown of the costs for local hauling. The total operating costs contain only "out of pocket
The fully distributed costs are found by including such common costs as administrative salaries, billing and collecting costs, and interest costs. For the trucking industry, these costs average around 14% per year.

The final adjustment to determine fully allocated costs is a profit allowance. The most common method is through the operating ratio (operating costs/operating revenue). For a firm to be profitable, this ratio must be less than one. A common trucking industry average target is an operating ratio of .90.

### TABLE A

<table>
<thead>
<tr>
<th>VEHICLE OPERATING COSTS</th>
</tr>
</thead>
</table>

#### A. TRACTORS

<table>
<thead>
<tr>
<th>COSTS</th>
<th>$/HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation</td>
<td>1.98</td>
</tr>
<tr>
<td>Driver Wages</td>
<td>9.62</td>
</tr>
<tr>
<td>License</td>
<td>.24</td>
</tr>
<tr>
<td>Insurance</td>
<td>.69</td>
</tr>
<tr>
<td>Fuel</td>
<td>2.88</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>.50</td>
</tr>
<tr>
<td>Tires</td>
<td>.48</td>
</tr>
</tbody>
</table>

Tractor Sub Total  $16.52

#### B. TRAILERS

<table>
<thead>
<tr>
<th>COSTS</th>
<th>$/HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation</td>
<td>.33</td>
</tr>
<tr>
<td>License</td>
<td>.10</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>.25</td>
</tr>
</tbody>
</table>

Trailer Sub Total  $.68

Total Operating Costs  17.20
Fully Distributed Costs  20.37
Fully Dist. Costs + Profit  22.63
Chapter 4

The Nature of Drop Trailer Traffic
Introduction

In this chapter the characteristics of drop trailer traffic are examined. This includes the type of products which move by drop trailer and the major users of the facilities. The size of the market is studied by reviewing the trailer volumes moving over the past 7 years. A number of recent developments and trends regarding this traffic is analyzed. The chapter concludes with a projection of drop trailer volumes for the next five years.

4.1 Characteristics of Drop Trailer Traffic

4.1.1 Commodities

The preponderence of traffic carried between the Island and the Mainland in semi-trailer equipment is general merchandise and consumer goods. These commodities can be divided into an eastbound and westbound direction, as well as by truckload and less than truckload lots.

The major westbound truckload commodities are foodstuffs, meat, beer, hardware, appliances, packaged peatmoss, fertilizer, building materials, concrete, pipe and steel. About 75 percent of these commodities move in van type trailers and the rest on flatdecks. There is some heavy equipment moved as well on low-boy trailers. These commodities all originate from the lower main-
land. Truckload movements originating from inland points bound for Vancouver Island are mainly fruits from the Okanagan Valley and liquor from Winfield.

Westbound less-than-truckload traffic is mainly general merchandise sent in lots of 500-5000 lbs. The bulk of this traffic is handled in van type trailers by the two major carriers (C.P. and Johnston Terminals) who offer pickup and delivery services. These shipments are consolidated at the carriers' terminals and sent in trailer loads of 30,000-35,000 lbs.

Eastbound truckload commodities are mainly lumber products, with some movements of wine and grapes. On a seasonal basis, ice-packed fish are moved. The government warehouse in Victoria is the source of some traffic such as road signs and printed matter. Eastbound general merchandise in less-than-truckload lots are virtually non-existent.

In 1972 a new type of commodity began to move in significant quantities. In that year over 500 mobile homes were carried as drop trailers. In 1973 this increased to over 1500, and reached 2200 in 1974. Indications are that this movement tapered off rapidly in 1975, a result of the general economic slowdown.

1Personal Interview with Mr. J. Yates, Manager, B.C.C.S.S.
4.1.2 Users

This section examines the users of the drop trailer facilities. The purpose is to identify the major users, determine the nature of their demand; and study the characteristics of their drop trailer operation.

The average number of daily trailer movements to the Island was estimated from conversations with personnel of the firms involved, B.C.C.S.S., and a student paper by C. Jurczynski. The number of trailers returning from the island will be slightly less, a result of stacking empty flatdecks three high. The west-bound movements of drop trailers are shown in Table 4.1 below.

<table>
<thead>
<tr>
<th>Company</th>
<th>Trailers per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnston Terminals</td>
<td>55</td>
</tr>
<tr>
<td>C.P. Transport</td>
<td>35</td>
</tr>
<tr>
<td>Domans Transport</td>
<td>22</td>
</tr>
<tr>
<td>Capital Freightways</td>
<td>20</td>
</tr>
<tr>
<td>Safeway</td>
<td>12</td>
</tr>
<tr>
<td>Sidney Freight Lines</td>
<td>6</td>
</tr>
<tr>
<td>Route of the Hiadas</td>
<td>6</td>
</tr>
<tr>
<td>Grassick Transport</td>
<td>6</td>
</tr>
<tr>
<td>Intercity Transport</td>
<td>4</td>
</tr>
<tr>
<td>Ideal Fuel and Transport</td>
<td>4</td>
</tr>
<tr>
<td>Mairs Transport</td>
<td>3</td>
</tr>
<tr>
<td>Nabob Transport</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>187</strong></td>
</tr>
</tbody>
</table>

Source: Johnston Terminals, C.P. Transport, B.C.C.S.S.

\[2\] Jurczynski, C., *op.cit.*, p. 16.
The outstanding fact in Table 4.1 is the small number of firms which account for the bulk of the trailer movements. Unlike B.C. Ferries which cater to thousands of users, B.C.C.S.S.'s drop trailer traffic is derived from very few firms. Johnston Terminals which is the largest, comprises about 30 percent of the total traffic. The five largest firms, which will be discussed further, account for almost 80 percent of the traffic.

Johnston Terminals and C.P. Transport have essentially the same type of operation. They are both common carriers and have collection and distribution terminals based in Vancouver. Approximately 91-95 percent of all shipments originate in Greater Vancouver and the lower mainland. Piggyback shipments from eastern Canada account for only a very small proportion (1-5 percent) of trailer movements to the Island.\(^3\) Since most shipments are less-than-truckload (LTL), they are picked up, consolidated at the terminals, and sent on the ferries as full truckloads. Johnston's estimate 90 percent of their trailer movements to the island are a result of this method.\(^4\)

Both Capital Freightways and Domans Transport began as private truckers, -- Domans for transporting lumber from Duncan to Vancouver, and Capital for hauling vegetables from Vancouver to

\(^3\)Personal Interview with Mr. L. Buswood, Manager, C.P. Transport, Vancouver, B.C.

\(^4\)Personal Interview with Mr. C. Bawa, Johnston Terminals, Vancouver, B.C.
Victoria. Capital, which serves only Victoria, was set up in the 1960's to move general merchandise with the vegetables. They have a 100 percent empty backhaul. Domans, which purchased Marpole Transport and obtained a general merchandise permit, haul lumber from Duncan via Nanaimo, and backhauled construction material to the island. They have almost an equal east west movement of goods.

Canada Safeway is the only private carrier of the five largest users. They supply 18 stores on the island (10 in Victoria) from a central distribution warehouse in Burnaby. The traffic is split evenly between Victoria and Nanaimo, with six trailers moving to each, daily.\textsuperscript{5}

All of the five carriers noted above use B.C.C.S.S.'s system of drop trailers exclusively. The use of live trucks on B.C. Ferries would arise only on special occasions or emergency situations.

4.1.3 Traffic Volumes

The volume of truck, trailer and railcar movements were obtained through B.C.C.S.S. The data for trucks and trailers contains live truck as well as drop trailers. However live trucks and other equipment movement accounts for less than 5 percent of

\textsuperscript{5} Personal Interview with Mr. M.T. Oliver, Manager Trucking Operations, Canada Safeway Stores, Vancouver, B.C.
total, so their numbers are relatively unimportant. Table 4.2 contains the volumes for the past seven years.

The split of drop trailer traffic between the two routes was not available. For illustrative purposes, the Table 4.2 figures are presented in Exhibit 4.1. Upon examination of this exhibit a few factors are noted:

(1) On both B.C.C.S.S. routes, drop trailer movements have been increasing. This increase has been most spectacular on the Vancouver-Swartz Bay route. The overall increase in drop trailers since 1967 has been 58 percent, or an annual increase of 7.28 percent.

(2) Railcar movements have been declining since 1968 at an average annual rate of 5 percent. It should be noted however, that the largest drops were in 1970 and 1974. Both these years experienced slumps in the world demand for lumber and forest products.

(3) The volume of drop trailers carried on B.C.C.S.S. represents the total number of units moving to and from the island. Since B.C. Ferries have banned drops in 1973, this traffic is 100 percent captive to B.C.C.S.S. This would account for some of the large increase noted in 1974.

(4) Great difficulty was encountered in determining what share of tractor-trailer movements to the island, B.C.C.S.S.'s

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6 Personal Interview with Mr. J. Yates, Manager, B.C.C.S.S.
<table>
<thead>
<tr>
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<tr>
<td>Railcars</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Vancouver-Nanaimo</td>
<td>25,715</td>
<td>26,249</td>
<td>21,471</td>
<td>22,196</td>
<td>21,493</td>
<td>20,396</td>
<td>17,692</td>
<td>17,590</td>
<td>20,581</td>
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<tr>
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<td>2.0%</td>
<td>-18.2%</td>
<td>3.3%</td>
<td>-4.5%</td>
<td>-5.1%</td>
<td>-13.3%</td>
<td>-0.8%</td>
<td>+17%</td>
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<tr>
<td>Trucks &amp; Trailers</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Vancouver-Nanaimo</td>
<td>41,334</td>
<td>40,738</td>
<td>38,216</td>
<td>41,601</td>
<td>45,965</td>
<td>44,562</td>
<td>50,576</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vancouver-Swartz Bay</td>
<td>14,352</td>
<td>17,176</td>
<td>19,203</td>
<td>23,323</td>
<td>25,657</td>
<td>31,321</td>
<td>37,474</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55,686</td>
<td>57,914</td>
<td>57,419</td>
<td>64,924</td>
<td>71,622</td>
<td>75,883</td>
<td>88,053</td>
<td>85,841</td>
<td>92,224</td>
</tr>
<tr>
<td>Net Change</td>
<td>4.0%</td>
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<td>13.0%</td>
<td>10.3%</td>
<td>6.0%</td>
<td>16.0%</td>
<td>-2.6%</td>
<td>+7.4%</td>
<td></td>
</tr>
</tbody>
</table>

Source: B.C.C.S.S. Traffic Volumes
EXHIBIT 4.1

B.C.C.S.S. ANNUAL TRAFFIC VOLUMES

Note: 1. Truck-Trailers, Vancouver-Swartz Bay
2. Truck-Trailers, Vancouver-Nanaimo

Source: B.C.C.S.S.
volume represented. In other words, how many tractor trailer units went by live truck rather than drop trailer? The greatest obstacle in arriving at a solution was B.C. Ferries' classification of traffic. Their totals include all commercial units of 12,000 GVW. This would include delivery trucks, straight trucks, panel trucks, etc. Therefore their figures are somewhat meaningless for comparative purposes.\(^7\)

(5) The traffic volumes presented indicate a westbound traffic split of 60:40 in favor of Nanaimo. This split, has been narrowing continuously over the years shown.

4.1.4 Traffic Peaking

Yearly Variations

The greatest problem facing B.C. Ferries is the severe peaking during the summer months, July and August, where effective utilization is almost 100 percent. The underlying reason for the peaking is the demand created by tourists, which represent over 70 percent of the trips during July and August. Much of this demand is created by users from outside B.C.

Fortunately for both B.C.C.S.S. and B.C. Ferries seasonal peaking is not a characteristic of the commercial traffic moving to and from the island. The largest demand for truck transportation is for the movement of consumer goods and general mer-

\(^7\)Crilly, in his analysis of B.C. Ferries estimated the split was approximately 50:50.
chandise. This remains constant throughout the year with only very slight increases during the summer vacation months. The demand for transporting lumber products eastward to the mainland is subject to some fluctuations, however due to the excess trailer capacity moving in that direction, total movements will not be affected. This also applies to fish products which tend to be seasonal.

Weekly Variations

Under normal circumstances, there is very little variation in volumes moving during the weekdays. The weekends however, are generally restricted to traffic other than drops, especially railcar and passenger. B.C.C.S.S.'s two leased ferries do not run on the weekends.

Daily Variations

B.C.C.S.S.'s ferry schedule is set in line with the requirements of the drop trailer traffic. The demand for such a ferry service takes place before and after the normal business hours of the day. Likewise, B.C. Ferries experience a tremendous demand from commercial trucks on the first run of the day at 7:00 a.m. This often causes an overload situation where some units must be left behind for a later sailing.

B.C.C.S.S.'s daily volumes per sailing are presented in Exhibit 4.2. The most outstanding item to note is that only about 5 percent of the drop trailer traffic is carried between 9:00 a.m. and 5:30. The most popular times are between 8:00 p.m. and mid-
Night. B.C.C.S.S.'s largest shore crew begins its shift at 4:00 p.m. for loading and unloading the trailers. This crew is composed of one traffic supervisor, five "hostlers", and two shoremen. The other two shifts utilize the supervisor and shoremen, but decrease the number of hostlers.

EXHIBIT 4.2
DAILY DROP TRAILER TRAFFIC: B.C.C.S.S.

Source: B.C.C.S.S. Operations Report
4.1.5 Traffic Patterns

The dominant traffic pattern in Island-Mainland freight transportation today is the directional split of volumes by vehicle mode. As stated earlier, the trucking industry suffers from a freight imbalance of 4 to 1 in favor of westbound movements. The imbalance is even more pronounced for the railways, a ratio of 6 to 1 in favor of eastbound traffic. Thus the principle transportation problem is one of an inefficient use of equipment caused by empty backhauls.

The origins of the modal split problem can be found in the development of the economy of Vancouver Island. The economic base of the island is centered on its forest industry and immediate derivatives. More recently, the climatic and aesthetic attractions have given rise to a large retirement population as well as a booming tourist industry. Thus those industries involved in the production of forest products, intermediate goods supply, and consumptive goods supply create the fundamental demand for the transportation service industry.

Historically the forest industry has been rail oriented with respect to outbound forest product movements and inbound intermediate requirements, such as chemicals. The emergence of the island as a significant regional market has created a strong demand for the transportation of consumer goods and general merchandise. The transportation of these products has been dominated by
highway carriers which can provide a faster service, and flexibility of origin and destination points. Hence the resultant orientation of inbound consumer goods to trucking and outbound forest products to rail.

There have been two developments in recent years which have had an increasing importance to commercial traffic to the island. The first is a general trend away from railcar to highway transport. The tremendous flexibility and accessibility of the highway mode is the basis for this trend. Trucking firms can provide one day door-to-door service to most island communities whereas the rail is subject to inflexible routes and at best, 4 day service to the island. The forest industry now hauls most of its intermediate goods to the Island via truck rather than rail. Exhibit 4.1 revealed the downtrend in the number of railcars movements to and from the Island by B.C.C.S.S.

The second development has been the trend of several shippers and carriers to treat Vancouver Island as a pickup and delivery area, centered on Vancouver. Such a development favors the highway mode over railcar. A good example of such a distribution system is Safeway Stores, which deliver to all island points directly from the central Vancouver warehouse.

The solution to the twin backhaul problems would seem to be a move to a single mode of transport. If such an alternative could be developed, the potential for reducing overall costs and
inefficiency are considerable. Besides the two trends mentioned above, there are several factors which will increase pressure to move toward a more efficient solution.

As equipment and operating costs continue to increase, so will the costs of inefficiency (empty backhauls), forcing shippers and carriers to reconcile the situation. The Island population is expected to continue growing at above the national average, aided by in-migration as well as natural growth. This will increase the demand for consumer goods transport, thereby, increasing the empty trailer backhaul problem. The future of the north Island will be centered around forestry and the tourist industry. The transportation requirements of this area will be oriented to the highway. Thus, all indications point toward the expanding motor carrier industry, and declining rail traffic.

The experience of Domans Transport suggests the use of drop trailers as a feasible means of moving forest products from the Island to the mainland. As a private carrier, Domans transported lumber products from their mill at Duncan to the mainland for transhipment. When they became a common carrier approximately 15 years ago, construction materials were carried to the Island on return trips. This situation is unique in that Doman's eastbound and westbound movements are about equal. Its existence and growth for several years suggests trucking as a feasible means of moving lumber products from the island.
If the movement of forest products by truck can be shown to be feasible on a large scale, then the requirements for rail transport to the island may be eliminated. If such a study were undertaken, the total costs of both the inbound products and outbound lumber must be considered rather than their individual directional movements. By eliminating the empty backhaul, lower total costs may be easily within reach. An added benefit to such a system would be higher service levels, especially given the Island's orientation to the highway.

4.2 Traffic Projections

This chapter has analysed the characteristics of drop trailer traffic, including current volumes, peaking and traffic patterns. With this as a basis, it is an opportune time to discuss the factors and considerations which will affect future traffic volumes. The necessity of a projection becomes apparent when analyzing the capacity of the present system. It is necessary for determining future needs, and vital when planning for new or expanded facilities.

Since the main products carried by drop trailer are consumer products and general merchandise, the demand for such transportation in the future will be closely linked to the demand for consumer products. Although this market is subject to fluctuations in the general economy, many of the commodities carried are staple
products. Thus the movement in the future will be relatively stable. It will grow as the population of the island grows. In the past 10 years this has been at an average annual rate of 3.14 percent, much higher than the national average. The opening of the new highway from Kelsey Bay to the northern island points will create a new market for carriers as goods are currently shipped via barge and air freight. The flexibility of trucking should prove competitive with these modes.

Highway transport is expected to continue to make inroads into the traditional railcar market. As more and more shippers use Vancouver as a transhipment centre for eastbound freight, the railcars will lose business to truckers. Section 4.1.5 outlined several factors which will place further importance on trucking to the Island in the future.

A regression analysis was performed on the volume data, and a regression equation determined. The trend line was plotted against the traffic volumes and are contained in Exhibit 4.3. The only significant variation from this trend line was in the year 1974 which was the year following the B.C. Ferries ban on drop trailers. This trend would indicate a annual growth of 5036 units per year. This represents the best estimate of what can be expected in the near future.

The above estimate also assumes that the B.C. Ferries trailer ferry captures no B.C.C.S.S. drop trailer traffic. This
assumption is realistic for the following reasons:

(1) B.C. Ferries do not plan to specialize in transporting drop trailers on the new ferry.\(^7\)

(2) Parking facilities are limited for drops at all four B.C. Ferry Terminal locations.

(3) There are no plans at present to provide specialized loading facilities.

(4) B.C. Ferries need for the new trailer ferry is to alleviate the problems caused by commercial traffic and over-heights.

(5) It would be a reversal in Government policy regarding commercial traffic.

(6) B.C. Ferries may fear reactions of B.C.C.S.S. who have been an important supplement to their capacity.

Exhibit 4.3 includes a "high" and "low" estimate of future traffic volumes. The high estimate places the annual growth at 15 percent above that indicated by the trend projection. The low estimate put the increase at 20 percent below the annual increase projected. These two figures are for illustrative purposes and the lower increase will be used to check the sensitivity of the projection.

Such a steady increase in traffic has important implications which cannot be overlooked at the present time. It raises the question of the adequacy of the present system, including the capacity of vessels and terminal facilities to meet these projec-\(^7\) Personal Interview with Mr. B. Bouchard, B.C. Ferries.
EXHIBIT 4.3
ANNUAL TRAFFIC PROJECTIONS

LEGEND
1. High Estimate Limit
2. Expected Growth
3. Low Estimate

No. of Units (000's) vs. YEAR

tions. Thus the next chapter concerns itself with an analysis of B.C.C.S.S.'s facilities.
Chapter 5

Drop Trailer Facilities
Chapter 5 presents an analysis of the B.C.C.S.S.'s facilities for the movement of drop trailers. The main area of concern is with the present capacity of the system, and its adequacy for handling future volumes of traffic. The location of the present facilities is analysed with particular emphasis on those factors which will limit future expansion, and necessitate a relocation of facilities.

5.1 Present Facilities

5.1.1 Terminal Area and Vessels

The B.C.C.S.S. terminal is located in Vancouver's inner harbour at the foot of Burrard Street. It occupies an area of approximately 9 acres. However this area tends to be long and spread out, roughly following the shorelines, and stretching from Main Street to Cardero Street.

As referred to in section 3.1.1 B.C.C.S.S. provide their service from two ship berths, known as Piers A-1 and A-3. As well, the administrative offices of B.C.C.S.S. are located on Pier B-C, which is owned by the National Harbours Board, and leased to B.C.C.S.S. A small office near the two piers serves as the traffic office for the Traffic Supervisors for the day to day operations.

A map detailing the layout of the location is contained in Exhibit 5.1.
The five ships used by B.C.C.S.S. are described in Table 3.1. The capacity of this fleet can best be described in terms of "lift-off capacity". For comparative purposes the lift-off capacity is computed in terms of one vehicle type. The conversion factor, obtained from B.C. Ferries is: 1

1 Tractor Trailer = 3.0 automobiles

Using this factor, the lift-off capacity was estimated for B.C.C.S.S., and for comparative purposes, B.C. Ferries. The lift-off capacity was determined using 16 sailings per day for each B.C. Ferry terminal, and 9 sailings per day (summer schedule) for B.C.C.S.S.

1Personal Interview with Mr. B. Bouchard, B.C. Ferries.
### TABLE 5.1
SYSTEM CAPACITIES

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<tr>
<th>Route</th>
<th>Autos/Day</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.C.C.S.S.:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swartz Bay - Vancouver</td>
<td>888</td>
<td></td>
</tr>
<tr>
<td>Nanaimo - Vancouver</td>
<td>1332</td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
<td>2220</td>
<td>15.6%</td>
</tr>
<tr>
<td>B.C. FERRIES:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route 1</td>
<td>6500</td>
<td></td>
</tr>
<tr>
<td>Route 2</td>
<td>5500</td>
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</tr>
<tr>
<td>Sub Total</td>
<td>12000</td>
<td>84.4%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>14220</td>
<td>100.0%</td>
</tr>
</tbody>
</table>


The dominance of B.C. Ferries in terms of lift-off capacity is shown in Table 5.1. B.C.C.S.S.'s maximum daily lift-off capacity in terms of drop trailers is 630 units. This figure includes the extra midday sailing set up during the summer months which runs between Nanaimo and Vancouver and carries mainly tourist traffic. When this and the normal railcar traffic are accounted for, the effective drop trailer capacity is 472 units per day. Thus in 1974 drop trailers moved at approximately 75 percent of capacity. The capacity in excess of railcars and drops is assigned to cars.
5.1.2 Capacity of Facilities

The two most important factors which will limit the system's capacity in the future are vessel capacity and parking space. Of the two, vessel capacity will have the most immediate limiting influence.²

With the regular schedule, the maximum number of drop trailers which could be carried is 472 per day. On the basis of the traffic projections contained in section 4.2 this capacity will be reached in 1981, when the yearly volume should reach approximately 115,000 trailers. The lift-off capacity could be increased by an additional sailing of the "Trailer Princess", and the "Carrier Princess", operating on her summer schedule year round. This would satisfy projected volumes up to and including 1981.

The remaining B.C.C.S.S.-owned vessel, "The Princess of Vancouver" is currently operating at capacity with three round trips of approximately 7 and 1/2 hours each. B.C.C.S.S. experience much longer turnaround times with drop trailers than does B.C. Ferries with autos and live trucks. On average, B.C. Ferries load a car every 3 seconds while B.C.C.S.S. usually takes over one minute per trailer.

²Personal Interview with J. Yates, Manager B.C.C.S.S. and J. Finny, Traffic Supervisor, B.C.C.S.S.
The size and physical layout of B.C.C.S.S.'s parking facilities is a constant source of operational problems. The maximum number of trailers that can be parked in an orderly fashion is about 130. Slightly more can be parked, but this leads to overcrowding and congestion. As a result, B.C.C.S.S. must be in constant communication with carriers regarding removal of incoming trailers.

The congestion results from the popularity of the overnight sailings, and is thus a peaking problem. If extra sailings were added during the day, then the parking lots could handle the additional traffic. However, as there is a distinct preference for night sailings, this possibility seems remote, unless there are financial inducements to send trailers during the day.

The piers used for loading and unloading the ferries are in the same position. They are operating close to capacity during the evening hours, but once again, could be better utilized during the day. The fixed facilities cannot handle more sailings during the evening hours, thus they are closely tied to the vessels with respect to reaching full capacity.

The ability to increase operating efficiency by enlarging the parking lot is remote. In the first place, the terminal is

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3 Mr. J. Finney, Traffic Supervisor, B.C.C.S.S.
in a highly developed area. There is no vacant land in the immediate area in which to expand. The railway tracks and the downtown core prevent expansion southward. Land east and west of the C.P.R. yards is presently occupied by other waterfront users.

5.2 Location Analysis

5.2.1 Necessity of Present Location

Besides the physical limitations of the present facilities, there are other factors involved which present problems to the present terminal. Most of these arise as a result of the location of the facilities relative to other downtown development.

One underlying question in this regard is whether or not the current location is necessary for present and future operations. Historically, during the early development of Canada, the railway was the prime (and often the only) means of transportation for both passengers and freight. Thus a central location on the waterfront was vital. Today, C.P.'s main yards are located in Coquitlam, and only those cars bound for the island use the downtown yard. The trucking operations do not require the central location, and in many cases find it inconvenient. Thus most parties would agree that present operations could be carried on without any loss in efficiency at an alternate location. This factor coupled with the unattractiveness of the rail lines, parked trailers and wharfs set against downtown Vancouver have lead several
parties to believe the facility should be relocated.

5.2.2 Political Pressure

Perhaps the most important issue with the present operations, is their inconsistency with future plans for the area. Like most major North American cities urban renewal and redevelopment have been taking place. The waterfront area between Main Street and Stanley Park has been the subject of an extensive study by the City Planning Department. Over a period of 3 years the study group has presented four reports known as the "Waterfront Planning Study". The study calls for the urbanization and residential uses combined with "public open spaces". The prime aspiration is to link the waterfront physically and socially with the permanently developed downtown peninsula. The new development would have to be compatible with existing users such as Stanley Park and Gastown. Listed as possible means of achieving such goals would be the relocation of all or part of the railway west of Main Street, and the curtailment of heavy truck movements to and from the area.

The City has recently accepted in principle the plans outlined in the study. In light of this, further development and

4Mann, R.C. project Manager, Waterfront Planning Study. A joint study sponsored by the City of Vancouver and the Ministry of State for Urban Affairs, Vancouver, 1974.
expansion in the area would not receive the City Council's approval. Even if further expansion by C.P. was physically possible, permission to do so would be withheld by the city, thereby effectively preventing any new development.

The convenience and exposure of the area are extremely favorable for the recreational and residential proposals contained in the waterfront study. The land is along the waterfront adjacent to the largest commercial, financial and business district in western Canada, and close to several highrise and multi-unit dwellings. The central downtown location makes it convenient to a large number of persons. In 1972 there were 46,000 persons living in the downtown peninsula (area 4 square miles) and this figure is expected to grow to 64,500 by the year 1985. The orientation of the land is excellent. It is in a sheltered harbour, adjacent to Stanley Park, with an excellent view of the north shore mountains. The waterfront planning committee suggests the best uses of the area would be those which stress the potential for social, commercial, and recreational activities while preserving the aesthetic qualities of the area.

Besides the city's plans, there are problems caused by the central location of B.C.C.S.S.'s facilities. Perhaps the most

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5 Personal Interview with Mr. T. Nonay, City Planning Department.
6 op. cit., Waterfront Planning Study - rough working papers. The same study estimates that by 1985, 95,000 persons will be working in the same area.
important are those concerned with the access to and from the facilities.

First, there are only two entrances to the terminal facilities. Burrard Street is the most important, and the only entrance facing south. The second entrance is on the east end on a private road north of Alexander Street. This road passes under the end of Pier B-C and requires tight manoeuvring.

Access to these entrances is usually made along Burrard Street via Broadway and Oak, or along Hastings, Main or Kingsway. In all cases, access to the facility involves a trip through downtown Vancouver. Currently for carriers like Johnston Terminals and C.P. Transport, the distance is not great but is time consuming. C.P. Transport however, are in the process of relocating their terminal to Coquitlam. For other carriers like Domans and Safeway who are located outside Vancouver city limits, the trip is both lengthy and time consuming.

The presence of these large trucks on city streets is a constant source of complaints from both residents and motorists. These trucks are generally noisier, slower and contribute disproportionately to traffic and environmental problems.

5.2.4 Relocation Question

The operational problems of congestion, access and limited
room for expansion, as well as the political pressures involved have raised the question of relocation. This is a very complex problem due to the number of parties involved, such as the National Harbours Board, the City of Vancouver, Marathon Realty, C.P. Rail and B.C.C.S.S. As well, a decision to relocate would have severe effects on the trucking companies, especially those like Johnston Terminals and Capital Freightways whose pooling terminals are located in downtown Vancouver, fairly close to the ferry terminal.

The relocation issue will likely involve concessions by the government agencies, since C.P. is such a large landholder in the area. As a result of the intricacies involved, and the fact that no concrete decisions have yet been made, all interested parties as well as B.C.C.S.S. are very reluctant to discuss the matter.

5.2.5 Alternatives

Faced with the prospect of relocation, C.P. will have several alternatives to choose from. To date they have commissioned a study to assess the opinions of the major users with respect to location.

The alternatives range from a complete relocation of all facilities, to remaining where they are. Any decision to relocate
would have a great impact on the users of the facilities, especially those located near the facility in the downtown area. An examination of all the possible alternatives is beyond the scope of this thesis. Rather the thesis will analyse one particular alternative, which in this case is an immediate partial relocation.

Under this scheme, which C.P. has considered, a portion of the drop trailer traffic would be diverted away from downtown to a less congested area. The area which has been considered, is located on the North Arm of the Fraser River, close to the south side of the Knight Street Bridge. This location has ample space available, is adjacent to the river, has convenient street access, and is located in an industrial park. This area of north Richmond is rapidly becoming the largest warehousing district in Greater Vancouver, a result of the continuing trend of locating away from downtown Vancouver.

The rationale behind a partial relocation can be found in the concept that only those units originating from the downtown area, North Vancouver, Port Moody and surrounding areas would use the present facilities. Traffic originating in New Westminster, Richmond, Delta, Surrey and other outlying areas would use the new facilities.

7Personal Interview with Mr. J. Yates and Mr. Atkin, B.C.C.S.S.
The decision to relocate only part of the facilities would enable C.P. to continue to grow, as well as retain their facilities in the present location, possibly for other uses in the future. In any case it would allow C.P. to prolong having to make a final decision for some time yet. The move would solve C.P.'s immediate congestion problems. As well, there is ample land available to accommodate further expansion at the new location.

On a wider scale, it would provide benefits to other parties such as the city, major users, and the public. In order to evaluate such a project, a Benefit-Cost Analysis is employed.
Chapter 6

Benefit Cost Analysis of Relocation
This chapter presents a benefit-cost analysis of a partial relocation of B.C.C.S.S.'s facilities. The first section of the chapter deals with the usefulness of benefit-cost analysis as a tool in decision making. The next two sections deal with the costs and benefits of such an alternative. Finally the results of the analysis are presented in Exhibit 6.2 and discussed in the conclusion.

6.1 Benefit Cost Analysis

6.1.1 Usefulness of Benefit Cost Analysis

Benefit-Cost Analysis has been chosen as an appropriate means of evaluating the proposed project. By the basic definition of analysis one must focus on questions which go beyond a description of a situation to understand the "causality and interaction of forces and to draw conclusions or implications from them".¹

Benefit-Cost Analysis finds its importance in providing a framework in which a number of alternatives can be evaluated. It is extremely useful for setting out all those factors which will be taken into account in making a decision or a choice. It forces a detailed study of each situation.

Since there will be a number of alternatives in this case, understanding the consequences of alternative actions in

order to make rational decisions is necessary. Thus benefit-cost analysis can be an indespensible tool in decision making.

6.1.2 Costs

As the proposed project would not involve a complete relocation, not all the functions would be required to move. In particular the office and administrative functions would remain at their present location. This not only avoids the cost of an expensive construction on the new site, but provides the company with greater mobility should they decide to move to an alternate site for complete relocation at a later date. The only building required would be a small non-permanent office for the traffic supervisor.

The land acquisition would represent one of the major cost items. The amount of land required, with potential for expansion would be approximately 15 acres. The parking of each trailer requires an area of 45 feet by 12 feet. For efficient handling, each row of trailers should be separated by a 75 foot aisle. The trailers must also be separated into incoming and outgoing trailers. Thus with 12 acres for parking and assuming 30 trailers per row, the new facility could park approximately 360 trailers at one time.

\(^2^{B.C.C.S.S.\text{ publication }A\ Report\ on\ Handling\ Roll-On\ Roll-Off\ Traffic\ at\ Vancouver.\ Vancouver,\ 1975.}
The second largest single cost of the new facility would be the construction of the pier. An estimate of this cost was obtained from B.C.C.S.S.\textsuperscript{3} As well, there will likely be a certain amount of dredging around the pier required.

Approximately three hostlers would be required for the loading and unloading operations. With an efficient layout, these operations can be performed with a 10-15 minute time savings per ship over the existing terminal.

The following figures represent the costs for constructing the new drop trailer facility on the north arm of the Fraser River. These figures are estimates based on conversations with various persons. The construction period is estimated at eight months.

<table>
<thead>
<tr>
<th>Capital Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Acquisition</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>Pier Construction</td>
<td>600,000</td>
</tr>
<tr>
<td>Access and Parking</td>
<td>200,000</td>
</tr>
<tr>
<td>Traffic Office</td>
<td>20,000</td>
</tr>
<tr>
<td>Lighting</td>
<td>40,000</td>
</tr>
<tr>
<td>Equipment</td>
<td>106,000</td>
</tr>
<tr>
<td>Dredging (est.)</td>
<td>100,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2,266,000</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{3}Personal Interview with Mr. Akin, B.C.C.S.S.
Since the new facility would be located in an industrial park, unrestricted movements of large tractor-trailer units would be permitted, so there would be no noise or congestion costs.

6.1.3 Benefits

There are several benefits which would result from the diversion of a portion of traffic from the downtown location to the new facility. These benefits range from preventing a saturation of capacity and increased accessibility to decreasing traffic and noise in the downtown area. However, some difficulties are encountered due in the measurements of these benefits. Since all benefits are to be expressed on the same scale (i.e. dollars), a value for such intangible items such as time and congestion must be computed.

One of the most critical areas in the analysis is the determination of future volumes using the facilities. The two largest benefits are the result of increased capacity of the system, and greater accessibility for diverted traffic. Both of these depend on the amount of traffic that will be diverted. Increased capacity is not a benefit itself, rather the benefit is the value of additional traffic or a decrease in operating costs to a given traffic volume.

Section 4.2 has provided a forecast of future drop trailer traffic. Section 5.1.2 of the last chapter estimated the
point at which capacity would be saturated would be in 1981 at the latest. After that time, all new traffic would have to use the B.C. Ferries and cross the Strait as live trucks. Therefore, one benefit of the proposed facility would be the ability to carry those units which would otherwise have to use B.C. Ferries. An estimate of this benefit can be derived from the previous analysis of the economics of drop trailers. In that analysis, (Section 3.3) it was determined that the use of drop trailers resulted in a savings of at least $49.60 per one way trip. It will be slightly larger when increased time accessing the facility is considered. This benefit applies only to those units in excess of the 1981 traffic, or traffic which would otherwise have to use B.C. Ferries. The dollar value of this benefit to generated traffic has been calculated for each year and appears in Column A of Exhibit 6.2.

A second benefit is a savings in costs to various trucking firms due to a greater accessibility of facilities. This is a savings in time and operating costs. Since a large number of trips are generated in the Richmond, Delta and New Westminster areas, a journey through the centre of Vancouver could be avoided. The size of this benefit will depend on the volume of traffic moving through the new facility. B.C.C.S.S. has estimated that 40 percent of the traffic would be routed through it. This figure has been substantiated through an analysis of trucking locations and movements. This involved contacts with most carriers.
using B.C.C.S.S. facilities. Although all carriers were reluctant to give out detailed information for competitive reasons, some generalizations on traffic movements were obtained.

For some carriers, the new location would be much closer to their terminals and accordingly all their movements would be routed through it. Domans for example, would be almost adjacent to the terminal. Safeway, located in south Burnaby, would find it much more convenient to use the new facility.\textsuperscript{4} Exhibit 6.1 shows the locations of the major Vancouver-based users of the drop trailer facilities. As well the locations of the proposed facility and the present facility are noted. The carriers not listed on the map are generally based on Vancouver Island.

The estimated number of daily trailer movements through the new facility assuming it would be completed by the beginning of 1978 are contained in Table 6.1.

\textsuperscript{4} Personal Interview with Mr. M.T. Oliver, Trucking Department Manager, Canada Safeway Limited.
EXHIBIT 6.1
GREATER VANCOUVER

Legend
1 Present B.C.C.S.S. Terminal
2 Proposed Terminal
3 Johnston Terminals
4 C.P. Transport
5 Domans Transport
6 Capital Freightways
7 Safeway
8 Sidney Freight Lines
9 Route of the Hiadas
10 Mairs Transport

Note: 4A Location of C.P. Transport's proposed terminal.
TABLE 6.1

ANNUAL DIVERTED TRAFFIC VOLUMES

<table>
<thead>
<tr>
<th>Year</th>
<th>No.</th>
<th>Year</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>40,560</td>
<td>1983</td>
<td>50,632</td>
</tr>
<tr>
<td>1979</td>
<td>42,574</td>
<td>1984</td>
<td>52,646</td>
</tr>
<tr>
<td>1980</td>
<td>44,589</td>
<td>1985</td>
<td>54,661</td>
</tr>
<tr>
<td>1981</td>
<td>46,603</td>
<td>1986</td>
<td>56,675</td>
</tr>
<tr>
<td>1982</td>
<td>48,618</td>
<td>1987</td>
<td>58,689</td>
</tr>
</tbody>
</table>

To obtain the cost savings for units diverting to the new facility, the savings in time and distance must be calculated. This involves determining the number of units moving from each area. Information from the City Engineering Department\textsuperscript{5}, B.C.C.S.S. and the trucking companies were useful in making the estimates. The traffic origins were then grouped into three areas where the change in distances to the terminals would be approximately the same. The three groups are:

1. Richmond and Delta This group also includes the industrial area along the north shore of the North Arm. This group would have easiest access to the new facility, and avoid a trip across Vancouver.

2. New Westminster This group also includes south Burnaby. Traffic from this area would use Marine Drive to access

\textsuperscript{5}City Planning Department Truck Route Study, Vancouver, 1974 and 1975 Truck O-D Study, unpublished preliminary data 1975.
the new terminal rather than Kingsway and Main to downtown.

3. Fraser Mills, Coquitlan and Points East on Hwy. 401

This traffic would normally use Highway 401 or the Lougheed Highway to access Hastings Street or Grandview Street.

For each of these three groups, the distance and time savings were calculated. These, as well as the traffic flows are contained in the following table.

<table>
<thead>
<tr>
<th>Area</th>
<th>Traffic Source</th>
<th>Savings in Miles</th>
<th>Savings in Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Delta and Richmond</td>
<td>45%</td>
<td>8.5</td>
<td>45 minutes</td>
</tr>
<tr>
<td>2. New Westminster</td>
<td>35%</td>
<td>6.0</td>
<td>30 minutes</td>
</tr>
<tr>
<td>3. Fraser Mills, Coquitlan, Points East</td>
<td>20%</td>
<td>2.0</td>
<td>12 minutes</td>
</tr>
</tbody>
</table>

The importance of the benefit to diverted traffic lies in the saving of time. The important question is what is the value of this time savings? In most Benefit-Cost studies involving public transport projects this question leads to varied opinions. There is no "correct" value as everyone values time in a different way. In this case the value of time is less complex since we are valuing the time of a relatively homogeneous resource, a tractor-trailer combination. The time saved allows further activities to be engaged, hence more economic value can be pro-
duced with the labour and resources released. The value of time becomes the opportunity cost of the unit.

In Chapter 3, the opportunity cost of a tractor trailer unit was determined to be approximately $22.63 per hour. This figure is then applied to the time savings for each area on a yearly basis. For example, in 1980, the traffic from area three would save approximately 1783 hours, with a value of $40,349. These benefits appear in column B of Exhibit 6.2.

There would be a benefit to downtown Vancouver if drop trailer traffic diverted to an alternate location. This benefit would be in the form of less congestion, noise and pollution. The size of the benefit would depend on the amount of traffic diverted.

The City Engineering Department, in their study of truck routes determined that trucks make up 15 percent of the urban traffic stream.\(^6\) About 70 percent of this traffic is composed of lighter trucks (2 axle with less than 40,000 GVW) with operating characteristics similar to cars. Truck interference with general traffic is thus caused by the larger trucks which account for less than 5 percent of all vehicles in the traffic stream.

\(^6\)Ibid., Truck Route Study, p. 7.
Of all the trucks in the over 40,000 GVW class, tractor trailer units account for approximately 30 percent, the remainder being 3-axle and dump trucks. However, even though their numbers are small, they do have a disproportionate influence on congestion due to their size and acceleration/deceleration characteristics.

Larger trucks also have the distinction of being very noisy. The human ear can adjust to sounds up to 80 decibels (db). Lighter units such as 2-axle trucks usually generate noise levels less than 75 db. Tractor trailer units however, often generate noise greater than 80 db. Noise monitoring studies indicate that diesel trucks are approximately 8 db. louder than gasoline powered trucks, and 13 db. louder than automobiles.

The result is that large trucks are clearly audible and a major cause of annoyance, in the form of loss of sleep, interference with conversation, and loss of amenities afforded by a quiet environment. Numerous studies exist relating to the topic of noise and its effects on the surrounding environment. As vehicular traffic continues to increase, noise levels will also, and the environmentally aware public will put increasing pressure on government for tighter controls and restrictions.

\[\text{Ibid., Truck Route Study.}\]

Unlike the other benefits of a partial relocation, the decrease in noise and congestion has a finite term. It will last until the capacity of the present system is reached given that the alternate location is completed. The benefit is derived from less heavy truck traffic in the downtown area. Figure A presents a visual interpretation of the volume of traffic the benefit is generated from.

**FIGURE A**

**DIVERTED TRAFFIC**

In Figure A, the line AB represents the expected traffic to the downtown facility providing no alternate location was constructed. Full capacity would be reached at point B. The line DC is the traffic to the downtown facility if the new facility is built. This traffic would also reach capacity, represented by the line BC. Line AD would be the traffic diverted to the new
facility at its opening. The shaded area is the amount of traffic diverted from the old facility, until that facility is again at its full capacity. It is the removal of this traffic from the downtown area that produces the benefit of less noise and congestion.

Valuation of this intangible benefit is extremely difficult. Several studies have been conducted in recent years concerning the measuring of the costs of noise and air pollution, especially that in and around airports. Feller and Nelson suggest several conceptual problems still exist in the valuation and enumeration of such costs, and as yet useful guidelines for policy formulation do not exist.  

Several methods have been used in the attempt to measure nuisance costs. The ideal measure in this study would be the extra nuisance generated by one truck. An alternate estimation could be achieved through direct interviews of persons affected. The cost of the nuisance is then the maximum sum they would be willing to give to be on the same level of utility without the nuisance.  

Emperical problems exist with this approach because people would tend to give biased answers. Also it would not simulate real market conditions.


One of the most widely used approaches for the measurement of nuisance is its effect on residential property values. The theory behind this method is that persons purchase property (land and improvements) for the stream or flow of services they produce, i.e., space, location, protection against crime and the elements, and various amenities. The price of a house will increase or decrease depending on the flow of services from it. Thus the presence of a nuisance will reduce the valuation of the amenity service. The decrease in the valuation of the amenity service will be exactly equal to the fall in the house price. Therefore, for a given area that includes "noisy and quiet" houses the cost of the noise should be reflected in the change in the prices of the houses, all other things being equal. Figure B presents this theory graphically.

FIGURE B

HOUSE PRICES

\[ \Delta P \{ \]

quiet

Marginal Money Values

\[ N_0 \]

\[ N_1 \]

\[ P_0 \]

\[ P_1 \]
The line MM' is the marginal money valuation attached to a house with a particular noise level. An increase in the level of noise from \( N_0 \) to \( N_1 \) would produce a change in the price of the house \( B \). The sum of the decreases of all houses affected by the introduction on a noise would represent the cost of that noise.

Feller and Nelson note the studies using this approach indicate that reduction in property values does occur due to pollution, but suggest some uncertainty as to the magnitude of the reductions.

All these approaches to the measurement of nuisance costs share the same characteristics. They are large cumbersome undertakings, costly, time consuming, and contain several problems. As a result they do not lend themselves to a good estimate for the purposes of this study without a major undertaking. To avoid the inaccuracy using a "fast and dirty" number which could also impair the other results, the measuring of the nuisance benefit will be ignored for the present time. This does not present any serious problems as the benefits and costs can be compared with the absence of this benefit. This allows one to see if the nuisance benefit would be in a position to seriously influence the results depending on its magnitude.
6.1.4 Discount Rate

The choice of an appropriate discount rate is important as it directly affects the size of future cash flows. The main consideration with this particular analysis is that it would be undertaken in the private sector. Thus the most appropriate interest rate would be the private opportunity cost. The problem lies in measuring this rate. A guide to this discount rate would be the internal rate of return on projects foregone. Unfortunately this information is not available, however a fairly good estimate can be made. The rate of return on assets for C.P. Rail is extremely low, and is not considered a good approximation. The rate of return on equity, which can be used for a guide was in the 8.7 to 9.8 percent range in the past two years. Another guide is the long term debt rate. Bonds issued in 1974 and 1975 were 10.35 percent and 11.25 percent. With these two figures as a guide, a rate of 12 percent has been used. To test the sensitivity of the results to the discount rate, other rates of 10 percent and 14 percent have been used as well.

The costs and benefits for the proposed relocation are summarized in Exhibit 6.2 on a yearly basis. Since the purpose of relocation is to satisfy B.C.C.S.S.'s intermediate requirements, a term of 10 years is used. After that time a complete relocation of the downtown facilities will take place to this or another location.
EXHIBIT 6.2

BENEFITS AND COSTS OF BUILDING AN ADDITIONAL DROP TRAILER FACILITY

I. BENEFITS:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>A. COST SAVINGS ($)</th>
<th>B. COST SAVINGS TO DIVERTED TRAFFIC: (BY AREA) ($)</th>
<th>12%</th>
<th>10%</th>
<th>14%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>309,782</td>
<td>160,628</td>
<td>36,706</td>
<td>452,753</td>
<td>461,019</td>
</tr>
<tr>
<td>1979</td>
<td>325,170</td>
<td>168,616</td>
<td>38,516</td>
<td>424,351</td>
<td>439,894</td>
</tr>
<tr>
<td>1980</td>
<td>340,589</td>
<td>176,582</td>
<td>40,349</td>
<td>396,843</td>
<td>418,864</td>
</tr>
<tr>
<td>1981</td>
<td>714,796</td>
<td>184,548</td>
<td>42,182</td>
<td>417,810</td>
<td>449,039</td>
</tr>
<tr>
<td>1982</td>
<td>324,582</td>
<td>192,536</td>
<td>43,992</td>
<td>529,069</td>
<td>578,956</td>
</tr>
<tr>
<td>1983</td>
<td>574,368</td>
<td>200,524</td>
<td>45,826</td>
<td>611,678</td>
<td>681,588</td>
</tr>
<tr>
<td>1984</td>
<td>824,154</td>
<td>208,490</td>
<td>47,636</td>
<td>670,507</td>
<td>760,787</td>
</tr>
<tr>
<td>1985</td>
<td>1,073,939</td>
<td>216,478</td>
<td>49,469</td>
<td>709,799</td>
<td>819,810</td>
</tr>
<tr>
<td>1986</td>
<td>1,324,221</td>
<td>224,444</td>
<td>51,279</td>
<td>733,031</td>
<td>853,983</td>
</tr>
<tr>
<td>1987</td>
<td>1,573,510</td>
<td>232,423</td>
<td>53,113</td>
<td>742,720</td>
<td>889,464</td>
</tr>
</tbody>
</table>

II. COSTS:

(From Section 6.1.2) $2,266,000

less Residual value of land and pier (1,800,000) 1,686,580 1,572,100 1,780,540

III. NET BENEFITS

4,001,981 4,781,304 3,329,713
Conclusions

Exhibit 6.2 indicates that the net benefits of relocating part of the present facilities are substantial. The new facility can be constructed and put into operation with a minimum amount of construction and capital outlay. The Exhibit also indicates the project is attractive if C.P.'s planning horizon is less than ten years.

In order to test the sensitivity of the results to the forecasted volumes, an analysis is also made using the lower limit estimate developed in Section 4.2. Even though the annual increase is 20 percent lower, the net benefits are still positive indicating the projects would be acceptable. With a 12 percent discount rate, the net benefits would be $2,713,213 and $2,193,792 for a 14 percent discount rate.

The weakness associated with this analysis is that up to now it has ignored the financing of the project. In Exhibit 6.2 all the benefits accrue to parties other than the B.C.C.S.S. Typically in social cost benefit analysis the distributional effects are ignored so long as the gainer could compensate the losers. In this project a private firm will have to make the decision as well as the capital expenditures, thus an examination of the distribution of benefits and costs is necessary.

Theoretically, the gainers in this project, i.e. the
trucking companies who use the facility, should be willing to pay a premium to use the new facility since it would produce a savings to them. The amount of this premium would be less than or equal to that saving.

Another approach would be to examine the benefits from the point of view of the B.C.C.S.S. The benefit to them would be the ability to increase revenues and thus profits by being able to extend their capacity beyond 1979. If the B.C.C.S.S. operating economics and profitability were known, it would be a fairly simple task to measure the benefit of generated traffic. If the profits from lost traffic due to no facilities are equal to the cost of building the facilities, then it would be built.

Since the profit margin on ferrying drop trailers is not known, the size of the benefit cannot be determined. However, the benefit can be analyzed by two alternate methods. First, we can assume a required rate of return on capital invested, and determine if the profits generated would justify the expenditure. Secondly, the rate can be determined that will justify the expenditure. In other words, that rate that will equate the discounted costs and benefits.

The first method suggests we assume a rate of return. Since the discount rate of 12 percent was used previously as the rate on projects foregone, the same rate would be appropriate for this analysis. The first step is to determine the number of units
generated by the new facility, the revenue they produce, and the profits they generate. Since the existing facilities would not be saturated until mid 1981, the traffic we are interested in is the excess beyond that date. This information is included in Table 6.3.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TRAFFIC No. of Units</th>
<th>REVENUE $(Average)</th>
<th>PROFIT $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>1,508</td>
<td>122,902</td>
<td>9,373</td>
</tr>
<tr>
<td>1982</td>
<td>6,544</td>
<td>533,336</td>
<td>36,313</td>
</tr>
<tr>
<td>1983</td>
<td>11,580</td>
<td>943,770</td>
<td>57,374</td>
</tr>
<tr>
<td>1984</td>
<td>16,616</td>
<td>1,354,204</td>
<td>73,500</td>
</tr>
<tr>
<td>1985</td>
<td>21,652</td>
<td>1,764,638</td>
<td>85,528</td>
</tr>
<tr>
<td>1986</td>
<td>26,688</td>
<td>2,175,072</td>
<td>94,120</td>
</tr>
<tr>
<td>1987</td>
<td>31,724</td>
<td>2,585,506</td>
<td>99,872</td>
</tr>
<tr>
<td>1988</td>
<td>36,760</td>
<td>2,995,940</td>
<td>103,359</td>
</tr>
<tr>
<td>1989</td>
<td>41,796</td>
<td>3,406,374</td>
<td>104,929</td>
</tr>
<tr>
<td>1990</td>
<td>46,832</td>
<td>3,816,808</td>
<td>104,977</td>
</tr>
</tbody>
</table>

NOTE 1. Profit figures are discounted at 12 percent.

Table 6.3 indicates that the discounted stream of profits up to and including 1990 are $769,345 assuming a required rate of 12 percent, and a 10 year life. Therefore, if the assumption of B.C.C.S.S.'s rate of return is correct, then the project would not be acceptable since the discounted benefits would be less than the discounted costs of $860,623. The net benefits do become positive, or the project becomes acceptable if the planning horizon extends beyond ten years, or if the discount rate is 10%.
The obvious question which arises from Table 6.3 is the actual construction time of the project. Comparing Table 6.3 and Exhibit 6.2, from the point of view of the B.C.C.S.S., the project need not be started until mid 1981 when the existing facility is nearing absolute capacity. The benefit in waiting however, would be to keep various options open as long as possible.

The second method of analysing the acceptability from the view of the private firm is to determine the rate at which the discounted benefits (profits) accruing to B.C.C.S.S. will equal that of the capital expenditure. This method involves a certain amount of trial and error calculation, as well as interpolation. However, the result is that the project would have to earn a rate of 13.42 percent in order to meet the capital outlay. Thus the decision of management, (if economics were the only criteria) can be put into perspective. In other words, if the pricing structure of B.C.C.S.S. was constructed to generate a rate of say 13.42 percent or better, then the project would be accepted.
Chapter 7

Summary and Conclusions
7.1 Review and Summary

The size of Vancouver Island, in terms of population and economic importance necessitates an efficient and continuous link with the B.C. Mainland. The ferry system has been a vital component in providing such communication. Freight traffic is particularly important, since it is almost entirely dependent on water transportation. This traffic has been growing steadily, with an increased emphasis on motor freight transportation.

This thesis has studied a number of aspects of drop trailer traffic, a subject hitherto lacking in published information. By meeting the objectives of the thesis, it is hoped a large step can be made in filling this void. The first objective is an analysis of the economics of shipping via drop trailer. Secondly, the size importance and recent trends in this traffic is studied, and a projection of future traffic is made.

The third objective is an analysis of the physical facilities available to drop trailers. This analysis deals with the current question of a relocation of facilities. One alternative to complete relocation, is a partial relocation of facilities. An analysis of the costs and benefits is performed to determine the net benefits of such a project. The body of information contained in this thesis will be useful as a base for future researchers working in related areas.
In order to understand the current situation in the drop-trailer industry, a knowledge of its evolution and development is important. This information is contained in Chapter 2 which develops the importance of Vancouver Island, the general problem of freight transportation to it, and a brief history of the ferry system. Up until 1958, the ferry service to the Island was operated entirely by private enterprise. After that date, the Government took over the service, and embarked on a rapid expansion of the fleet and terminal facilities. It became an efficient system oriented to automobile and passenger traffic, and featured rapid sailing and turnaround times. As the handling of drop trailers and other traffic did not mix well, they were restricted in 1968, and totally banned in 1973. As a result, British Columbia Coastal Steamship Service handled this traffic and has emerged as primarily a specialized drop trailer carrier. With the current congestion and peaking problems on B.C. Ferries, B.C.C.S.S.'s service is now an important supplement to their capacity. Thus the two carriers are essentially non-competing with respect to their traffic.

B.C.C.S.S. is now the only company to provide drop trailer service to the Island. Several trucking companies moving trailers to the Island have found this service very advantageous to their operations. It allows them to reserve space on each sailing, deliver the trailer to the yard at their convenience and literally drop them off, and have priority over automobile traffic. The system eliminates the need for the driver and tractor unit to
accompany the trailer on the ferry, thereby saving costly idle time. The analysis of the economics of drop trailers found that on the Vancouver to Island routes, the user of the system could save a minimum of approximately $49 per trip rather than sending it as a live unit on B.C. Ferries.

The traffic analysis found that there is a small number of companies using the drop trailer facilities. However, these users have been shipping trailers in substantial volumes. The service demanded by these users is overnight, thus the sailings are scheduled to meet this need. Drop trailer traffic has been growing at an average annual rate of about 7.3 percent over the past 10 years. Aiding this growth has been a continuing shift of rail traffic to highway transport. Volume figures indicate rail-car traffic has been declining at 5 percent over the last 8 years. Drop trailers suffer from a freight imbalance of 4:1 in favor of westbound movements over eastbound. For the railways, the imbalance is more severe, 6:1, but in favor of eastbound shipments over westbound. The solution to the twin backhaul problem may lie in a move to a single mode, if it can be shown to be economically possible.

Drop trailer traffic does not suffer from the seasonal variations that plague the B.C. Ferries. The main commodities carried by drop trailers are general merchandise and consumer goods, which do not vary greatly by season. A regression analysis of the traffic volumes produced a regression equation for the growth.
Using this trend, the anticipated future volumes of traffic are expected to increase at 5,036 units per year.

An analysis of B.C.C.S.S. facilities revealed several problems which will greatly affect future operations. The capacity of the system was found to be rapidly approaching a point of saturation. This applies to both vessel capacity and terminal facilities. Under the present schedule capacity will be reached by 1987.

Not only are there physical limitations to expansion, but political ones as well. The central location of the facilities, its easy access by the public, and the aesthetic qualities have made it the subject of the City's redevelopment plan. Development or expansion in the area by B.C.C.S.S. would be effectively prevented by City Council's withholding of building permits.

The central location of the facilities also presents other problems to some trucking companies. These are mainly in the area of convenience and accessibility. Not only is there limited access to the terminal yard, restricted truck routes, but travel through downtown Vancouver is difficult and time consuming. Large trucks also contribute disproportionately to noise and congestion in downtown.

With these considerations B.C.C.S.S. have had to consider relocation of facilities as a means of solving some of these pro-
blems. One alternative under consideration is the construction of another facility at a new location, and diverting a portion of the drop trailer traffic to it from downtown. The analysis of this alternative found that not only did it solve many of the problems with the existing facility, but the net benefits of such a project could be very considerable.

7.2 Areas for Future Research

A number of related topics have arisen as a result of the analysis of drop trailer traffic. These topics should be given careful consideration and examination as they are extremely important to the future of the Mainland-Island ferry system.

The B.C. Ferry policies regarding certain traffic movements should be analysed. Traffic falling into this category would be overheight vehicles such as commercial units and recreational traffic. These units interfere with the loading, unloading and capacity of the B.C. Ferry fleet. The analysis would be even more important from the stand point of B.C.C.S.S., given that the new trailer ferry is scheduled to go into operation in 1976. A change in B.C. Ferry policy regarding drop trailers would have a large impact on B.C.C.S.S.'s operations, especially investment plans.

A second topic of importance would be a feasibility study of trucking lumber from the Island to the Mainland. The experience
of Doman's Transport would suggest this as a feasible method of mitigating the twin backhaul problems currently experienced by railcars and drop trailers. This question could be part of a larger study dealing with the rail-truck competition on the Island.

The trend of viewing Vancouver as a distribution center for the Island, the limited rail access on the Island, the time required for transshipping railcars, and the flexibility of trucks have all contributed to the growth and importance of drop trailers. Future development on the Island, especially in the north will be highway oriented, and likely centered on Nanaimo. The economic potential of the area, the origin-destination of the goods, and their impact on drop trailers and the location of facilities should all be examined.
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