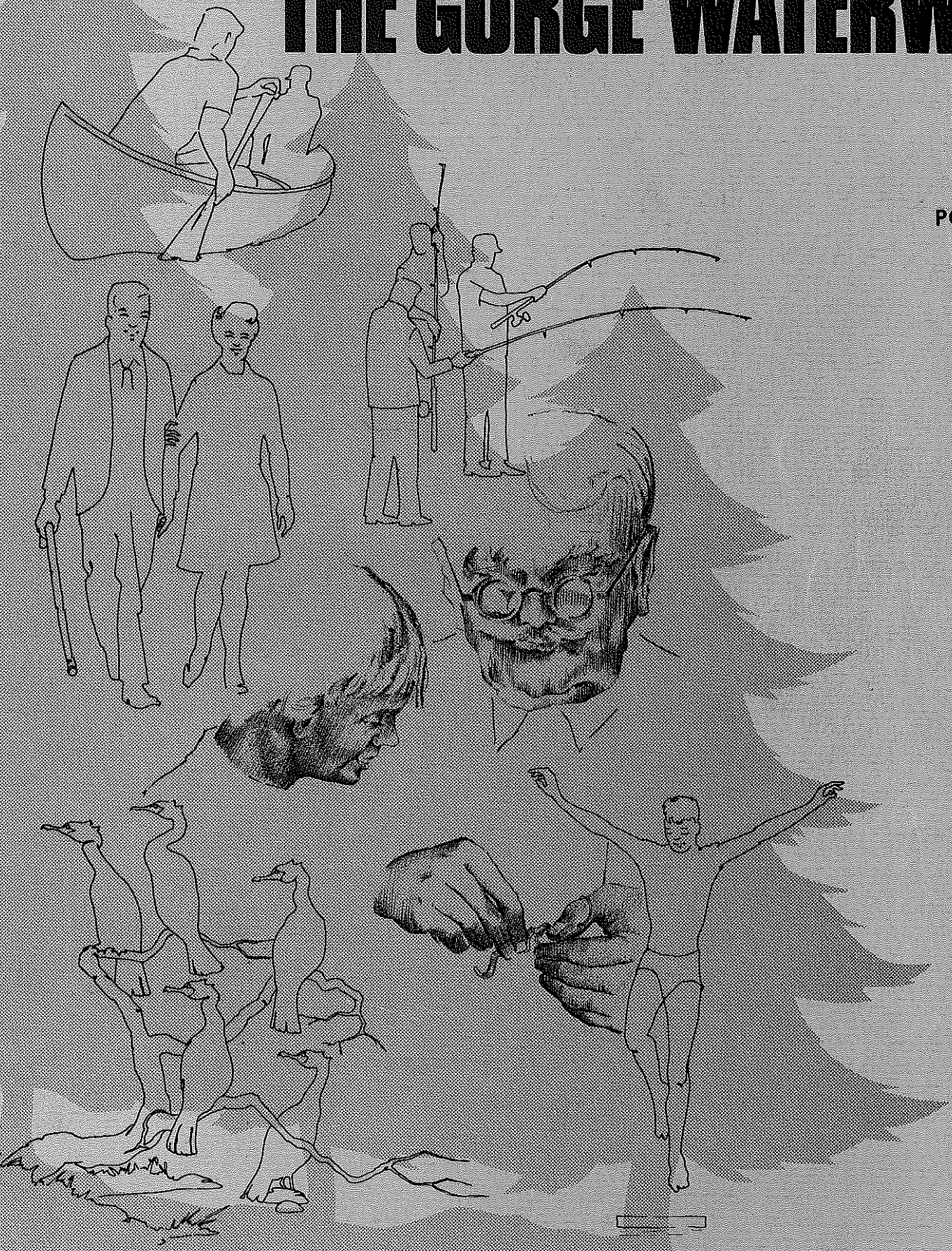
THE GORGE WATERWAY

SELKIRK
WATER
TO
PORTAGE
INLET



THE CORPORATION OF THE DISTRICT OF SAANICH

THE CORPORATION OF THE DISTRICT

OF SAANICH

T H E G O R G E W A T E R W A Y

SELKIRK WATER

TO

PORTAGE INLET

BY

F. E. Neate, P. Eng.

March, 1970

March 20, 1970

Mr. N. W. Life, P. Eng.,
Municipal Engineer,
Corporation of the District
of Saanich,
770 Vernon Avenue,
Victoria, B.C.

Dear Sir:

I take pleasure in submitting herewith a report entitled "The Gorge Waterway". Preparation of the report has been a most interesting task since I have personal memories of the area as a swimming place.

There must be acknowledgment of the assistance provided by previous reports, various senior government departments (the Canadian Hydrographic Service in particular), the University of Victoria, a number of private individuals and many Saanich employees (including one who willingly rose in summer darkness to carry out bacteriological sampling).

Reference must also be made to the fact that the Corporation's budget was supplemented by grants from the Provincial Government and the Township of Esquimalt.

Yours very truly,

F. E. Neate

F. E. Neate, P. Eng.,
Senior Design Engineer.

FEN/mas.

VICTORIA ARM

Fig. 1

PORTAGE INLET

Fig. 2

INTRODUCTION

The Gorge Waterway is an arm of the sea extending inland from Victoria Harbour. The division between the two bodies of water may be taken as the Canadian National Railroad trestle across Selkirk Water, for seaward of this structure the shoreline is almost exclusively industrial land whereas residential property and parks predominate on the landward side of the trestle.

The waterway is tidal throughout its entire length but is divided into two sections of differing tidal characteristics by the narrow rockbound 'gorge' at Tillicum Road. From Selkirk Water to the Gorge Narrows water levels quite closely reflect the height of the tide in Victoria Harbour. Above the Narrows the major difference lies in the fact that the water level invariably does not drop as low as Victoria Harbour at low tide. As Strait of Juan de Fuca tides at Victoria are characterized by certain days each month during which the water level is at, or close to, the highest level of the day for several hours, there are periods when the upper basin fills to the same high water level as Victoria Harbour. On other days when there are two distinct high waters in Victoria Harbour, the upper basin does not rise as high as the harbour.

The question "What should be done with the Gorge?" has been asked in one form or another many times in the last quarter century or so and is almost in the category of a perennial question. Through the years it has led to a number of formal reports and has resulted in at least two private engineering

firms voluntarily putting forward suggestions. The length of time involved, and the amount of effort already applied, serves to indicate that it is most certainly a difficult question to try to answer. In an attempt to supply an answer this report presents some recommendations which are believed to be non-contentious and generally acceptable and others which hopefully have a rational basis for being chosen as the best of the various alternatives which were considered.

The call for another report resulted from increased local government awareness of a need for conserving the natural amenities of the urban area, the activities of the Portage Inlet and Gorge Waterway Association, the shoreline improvements being carried out by the Capital District Improvement Commission and renewed public interest resulting from current posting of the area as "unfit for bathing". All of these factors contributed to the time being opportune for provision of funds by the District of Saanich and for a favourable response to requests by Saanich's Mayor (See Appendix I) for a sharing of costs by the Provincial Government and Esquimalt Municipality. The result was an appropriation large enough to permit fairly extensive field work directed toward some of the factors which previously had only been given limited or cursory study.

Previous reports refer to the waterway as a scenic and recreational resource of the Victoria area. While there can be no argument at present regarding the first adjective it is obvious, in view of the relatively little public or private recreational activity which currently takes place in or on the water, that the second refers more to potential than to existing value. The fact that this is so at a time when the voters have supported a regional

park acquisition program and there is talk of making expenditures on regional park development is perhaps the best reason for making a further effort to supply an answer to the question referred to above.


SAANICH
INTERURBAN RD.
CAREY RD.
QUADRA ST.
TRANS — CANADA HIGHWAY
W. BURNSIDE RD.
SWAN LAKE
SAANICH RD.
PORTAGE INLET
PROVINCIAL LANDS
CRISTE PT.
Craigflower Bridge
GORGE RD.
TILLICUM RD.
E. BURNSIDE RD.
VICTORIA
Gorge Narrows
HARRIET RD.
TOLMIE AVE
CRAIGFLOWER RD.
ARM
Selkirk Narrows
SELKIRK WATER
ESQUIMALT HARBOUR
ADMIRALS RD.
ESQUIMALT
BAY ST.
VICTORIA
ESQUIMALT RD.
VICTORIA HARBOUR
DOUGLAS ST.
GOVERNMENT
DALLAS RD.

Fig. 3

THE VALUE OF THE WATERWAY

The idea that the waterway is of distinct value to the city seems to be generally taken for granted. While this unchallenged acceptance may be due in part to a nostalgic feeling for the area stemming from its prominence as a recreational attraction in the early years of Victoria's development, there is very definitely an intuitive feeling that a substantial body of water lying within a growing urban area is of much more than historic value. Since intuition can hardly be used to justify an expenditure of public funds it seems sensible to anticipate recommendations calling for such action and to try and put into words some concepts related to the value of the area - if only to provide a standard against which to judge the recommendations.

The best approach seems to lie in examining the area's value as open space - it also seems particularly appropriate since the current regional park program is essentially the acquisition of open space. An estimate of value in terms of dollars can be derived from the price paid for the Cedar Hill Golf Course - this being the only recent major public purchase of undeveloped land in a built-up district. This purchase in 1967 involved 133 acres at a cost of $1,200,000 or $9,000 per acre. At this rate the area of water west of the C.N.R. trestle is worth more than $3,000,000, and land prices have risen by something in the order of 30% since 1967 so that, in terms of 1970 prices, it would require possibly $4,000,000 to purchase land to create the water surface alone.

Open space also has an intangible value which may be current or potential. The former stems from uses made of the area or benefits derived from its

existence at the present time. Potential value is related to changes or improvements which can be made to produce an immediate increase in intangible value and also to the future open space requirements of the community.

A list of current activities and benefits will provide an indication of current value. Those which come to mind are:

a) Commercial:

Log storage
Towing company wharfage
Boat mooring
Water tours for tourists
Boat building

b) Residential:

Swimming
Boat mooring
Pleasure boating
Wildlife observation
Fishing

c) Public*

Pleasure boating
Organized boat racing
Fishing
Waterside walking and driving
Wildlife observation

*Esquimalt's Kinsmen swimming pool, which is heavily used, is not considered to be part of the waterway.

In addition to these activities there are subtle benefits resulting from the existence of an open area of distinctive character; for example, the inlet adds substantially to the topographic variety which contributes so much to Victoria's attractiveness.

Proper assessment of current value requires qualification of the above list, for most (if not all) of the activities are limited in one way or another.

Log storage in a relatively small part of the inlet is probably the most important commercial activity. Both private and public boating are so limited as to make it unusual to see more than one boat in use at a time on the 200 acres of Portage Inlet. Swimming is limited to a very few individuals who ignore pollution postings. Of all activities, other than the one or two boat races which may be held during the course of a year, the herring fishing in the winter months probably attracts the most people - and the largest group at any one time is likely to be less than 75 persons.

As far as potential value is concerned it seems obvious that there will be an immediate increase in value as soon as it is established that the factors which limit swimming and boating can be overcome in an acceptable manner at reasonable cost. Whether or not this can be achieved by this report, the fact that the area simply exists as an open space is, without doubt, of greater importance to a community expecting substantial population growth and a change to higher residential densities.

Points indicating a high open space value for the area are brought out in two references to the reports of the U.S. Outdoor Recreation Resources Review Commission. C.W. Threinen in addressing the Twenty-ninth North American Wildlife Conference refers to the Commission's work as a "massive evaluation" reviewing existing demands and taking a long-range view of the future requirements of outdoor recreation. He states that:

> Among the facts cited was that the most important of the recreational demands was for scenery of which water is commonly the focal point. This was followed by swimming, fishing and boating of one form or another.

> To meet the demand for these activities, great amounts of surface water and public use opportunities in conjunction with them are required.

William H. Whyte in his book "The Last Landscape" refers to the same study and comments on the fact that the U.S. Congress in establishing the Commission in 1958 specifically excluded city areas from the study. He notes that:

> The Commission looked at them just the same. It had to. The simple, close-to-home activities, it discovered, are by far and away the most important to Americans. The place to meet this need, said Chairman Laurance S. Rockefeller, is where most Americans live — in the cities and suburbs.

FACTORS LIMITING USE OF THE WATERWAY

Having looked at the area in terms of current and potential value the problem to be dealt with seems to be the determination of the steps to be taken to increase current use of the area and to protect its potential value. The number of residential properties fronting on the inlet, the existence of four sizeable shoreline parks, and the heavy use of the semi-natural swimming pool in Esquimalt's Kinsmen Gorge Park all serve to indicate that the limited recreational activity at the present time is not due to insufficient access to the water or lack of interest by local residents. Naturally enough, since the area's defects are a logical starting point in developing plans for improvement, previous reports discuss them at some length. In view of the importance of these factors and the additional information concerning them collected through surveys carried out as part of this study, detailed review and discussion is appropriate.

The bacteriological quality of the water seems to be the subject having received the greatest attention through the years. This, no doubt, stems from the fact that the public made heavy use of the public and commercial swimming facilities (the "free" and "pay" bath houses) located near Tillicum Road up until 1938, at which time the area was closed to swimming on the recommendation of the Medical Health Officer of the day.

This recommendation stemmed from the occurrence of cases of typhoid, indications of contamination of the inlet's water obtained by use of a

relatively new and unrefined bacteriological test, and knowledge that roadside ditches in adjacent neighbourhoods carried septic tank effluent. The closure was in effect until the mid 1950's. At this time septic tank drainage in a major area of the District of Saanich was eliminated by provision of a community sewer system. Naturally enough, in view of continuing public interest in the area, water quality was rechecked and found to be satisfactory for swimming. Since the modified test used at this time was capable of giving a much better approximation of the degree of contamination than the test used previously and since the amount of septic tank effluent still reaching ditches could be just as great as at the time of closure in the 1930's (air photos of the early 1930's show Saanich's side of the inlet as sparsely developed and the years of closure saw numerous homes built in areas still not served by sewers) speculation suggests the thought that the original closure may have been unnecessary.

In the 1960's increased interest by the Metropolitan Health Board in the quality of shoreline waters and an increase in the number of infectious hepatitis cases in the city led to the current posting of the area as "unfit for bathing". Again popular and official opinion tended to attribute the contamination to the drainage of household wastes from surrounding unsewered areas.

Suspecting that insufficient weight had been given to the possibility that Victoria Harbour waters contribute significantly to the degree of contamination and knowing that there had been further developments in bacteriological testing, it was decided that more extensive water sampling would be useful. It was felt that a larger number of samples collected well off

shore would produce a better estimate of the degree of contamination than the limited number of shoreline samples which could be taken as part of the total public health beach monitoring program.

The B.C. Health Branch central laboratory was asked to allot time for the examination of a series of samples using the routine coliform, the faecal coliform and the faecal streptococcus tests.* While the laboratory would not agree to carry out the third test, approximately 50 samples collected at six stations during the summer of 1968 were checked for the other two groups of organisms. The estimates of the number of coliforms and faecal coliforms in each sample are given in Appendix II. While the table may best illustrate the difficulty of interpreting bacteriological results, the following points can be drawn from the faecal coliform data:

1. The quality of water in Portage Inlet is relatively high and is unaffected by the stage of tide.
2. All other sampling stations show evidence of having better quality at the end of a period of seaward flow.
3. Water quality decreases from station to station from Portage Inlet to Victoria Harbour.
4. At the end of an ebb the stations located opposite Saanich's Craigflower Park (Station 2) and Esquimalt's Kinsmen Gorge Park (Station 3) show the same level of contamination as Portage Inlet.

*The first test is that used in the 1950's and 1960's and was requested since it would provide means of comparison with previous results. The second is a relatively recent development intended to indicate coliforms derived from animal sources (some of the larger coliform group are thought to be associated with unpolluted soils). The third test is a further refinement thought to provide a means of differentiating between human and non-human sources.

Various lines of thought suggest that these observations do not support the theory that upper basin pollution is primarily due to drainage of septic tank effluent from the surrounding area. Possibly the most convincing is one involving the assumption that all sources of contamination are located along the unsewered southerly shoreline between Craigflower Bridge and Kinsmen Gorge Park. The sample results indicate that these sources are not able to raise the level of contamination of the last water flowing past them on an ebb tide (i.e. water from Portage Inlet). From this it can be concluded that they are also not capable of raising the faecal coliform density of a similar quantity of water coming from the opposite direction (i.e. the last water entering the same area on a flood tide).

If this is accepted it is necessary to look seaward for a source of contamination to explain the higher sample results found at Station 2 at the end of inward flow. The first noted is a sanitary sewer serving a small area in Victoria West and flowing into Selkirk Water near the C.N.R. trestle. Other sewers serving larger areas enter Victoria Harbour. The higher contamination at this end of the system is explained and it appears reasonable to conclude that organisms originating in Victoria Harbour travel into the inlet as far as Craigflower Bridge. It is highly likely that they go further and contribute to the contamination noted in Portage Inlet.

The last comment is supported by the changes in salinity in Portage Inlet during the course of a year. Additional support is provided by the movement of floating material known to originate in Victoria Harbour.

The mud bottom which is characteristic of the entire inlet is given as much attention in previous reports as water quality. While this type of bottom creates no problem in deeper water areas, Portage Inlet (which is approximately two-thirds of the water area of the inlet) is relatively shallow and extensive areas of mud are exposed at times of low tide. The mud contains a high percentage of organic material and smells strongly of hydrogen sulphide. The problem is accentuated by the fact that low tides are predominantly in the daylight hours during the summer months.

Since no one will use a mud bottom for wading or shallow water swimming, this characteristic of the inlet imposes a definite limitation on the recreational use of the water. An attempt to overcome this problem was made when developing Craigflower Park in 1961 by sanding the shelving foreshore. This was initially successful since swimming did take place but would probably have had to be repeated at regular intervals - the reason being that the voids in the surface inch or so of sand have tended to fill with the fine black sediment, a good part of which is probably organic material similar to that which is the source of odour in Portage Inlet. It is thought that this is the result of continual suspension, shifting and redeposition of fine particles throughout the inlet due to the interaction of waves, changing water level and tidal currents. Particles brought to a sanded area are likely to be captured by the protective action of the sand grains themselves.

In recent years Portage Inlet residents have expressed the view that the rate at which mud is accumulating in the area has increased and

that the areas exposed at times of low tide are noticeably larger. Some of the previous reports indirectly suggest that the rate of accumulation is thought to be at least measurable on a human time scale. These points, together with the number of past references to dredging as a solution, suggested that sampling of bottom materials would be useful. This was carried out by arranging a contract through Dr. H.D. Foster of the University of Victoria Geography Department, under which a university student, Mr. P.W. Marshall, obtained an extensive series of core samples. Mr. Marshall analysed the samples and produced a paper entitled "A Geomorphological Analysis of Portage Inlet". An abstract of this paper, together with a record of the materials found in each core and a plan showing sampling locations, are provided in Appendix III.

While Mr. Marshall's report does not provide a figure for the current rate of accumulation of mud, his work is of very considerable value for it clearly defines the extent and relatively limited thickness of this mud layer. It also brings to light the existence of a substantial layer of peat among the underlaying sediments.

A point which may be of some significance in connection with the suggested increase in area of exposed mud in recent years is the fact that in 1960 part of the rock restricting flow out of the upper basin was blasted away. This change must have resulted in lower low tide levels in Portage Inlet.

Other defects of a minor nature are:

a) Both swimming and boating are adversely affected by extensive beds of eel grass.

b) A filamentous algae grows prolificly in Portage Inlet during the summer months. As it forms large gas buoyed mats it is visually offensive in addition to being objectionable to swimmers and boaters.

c) The strength of current and drop in water surface in the Gorge Narrows at times of peak flow interferes with passage by boat between the two basins. The tourist launch trips from Victoria Harbour do not go beyond this point because of the day to day variation in the time at which the channel is navigable.

PAST PROPOSALS

There have been proposals for modification of the inlet throughout more than 100 years. The following item, which appeared in the August 28, 1858 issue of "The Victoria Gazette", is perhaps the earliest published comment:

> Union of Victoria and Esquimalt Harbors
> by means of a Canal
>
> The northern arm of Victoria harbor extends almost to Esquimalt harbor, and it is no Utopian project that of uniting the two by means of a canal. Just below Craig Flower, Victoria inlet, as it is here called, branches off to the west and toward Esquimalt for a half mile or more, and to within a distance of four hundred yards of the latter harbor, near the boundary line of Mr. McKenzie's farm. Between the two bodies of water there is a deep gorge or ravine, which seems intended as a natural canal, and maybe, in times long past, served in that capacity. A few thousand dollars judiciously expended, would turn this ravine into an excellent canal, uniting the two harbors, and capable of floating lighters heavily loaded with merchandise, and when once into the inlet, the navigation to this city is easy of accomplishment - at least, so we are assured by old residents. If Victoria ever becomes a great commercial city, as we believe it is destined to be, the advantages of this natural canal cannot be over-estimated. Vessels of the deepest draft cannot enter Victoria harbor, and such vessels are now forced to discharge their cargoes into lighters and sloops, which bring them hither by way of McCauley's Point - a distance of eight or ten miles. The canal and inlet would reduce the distance to less than four miles, and besides the travel would be more speedy, sure and safe. There is deep water in Esquimalt harbor just where the ravine comes in, and there would be no difficulty on this account. We hope this project will be taken into consideration by some of our capitalists.

During this period a number of competent studies have been produced and this report can do little more than abstract the basic concepts of the

various schemes, examine their advantages and limitations, and combine the most advantageous ideas into an optimum proposal.

Almost without exception the schemes suggested as a means of overcoming the inlet's main defects have involved one or another (or all) of the following: construction of a dam, introduction of water from Esquimalt Harbour, and deepening by dredging. Until relatively recently, attention has been concentrated on Selkirk Narrows as a dam site and on the construction of a canal from Esquimalt Harbour to Portage Inlet as a means of improving water quality. Reports prepared in the 1960's introduced the Gorge Narrows as a dam site and the use of pumping as a means of obtaining water from Esquimalt Harbour. Savings in cost seems to have prompted both changes.

A dam would provide a means of controlling the water level in the inlet. It could be used to maintain a high water level during the summer months or to change the inlet into a permanent fresh water lake. Either approach would prevent the entry of Victoria Harbour water. Warmer water for swimmers would result but the dam would interfere with the movement of boats unless a lock was provided. The ecology of the area would naturally be changed completely by conversion to fresh water and even a non-tidal salt water regime during the summer months might bring about substantial changes. The results might not necessarily be harmful.

The introduction of water from Esquimalt Harbour is a more complicated concept. Those advocating this measure have argued that it would

flush polluted water from the waterway and reduce the accumulation of mud in Portage Inlet. It has also been suggested that construction of a canal between the two bodies of water would provide a means for small boats to move back and forth. While one way circulation of water could definitely be achieved by a canal and a dam at Selkirk Water, it seems that pollution severe enough to warrant a substantial expenditure for flushing water would likely require the daily exchange of quantities approaching the volume of the normal tidal prism of the inlet. Since this is in the order of 50% of the total volume of water above Selkirk Narrows it can readily be seen that the summer water temperature gradient along the length of the inlet would be reversed - with Portage Inlet dropping close to the temperature of Esquimalt Harbour. It is likely that even under a greatly reduced rate of exchange somewhat lower water temperatures would result. While the thought that one way circulation would reduce the accumulation of mud in Portage Inlet is suspect, it seems reasonable to suggest that the rate of movement required to achieve this would be in the order of the natural outflowing velocity. This leads back to high rates of exchange and lower water temperature.

Use of the tides to circulate water through the inlet would mean that the full benefit of a dam could not be realized, for it would not be possible to maintain the highest possible water level. The idea of using pumps rather than a canal to deliver water to Portage Inlet at the same rate as it is flowing out to Victoria Harbour appears to solve this problem - until it is realized that at maximum water level pumping capacity in the 1,000,000 to 2,000,000 gallons per minute range is required to produce a

velocity of flow equivalent to that occurring naturally at the peak of the ebb flow and that the cost of the power required to deliver a volume equal to the present average tidal prism is $200 to $300.

The 1950 report by the B.C. Water Rights Branch and an unpublished brief prepared in 1967 by Willis and Cunliffe Engineering Ltd. concentrate on methods of obtaining Esquimalt Harbour water. The Water Rights report examines the construction of a canal in detail and gives a preliminary estimate of the cost of the canal, a dam and lock at Selkirk Narrows, and a small amount of dredging. In terms of 1970 costs, the estimate amounts to $2,000,000.

The engineering firm's brief first examines the feasibility of introducing water by gravity flow under the restriction of a reduced tide range in Portage Inlet. Using a range of 0.8 feet and a high water level approximately 1.5 feet below normal tidal high water it concludes that the water in the inlet can be changed once in six days by means of works on the scale of those of the Water Rights report. Presumably as a means of reducing costs the study then turns to the use of pumps and notes that the same exchange rate can be achieved by pumping at the rate of 40,000 gpm. The estimated costs worked out in 1967 are $50 per day for power and $250,000 for construction of the pumphouse and discharge line. In 1970 the figures would probably be $60 and $300,000.

High costs, and the relationship between flushing and reduced water temperature, lead to the suspicion that reduction of pollution by this method should be given no further consideration. If it is accepted that the current regional trunk sewer programme will remove the minor

sources of contamination in the upper basin and it is realized that water from Victoria Harbour held above a dam should purify itself in a relatively few days there certainly appears to be no reason to do otherwise. The balance of this report is developed on this basis.

Dredging would have no effect upon the bacteriological quality of the water in the inlet, but does have the distinct advantage of not having to be carried out on an all-or-nothing basis. Small annual programmes would, however, result in a higher cost per cubic yard excavated. On a very limited scale, dredging would provide small shoreline swimming areas although it might be found that such basins would tend to collect sediment relatively rapidly.

THE COST OF PROVIDING DEEPER WATER

If it is assumed that domestic sewage contamination of Victoria Harbour waters will cease in the near future and that industrial pollution is not likely to be a problem (the latter is not necessarily so) it appears that cost is the main factor influencing the choice between a dam or dredging as a means of increasing water depth. The potential value of the inlet and the long standing general interest in major improvement of the area suggests that the choice does not lie between a dam and minimal dredging, but between a dam and dredging extensive enough to eliminate most of the areas of mud which are exposed by low tides and to provide swimming depths reasonably close to the high water shoreline.

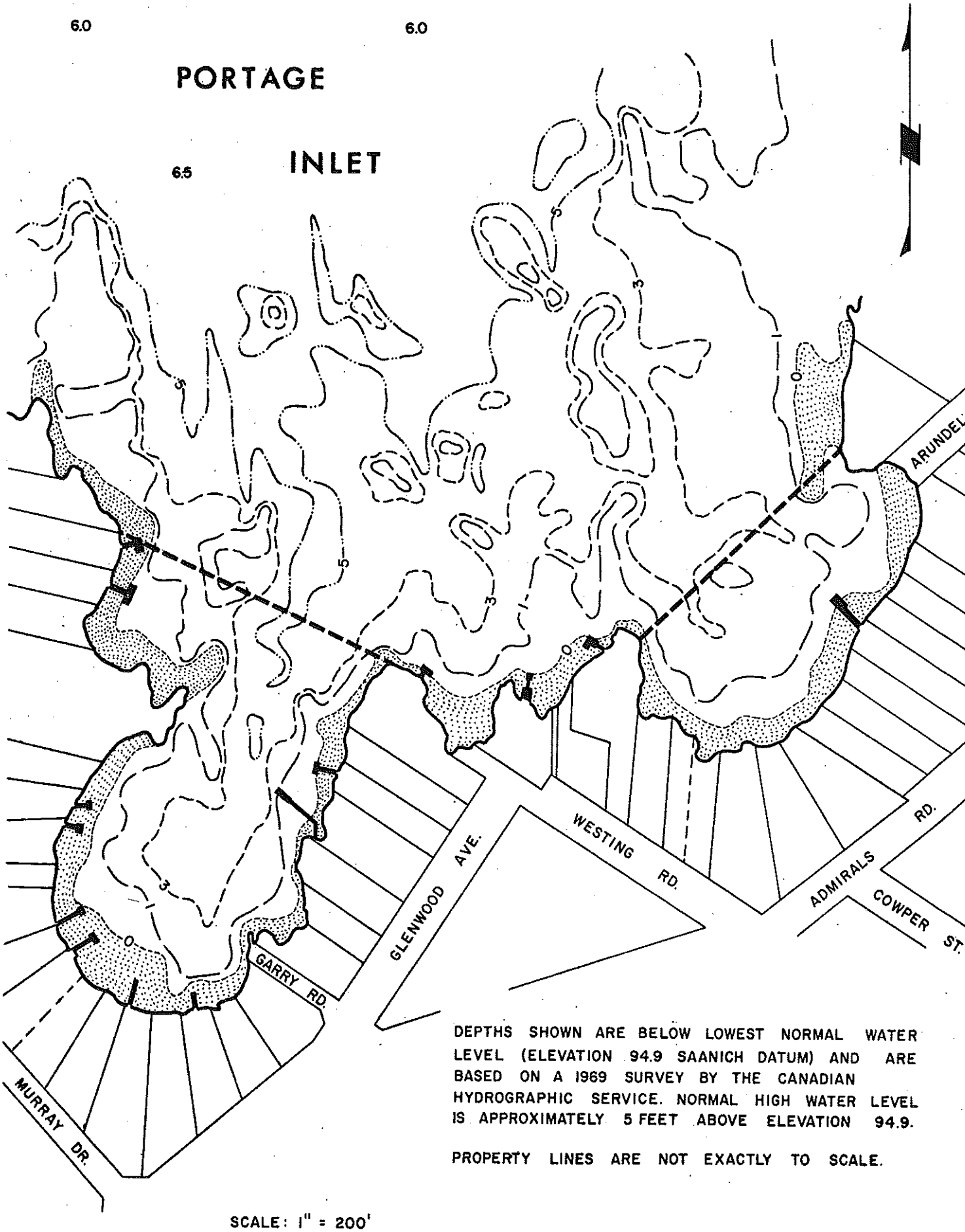
The cost of a dam is estimated to be in the order of $50,000 or $100,000 depending on the site chosen. These figures are based on earth construction using an impermeable membrane and waste fill from construction projects. They are drawn from rough analysis of two sites.

The cost of dredging is rather difficult to work out since B.C. firms specializing in marine dredging either have not responded to enquiries or have not undertaken any projects involving both restricted access and limited on-site disposal of excavated material. Quantities can be computed, however, and guessed costs may indicate the order of magnitude of the sum required to carry out the work. The uncertainties involved in any attempt to compute quantities for the entire inlet suggest that it would be wise to look first at limited areas in the hope that this is all that is required.

The part of Portage Inlet shown in Fig. 4 seems particularly suitable for the areas of exposed mud, the great amount of shallow water, and the substantial distance from shore of depths suitable for swimming more or less render the bay unusable by residents at times of low tide. When it is realized that the water level is within one foot of the level used in drawing the plan for periods of four to seven hours during the daylight hours on most days in July and August it is apparent that the land owners around the bay are likely to be interested in improvement by dredging. Assuming the areas within the dashed lines on the plan require deepening to a level six feet below low water level, and that this depth should be provided as close to shore as the line on the plan depicting the edge of exposed mud, the excavation required amounts to roughly 45,000 cubic yards. With the unit cost likely to be at least $2.00 per cubic yard* it seems that a dam holding the water level approximately five feet higher than low water level is probably a better solution. The thought that the contours of the bay probably reflect underlying mounds of rock which might rise above the desired bottom level reinforces this impression.

In case the preceding example is not sufficient the area of Portage Inlet west of Christie Point may be used to provide more conclusive figures. Here an area of approximately 20 acres can be considered to be exposed at low tide and the excavation required to create a basin of water of the same average depth at low tide as the average depth which exists at present at

*This cost is based on clam-shell or backhoe excavation with the excavated material barged to the north shoreline of the inlet and placed on shore at this point.



DEPTHS SHOWN ARE BELOW LOWEST NORMAL WATER LEVEL (ELEVATION 94.9 SAANICH DATUM) AND ARE BASED ON A 1969 SURVEY BY THE CANADIAN HYDROGRAPHIC SERVICE. NORMAL HIGH WATER LEVEL IS APPROXIMATELY 5 FEET ABOVE ELEVATION 94.9.

PROPERTY LINES ARE NOT EXACTLY TO SCALE.

SCALE: 1" = 200'

Fig. 4

high tide is 161,000 cubic yards. While use of a suction dredge with the discharge pumped to Esquimalt Harbour for barging to sea might reduce costs to $1.00 per cubic yard the sum of money involved is such that excavation of this magnitude is not likely to be carried out in this area. Nevertheless it cannot be denied that it is an excellent measure of the benefit which would result from construction of a dam.

In addition to these examples, detailed examination of the soundings shown in Fig. 5 indicates that the number of areas which should be deepened is such that the eventual total investment in even minimal dredging can be expected to be several times the cost of a dam. This, combined with the immediate benefit to the whole inlet and the complete control of water levels which would result from construction of a dam, leads to the conclusion that dredging as a general solution can be disregarded.

QUESTIONS RAISED BY A DECISION TO CONSTRUCT A DAM

If it is decided that construction of a dam is the most reasonable method of modifying the character of the inlet, the question of where to locate it immediately arises. This is complicated, for several sites are available and the relative merit of each site is dependant upon intangible factors as well as cost. The simplest approach seems to be to say that a rough comparison indicates one site to be outstanding. Surprisingly enough it has not gained prominence in the past, possibly because it requires the longest dam of all.

The site is Selkirk Water and the dam would extend from the foot of Washington Avenue, on the northerly shore, to the point of land located between the C.N.R. trestle and Banfield Park. The advantages of this location which counter balance the greater length of the dam are:

1. Banfield Park, one of the major existing parks fronting on the inlet, will benefit substantially.

This most attractive area, which is shown in Fig. 6, provides over 1300 feet of public shoreline. It seems reasonable to assume that it would be well used by swimmers if Selkirk Water contained clean, warm water held at high water level. When it is realized that it would cost approximately $500,000 to purchase the park at this time (assuming unimproved land was available in the area) it seems that a premium might be paid to locate the dam so as to include the park within the area benefiting from the dam.

SELKIRK WATER

Banfield Park on the far shore.

Fig. 6

2. The site is suited to construction of an earth dam.

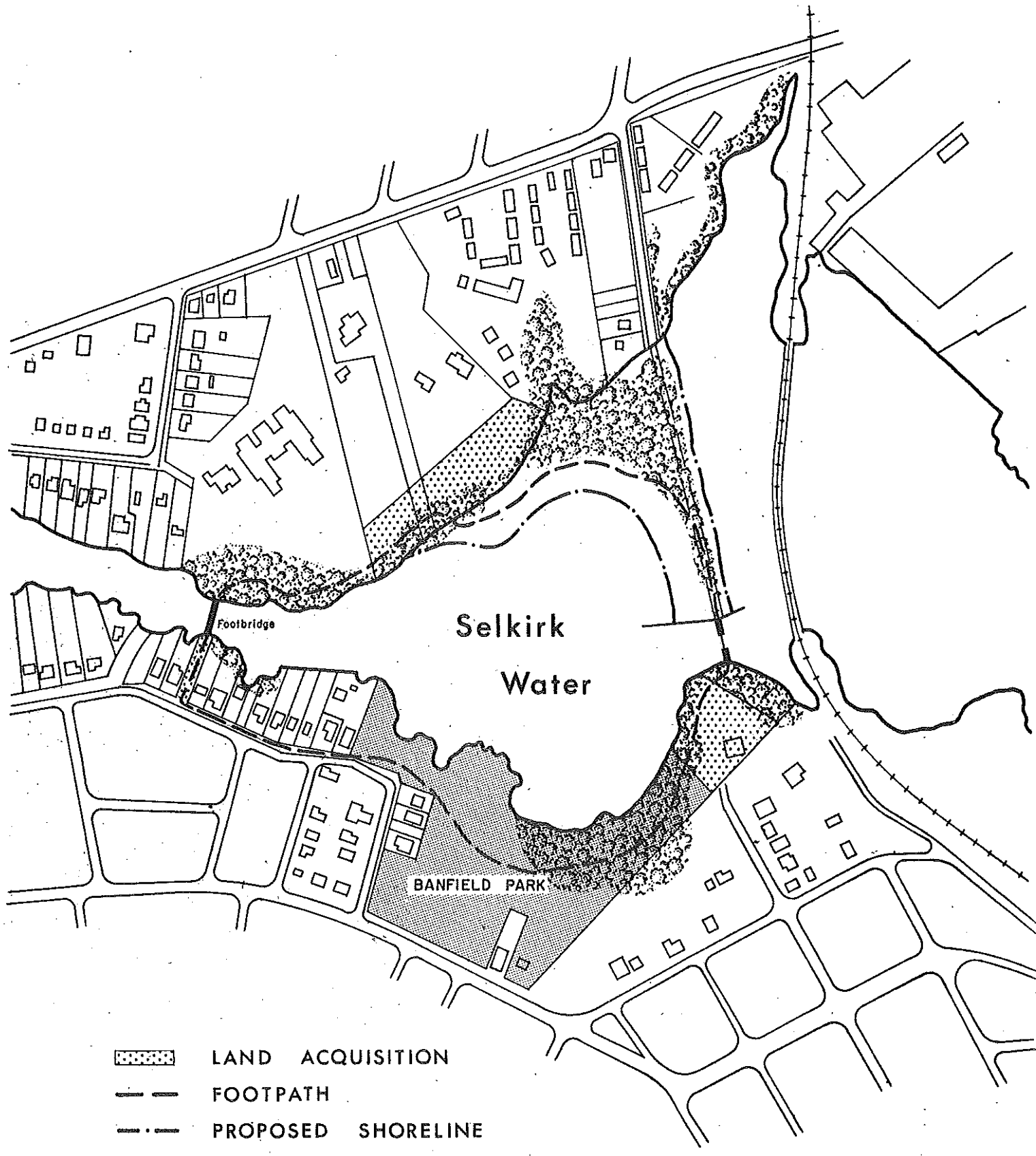
This type of dam is particularly advantageous because the disposal of waste fill from major building sites in the region is becoming a problem. While construction of a dam with such material is unusual, rough costing indicates that uncompacted fill used to support a light, sheet pile, seepage control membrane should provide a relatively low cost dam. Without the control structure, the cost of the dam should be less than $50,000 and might be considerably less if it proved feasible to charge contractors for the privilege of using the dump site.

3. A new park can be created on the landward side of the dam.

Here again waste fill can be used to provide a public asset at very little cost. The proposal shown in Fig. 7 provides approximately 5 acres of park area with over 1,000 feet of shoreline. The cost of creating a usable beach by placing gravel and sand on the foreshore is likely to be in the order of $25,000 which is a very small amount in comparison to the cost of purchasing a waterfront park of this size.

4. The dam and park will make possible the development of a loop footpath approaching a mile in length.

This statement is based on the belief that Selkirk Narrows is a natural site for a suspension footbridge. If the existing streets on the south shore are used as part of the footpath the only purchases required are one improved lot to provide the southerly approach to the bridge and 300 to 400 feet of shoreline immediately east of the Gorge Hospital to



PROPOSED DAM AND PARK

SCALE : 1" = 400'

Fig. 7

link the hospital grounds to the new park. The novelty of a suspension bridge should make the path attractive to families with children.

"Should the water above the dam be salt or fresh?" is the next question requiring consideration, for it appears that either is possible. Again the answer is not immediately obvious.

In the past there have been many references to the Gorge as the only warm salt water swimming area of the city. While it may be desirable to maintain a salt water regime to provide such swimming the possibility of maintaining the herring run is probably of equal importance. There is, however, the risk that salt water maintained at high tide level might kill many of the trees which add so much to the appearance of the waterway. This point should very definitely be given thorough study before selecting the salt water alternative. A change to fresh water would, of course, entail less risk to shoreline vegetation but would completely change the aquatic ecology of the inlet. The existing herring run would be destroyed and the salmon and cut-throat trout which pass through the inlet to spawn in Colquitz River and Craigflower Creek might be adversely affected.

Some individuals may express fears that ecological disaster will result from the degree of change in the inlet which a dam would produce. If so, there will no doubt be recommendations suggesting that detailed and all-encompassing biological studies be undertaken before a dam is constructed. While such work would be highly desirable if money was unlimited and ample time was available, one proposal (a $9,200 study of the herring run) for research for this report suggests that the likelihood of obtaining

conclusive information from biological studies is not great enough to justify the costs involved*. In general, it seems that while the science of ecology is capable of tracing and defining the inter-relationships between groups of organisms and their individual and collective dependence upon their normal environment, it is not advanced enough to do more than give a broad outline of the ecological pattern which will result from a major change in environment. There is, for example, still a large measure of uncertainty concerning even such an intensely studied subject as the growth of algae in sewage enriched water.

This pessimism concerning the value of ecological studies as a means of prediction is not intended to suggest that study of specific problems is not worthwhile or that the fact that changes will occur should be ignored. It does, however, indicate that care must be exercised in judging the proposals made by biologists. It also indicates that other methods of minimizing the risk of losing valuable biological stocks or of creating nuisance conditions must be sought. One approach which appears obvious is that of making the least possible change.

Ecological principles can be helpful and one concept which appears particularly applicable is that of nature coming to terms with change if given enough time. By this it is meant that under changed but reasonably stable conditions a new ecological balance will develop. It certainly

*For example, the work proposed would have determined when larval herring leave the inlet for the open sea but would not have conclusively established the feasibility of maintaining the run if the movement was delayed by several months due to closure of a dam (for this would presumably require a major relatively long term program involving raising and releasing tagged fish).

indicates that fluctuating conditions should be avoided.

These comments suggest that the salt water alternative is preferable if there is no danger of losing the shoreline trees. It also appears that the dam should only be closed in the summer months and that the control gate should be sized to ensure that the variation in salinity of the inlet in the winter months remains as it is at present. While it is obviously possible to experiment by gradually lengthening the period of high water from year to year or by periodically emptying and refilling the inlet during the course of a summer, various factors suggest that such actions are neither particularly desirable nor likely to prove helpful.

In spite of the desirability of maintaining salt water in the inlet in the hope of maintaining the herring run and of minimizing the effect of a change upon the salmon and cut-throat trout which pass through in the fall and winter months, experience with the proposed system of operation may point to a change to fresh water in part or all of the inlet. The former could be achieved by constructing a secondary dam at some point such as Craigflower Bridge to convert Portage Inlet to a fresh water lake. The balance of the inlet could remain tidal in the winter months and might serve to preserve the herring run.

While discussing the risk that unwanted biological changes may occur, particular reference must be made to algae. The possibility of nuisance due to blooms of algae will certainly be cited by individuals predicting the development of troublesome conditions and it appears to be the most likely source of difficulty for (as noted above) even under present circumstances Portage Inlet suffers from a heavy growth of filamentous algae.

This growth is dependent upon nutrients dissolved in the water of the inlet but nothing conclusive is known about the relative influence of the various sources of such nutrients in spite of a fairly extensive study of the inlet carried out by scientists of the Fisheries Research Board of Canada in the period August 1965 to December 1968.

The major sources are thought to be stream flow and the sediments covering the bottom. It is known that the relative importance of stream flow is increased by the sanitary wastes carried by the Colquitz River and it is thought that a large part of the fertilizing salts entering the inlet during the spring and summer are used in the growth of algae and eel grass and eventually incorporated in the bottom sediments when the plants die. If this is so, collection of the sanitary wastes by the sewer system presently under construction may not be all that is required to reduce the available nutrients to a level which will not produce nuisance growths. If this proves to be the case excessive growth may occur in either salt or fresh water and any plan for improvement must take into account the possibility that it may be necessary to remove the sediments.

In case it is thought that reconsideration of dredging as a means of improvement is indicated, it should be noted that only the relatively thin layer of organic mud noted by Mr. Marshall is involved (See Appendix III). While this layer would have to be removed from almost all Portage Inlet and possibly some of the deeper sections of Victoria Arm, the cost should be substantially less than that of the amount of dredging required to provide the same improvement in water depth as a dam provides. This claim is based on the fact that less material must be handled and on a

belief that a technique used by the Seattle Park Board should reduce unit costs substantially.

The work referred to was carried out in 1962 and involved the removal of 1,200,000 cubic yards of decayed organic material from Seattle's Green Lake. High rate pumping in a "vacuum cleaner" approach was used rather than conventional suction dredging and the waste was pumped to city storm sewers. The dredging was done in two stages with cost of the first being $135,000. Removal of the second 600,000 cubic yards cost $33,000 and was authorized to make maximum use of the dredge before it left the lake.

Seattle's use of storm sewers to carry away the waste is the important point for it indicates the possibility of using sanitary sewers to carry material taken from Portage Inlet out to sea. If this is not feasible the settling characteristics of organic sediments may be such as to permit discharge to take place in Esquimalt Harbout. Either method of disposal would eliminate the cost of barging to sea.

It is rather difficult to estimate the cost of removing the mud found in Portage Inlet. The area involved is much the same as the area of Green Lake but the volume of material to be pumped out is much less. The high cost of mobilization of equipment indicated by Seattle's experience, and the thought that the time required to complete the work is proportional to area rather than volume, suggests that Green Lake costs can be used as a starting point. The 1970 equivalent of $135,000 in 1962, plus an allowance to cover the possibility that it may be necessary to

barge the waste material to sea from Esquimalt Harbour, leads to a figure of $250,000.

The final question to be dealt with in this section is "Should the dam have a lock for the passage of small boats?" It seems a relatively easy question to answer for the dimensions of the inlet are such that motor boats are not compatible with intensive use of the area by swimmers and other types of pleasure craft.

There will be some interest in water skiing in Portage Inlet but even this section of the waterway is not large enough to permit unrestricted public use. Local residents can hardly expect restrictions to favour their interests alone so it appears that motor boats should be banned completely during the period that the dam is closed. If this is done there is no need for a lock.

RECOMMENDATIONS

While the previous sections indicate the main recommendation to be construct a dam across Selkirk Water to hold salt* water in the inlet at high water level during the summer months only, they do not touch on various factors which collectively are of equal importance to the future of the inlet and the part it can play in serving the needs of the community. Secondary recommendations with explanatory notes are therefore presented below.

Administration

1. It is recommended that the Capital Regional District become responsible for the waterway with the power to raise funds for improvement from the community in general and from particular groups who may benefit more than others.

This recommendation appears fairly obvious in view of the reasons for the creation of regional government and the fact that without it four governments must act together if costs are to be shared equitably. It carries with it the advantage of avoiding a need for year to year consultation among the various governments with the risk that a change in policy on the part of one governing body could hold up a majority proposal.

2. It is recommended that the Regional Board have the power to control the zoning of shoreline property.

This is a protective measure intended to ensure that the surroundings of the inlet are not adversely affected by an ill-considered and hasty action on the part of one government. Certainly any further construction of apartments on shoreline property is something to be avoided.

*Subject to there being no risk of losing shoreline trees.

3. It is recommended that protection and development of the area be treated as a distinct function of the Regional Board apart from its regional parks responsibilities and that all municipal parks fronting on the waterway be transferred to the Region under this function.

The desirability of making improvements at an early date and the variety of ways in which money should be raised to cover costs suggest this recommendation. The transfer of the parks is included to emphasize the regional significance of the waterway and to make feasible the implementation of the next recommendation.

4. It is recommended that the Regional Board confine its activity to raising funds and setting policy by arranging to have one of the municipalities carry out planning, development, and maintenance to meet the Board's requirements.

This is suggested because it is thought that the Regional Board's other functions will fully occupy its staff for some time to come. A single group to plan and care for the entire inlet is suggested to gain the advantage of a unified approach. Maintenance workers will have an opportunity to develop a feeling for, and pride in, the inlet as a whole and their comments and observations will, in turn, feed back automatically to influence future planning.

5. It is recommended that both bond issues and an annual general tax be used to finance improvements.

Use of both methods of obtaining money will, to some extent, enable costs to be distributed fairly. It is thought that land purchases would be financed by a general bond issue and that a local improvement charge applied to properties fronting on the inlet would be used to finance the construction of a dam. An annual general tax, perhaps confined to Victoria, Saanich, Esquimalt and View Royal, seems the appropriate means of providing funds for

minor improvements, maintenance, and a reserve to cover the possibility that it may prove necessary to remove nutrient-enriched sediment from the inlet. A local improvement to complete the new park which can be created adjacent to the dam might be favoured by the motels on Gorge Road.

A figure of $250,000 has been mentioned as the possible cost of reducing the amount of nutrients stored in the inlet. This is quite a large sum but it need not be provided at the time a dam is constructed, for the permanency of any undesirable condition which may develop cannot be judged properly on the basis of one year's experience. It is thought that the reserve could well be accumulated at the rate of $50,000 per year - since a five year period provides time for completion of the current sewer construction program and at least two summers to check the effect of the reduction in the quantity of nutrients entering Portage Inlet.

Land Acquisition

6. It is recommended that the following land purchases be undertaken with some sense of urgency;

    a) Parcels lying between Banfield Park and the C.N.R. right-of-way.

    b) The area east of the Gorge Hospital indicated in Fig. 7.

    c) Any vacant property fronting on the inlet.

    d) Any unimproved or subdividable land controlling the portage between Esquimalt Harbour and Portage Inlet (See Appendix IV).

Emphasis on land purchase is based on the belief that acquisition cannot be postponed without grave risk of losing key parcels which are, or will be, needed to attain maximum public use of the area. It might almost have been recommended that for a period the Regional Board should concentrate

exclusively on land acquisition to provide for future needs. It seems, however, that the ways in which money can be raised point to concurrent construction and land acquisition.

7. It is recommended that a policy of purchase-and-lease-back be adopted and used to gradually acquire the improved shoreline properties required for ultimate development of the waterway.

This concept will be new to the Victoria area although it is believed that it has been used by the City of Vancouver in its park development program. It involves the purchase of properties as they are put up for sale with each one being leased until the land is needed for park use. Properly managed, it is probable that the revenue from leases should carry most, if not all, of the annual costs of purchase until leasing is terminated by demolition. The arrangement carries with it the very definite advantage that the terms of a lease can control the effect that a property has upon the atmosphere of the inlet.

Development Policy

8. It is recommended that development of the inlet and its shoreline be planned to create an area which will draw those interested in walking and boating in quiet surroundings and to provide local swimming places which can be reached by walking or bicycling from adjacent residential areas.

With the Regional Parks report showing "walking for pleasure" as a leading recreational activity it seems that the Gorge, with its opportunities for loop paths in close proximity to water, provides an ideal opportunity to design for this activity. The reference to "local" swimming areas stems from a belief that, while it is neither desirable nor possible to cater to swimming on the massive scale of Elk and Beaver Lake beaches, it will be

impossible to resist the requests of local residents for areas which will provide recreation for their children during the summer holidays. Swimming is, of course, a historic and desirable use of the waterway. It is such a natural one that it may be difficult to avoid attracting residents of the other areas and parking restrictions may have to be imposed to prevent overcrowding.

9. It is recommended that every effort be made to maintain the appearance and atmosphere of the area, particularly as viewed from the water, in as natural a state as possible and that deliberate steps be taken to conserve and enlarge the remaining groves of native trees and to remove material which is not in keeping with this policy.

Since Victoria is still fortunate enough to have many areas which are well treed with Garry oaks, Douglas firs, and arbutus, little attention is paid to the fact that these trees are gradually being reduced in numbers through the spread of subdivisions and the change to apartments in the inner areas. A glance at the left side of Fig. 1 shows how far the process can go. While this may be an inevitable change it is suggested that the distinctive appearance of such trees contributes so much to the character of the city that local government should do all it can to preserve those under public control. There are even some who argue that means should be found to control the destruction of the city's landscape by preventing the removal of trees by private owners (there apparently is a law serving such a purpose in Massachusetts).

While the shore of the inlet still gives the impression of being well treed, an examination of Figs. 1 and 2 shows that this impression is dependent upon a very narrow belt of trees at most points. A critical look at the

large parks suggests that the time left before a very distinct change occurs is relatively short for the larger groves of evergreens are becoming sparser each year. The point may soon be reached where one heavy wind storm could decimate the groves adjacent to Tillicum Road. An immediate and substantial replanting of firs in these areas seems called for if the inlet is to be passed on to the next generation with some semblance of its original appearance.

10. It is recommended that the area be treated as a nature reserve and that improvements be designed with this in mind.

The inlet provides an excellent opportunity for wildlife observation within the urban area and it is expected that this will become a most important feature of the region as urban development spreads. The enjoyment which may be derived from walking along shoreline footpaths will obviously be increased by the presence of waterfowl and it is probable that they will contribute significantly to the pleasure of boaters.

11. It is recommended that there be no further construction of retaining walls of the type constructed by the Capital District Improvement Commission other than the extension required to carry the construction on the Saanich shoreline to Gorge View Drive.

While the shoreline retaining walls built in the last three years have produced a tremendous improvement they do tend to work against the preceding two recommendations. In the case of the Saanich shoreline the benefits to the pedestrian and motorist obviously greatly outweigh any loss of natural landscape. This is somewhat questionable in the case of Kinsmen Gorge Park, for it is suspected that the benefits derived from the wall could have been achieved in a much more subtle fashion - and at considerably less cost.

Two lines of thought seem to support the recommendation. One involves the distinct separation of land and water created by a wall as compared to the blending of the two inherent in a thickly treed shoreline from which branches, and even trees, reach over and down to the water. Of the two it seems that the second is the one likely to invite those afloat to relax and linger in the hope of glimpsing some little play of nature such as the flash of a kingfisher down and back to a perch with a fish.

The second is that those drawn to stroll on the footpath made possible by a wall will prefer to look across to a natural rather than a regimented shoreline for, as noted above, it is scenery which is in demand, and asphalt, concrete and steel appear to be what many people are trying to get away from in their outdoor activities. It is also thought that a path can be made more interesting by the presence of trees between it and the water's edge - just as a photograph of a distant landscape can be made more attractive by using nearby branches to frame the scene.

12. It is recommended that any development of the shoreline of Portage Inlet adjacent to the TransCanada Highway be designed to reduce the amount of highway noise reaching residential properties around the inlet.

The hillside and rock cuts rising behind the highway and the natural passage of sound over water combine to transmit an undesirable amount of highway noise across the inlet. While it will not be possible to cut it off completely, it seems that the use of waste fill to create a substantial mound between the road and the water, in the area presently used for parking, should help to reduce the volume of sound. A heavy planting of evergreens on the mound and along the rest of the shoreline will have some effect upon sound transmission and will also add to the attractiveness of the inlet.

In planning this work effort should be made to persuade the Department of Highways to avoid any further encroachment upon the inlet when it becomes necessary to enlarge the highway.

13. It is recommended that urban encroachment upon the lower reaches of Colquitz River and Craigflower Creek be prevented to preserve the areas for public use.

This is emphasized because it is felt that the significance of both streams as part of the recreational potential of the inlet is not recognized. The relationship between the streams and the inlet stems from the fact that a water level of Elevation 100 (Saanich Datum) in Portage Inlet makes almost two miles of additional waterway available to those interested in spending time on the water.

Both streams provide fresh water fishing in the winter months and the banks are obviously of importance to any system of footpaths proposed for the region. These factors alone suggest that preservation of the streams in as natural a condition as possible should be public policy.

CONCLUSION

It will be noted that a summary of costs has not been provided. While this may be thought to be inconvenient it does have the advantage of avoiding fixing attention on the total cost of a particular proposal when in fact the amount of land acquisition can vary rather widely.

While the amount of money required is certainly of major importance, it seems that the potential value of the waterway is such that certain steps can well precede any detailed study of costs. One is general acceptance or rejection of the reasoning of this report at some official level, and another is the transfer of responsibility to the Capital Regional District. There can then be an assessment of the amount the community should invest to enhance and protect an asset.

One point which may well be considered in any attempt to decide how much money to spend is related to the argument that one of the most important places to provide outdoor recreation is within the city itself. Certainly this argument appears particularly valid when expected population is related to the city's highway access to the countryside - for surely the water on three sides of the city will mean that 300,000 people living within five miles of the business district will produce the highway traffic one might expect from a city of over 1,000,000 people. It seems almost common sense to suggest that under such conditions even a city as fortunate as Victoria will find its urban open areas overcrowded in spite of all the expressways which may be built in the future.

One further point related to urban open areas needs to be brought out. It is the fact that all the currently proposed regional park acquisition is located well beyond convenient walking or bicycling distance of the bulk of the population. This means that those too poor to own cars, together with the handicapped and older people who do not wish to drive on busy highways, gain little or nothing from the program. The last group at least will increase in numbers and since their need for natural open areas is as great as others it seems to point to conservation of the natural features which still exist within the present urban area.

Such points as these, when considered in relation to the fact that a loan of $1,000,000 requires a regional levy in the order of $2.00 per household, lead to the thought that the question "What should be done with the Gorge?" may easily be replaced by "Is $1,000,000 too large an amount to spend to protect the future of the waterway?"

APPENDIX I

March 11th, 1968

The Honourable Ken Kiernan
Minister of Recreation and Conservation
Province of B.C.
Parliament Buildings
Victoria, B.C.

Dear Mr. Minister:

In spite of your busy schedule, particularly during recent weeks, I would hope that you have noted that a highly enthusiastic and most promising start has been made - largely through Saanich Municipal initiative - on the complicated and perplexing problem of studying, rehabilitating, and preserving the natural water system which stretches from Elk-Beaver Lake in the North, through Colquitz and other creeks, to Portage Inlet and the Gorge Waterway.

The first phase of this study - dealing with the Colquitz - has already been completed and has received many complimentary comments from interested individuals and groups. Considerable credit must go to Mr. Frank Neate, P.Eng., of the Saanich municipal staff for his competent and realistic appraisal of the present status of this creek and his imaginative plan for rehabilitation.

One unique aspect of the total project is that it has attracted the services of several authorities at the University of Victoria. These men sit on an "advisory committee", along with the regions' Medical Health Officer, elected representatives from Saanich, municipal engineers from Saanich and Esquimalt and a number of other persons who can make a real contribution to the success of the undertaking. I attach a photocopy of minutes from the most recent meeting, in order to give some idea of the quality of representation which is made available to us through this particular source.

The focus of attention now turns to Stage II of the study area - i.e. the waters of Portage Inlet and the Gorge itself. Here, again, Mr. Neate will direct the study, in fullest co-operation with representatives of all other affected organizations.

As you will fully appreciate, and it is for this reason that I send this letter, a considerable portion of the shoreline of both Portage Inlet and the Gorge is in "unorganized territory". Yet, it must be admitted that Saanich Municipality and, to a lesser extent, Esquimalt also have a direct interest in what is happening and what is likely to happen to these most valuable natural waterways.

The purpose of this letter is to respectfully request limited financial participation by the Government of B.C. in this project. Saanich is budgeting a total of $5,000 for the cost of Mr. Neate's time in this connection during our 1968 fiscal year and it is sincerely hoped that a special provincial grant of, say $2,500, might be made to represent the above-mentioned unorganized areas. A request for $500 has gone forward to Esquimalt Municipal Council within recent days.

I assure you that there would be no attempt to view such a grant as a precedent for requesting further provincial dollars in any following study or survey, for Phase III will move further south, and will involve Esquimalt, Saanich and the City of Victoria.

It is realized you might well suggest that I approach the Regional District in this connection and I would like to make it clear that this has been considered. However, the work we are attempting in this instance is conservation in its true form and this is beyond the terms of reference for the Regional District of the Capital of B. C. As well, it is my intention to later attempt to interest the Regional District in land acquisition of those portions of Colquitz Creek which remain in private ownership. This particular phase of the total project seems more properly within the scope of the Region.

I think we are witnessing the first steps in an immensely important and most challenging rehabilitative scheme for the entire drainage and tidal basin which has prompted so much concern for many years. It would be an honour to have the Province participate with us in this exciting job.

Sincerely,

Hugh A. Curtis
Reeve

HAC:sw
Encl.

APPENDIX II

RESULTS OF 1968 BACTERIOLOGICAL SAMPLING

1. SAMPLING STARTED AT END OF FLOOD

	Confirmed Coliform MPN				Faecal Coliform MPN			
Date / Station	13/8	26/8	1/10	28/10	13/8	26/8	1/10	28/10
1	33	130	49	348	7.8	33	13	79
2	68	1609	230	⩾2400	18	172	130	348
3	130	1300	1300	2210	20	790	230	490
4	⩾24000	1720	2400	1300	-	490	340	790
5	790	1300	3500	2210	110	230	1300	330
6	230	1300	9200	3480	230	490	5400	1300

Preceding Tide Cycle

	13/8			26/8			1/10			28/10		
	Hr.	Min.	Ft.	Hr.	Min.	Ft.	Hr.	Min.	Ft.	Hr.	Min.	Ft.
Ebb	7	20	3.2	6	50	4.5	9	55	6.2	10	35	7.3
Flood	5	15	1.4	6	40	5.0	9	20	6.2	9	55	7.3

2. SAMPLING STARTED AT END OF EBB

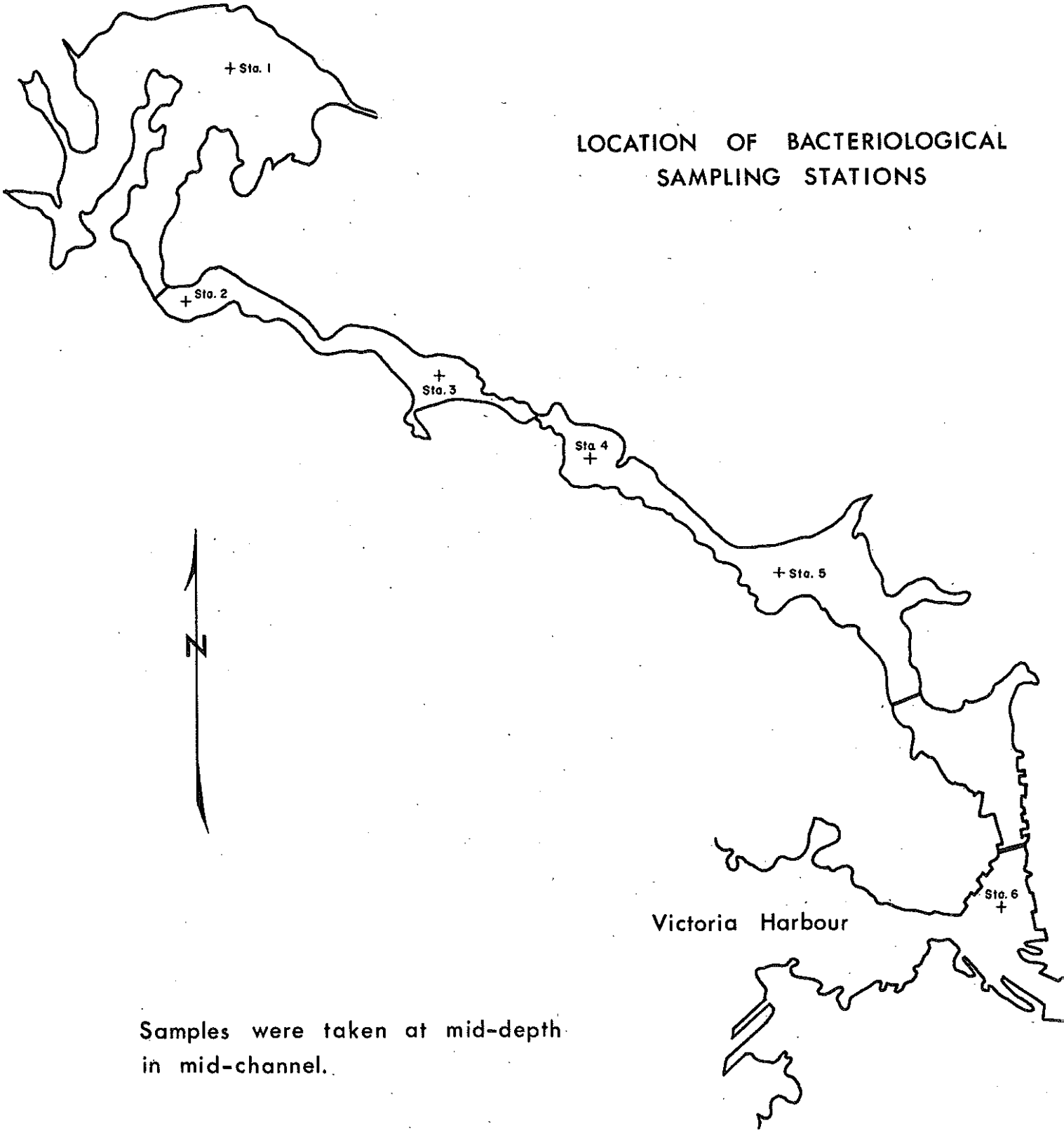
	Confirmed Coliform MPN				Faecal Coliform MPN			
Date / Station	9/9	25/9	7/10	17/10	9/9	25/9	7/10	17/10
1	7.8	49	542	79	4.5	22	33	14
2	45	78	1609	170	45	⩽23	70	20
3	20	140	1300	110	20	20	170	20
4	45	330	3480	230	45	18	330	78
5	45	790	9180	540	20	230	1300	130
6	-	490	5420	2400	-	130	1300	790

Preceding Tide Cycle

	9/9			25/9			7/10			17/10		
	Hr.	Min.	Ft.	Hr.	Min.	Ft.	Hr.	Min.	Ft.	Hr.	Min.	Ft.
Flood	5	45	2.7	6	30	4.5	6	25	3.5	8	45	5.1
Ebb	6	05	2.7	5	05	0.9	5	35	1.4	16	15	5.0

The figures under "Preceding Tide Cycle" give the length of time, and amount of rise or fall, between high and low water levels in Victoria Harbour.

LOCATION OF BACTERIOLOGICAL SAMPLING STATIONS



Samples were taken at mid-depth in mid-channel.

APPENDIX III

The following material is taken from the paper "A Geomorphological Analysis of Portage Inlet" prepared by P.W. Marshall as part of a contract with the District of Saanich. On page iv the footnote concerning the datum of the measurements defining the thickness of the various sediments underlying the inlet has been modified for clarity and to relate Mr. Marshall's datum to the datum used by the local municipal engineering departments. A modified "key plan of sediment sampling locations" has had added to it the actual thickness of the mud and transition (i.e. mud to clay) layers indicated by Mr. Marshall's table of "serial core sample data".

ABSTRACT

The position and orientation of Portage Inlet and the Gorge Estuary is probably at least partially determined by the location of a major fault in this area, though, marine planation surfaces and numerous grooves and striations indicate that marine and glacial processes have been extremely important in modifying these basins. Some time after 22,600 years B.P. a major lobe of the Cordilleran Ice Sheet impinged on southeastern Vancouver Island, which became ice free some time after 13,000 years B.P. This ice retreat was associated with the marine submergence of the lowlands of southeastern Vancouver Island. In Portage Inlet, this marine incursion terminated prior to 9,250 years B.P.

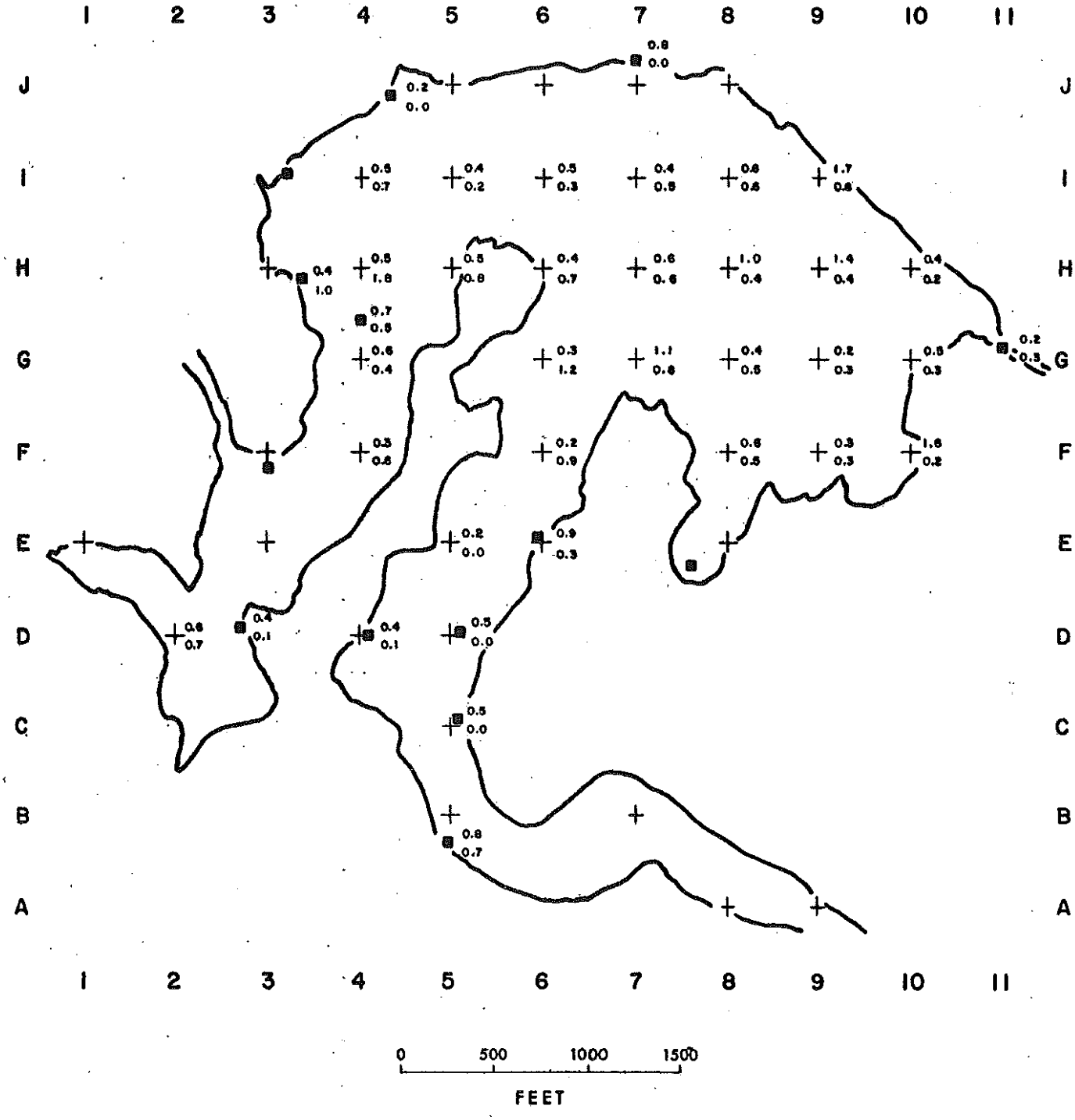
Peat deposition during the Hypsithermal climatic optimum occurred between 9,250 and 5,470 years B.P. The relative eustatic decline severed Portage Inlet from marine influences for at least the minimum period indicated by these dates. Volcanic ash which occurs within this peat horizon

is overlain by organic material radiocarbon dated at 6,670 years B.P. and was probably derived from Mt. Mazama in Oregon.

A marine transgression occurred some time after 5,470 years B.P. and re-established sea level at approximately its present height. Calcareous unweathered marine clay is evident over much of the Inlet indicating sea level has not severely fluctuated in the past several thousand years. Capping the marine clay is a ubiquitous horizon of highly organic mud which forms the uppermost sediment in Portage Inlet. Proposed modification of the Inlet for recreational use should consider its geomorphology in detail before any serious modification is undertaken.

PORTAGE INLET

KEY TO
SEDIMENT SAMPLING LOCATIONS



SAMPLING LOCATIONS OTHER THAN GRID INTERSEPTS — ■

FIGURES BESIDE SAMPLING STATIONS SHOW THICKNESS IN FEET OF MUD AND TRANSITION (MUD TO CLAY) LAYERS. UPPER FIGURES REFER TO MUD.

SERIAL CORE SAMPLE DATA

Core number	B5a	C5a	D2	D3a	D4a	D4b	D5a	E5	E6a
Mud	+ 2.8	- 8.2[b]	- 1.5	- 1.9	- 6.8	c	- 4.9	- 3.0	- 4.5
Transition	+ 2.0		- 2.1	- 2.3	- 7.2				- 5.4
Recent marine clay									- 5.7
Peat									
Volcanic ash									
Victoria clay	+ 1.3	- 8.7	- 2.8[a]	- 2.4[a]	- 7.7		- 5.4	- 3.2	
End of core	- 9.4	- 9.0	- 4.5	- 6.5	- 8.0		- 5.9	- 4.6	- 9.3[r]

a - Weathered Victoria clay.
b - Wood chips 0.1 ft. thick uppermost.
c - Beach sample of sand.
r - Rock terminated coring.

Figures are feet and tenths of a foot and give the elevation of the top of each sediment layer relative to Victoria mean sea level - which is Elevation 96.56 Saanich Datum.

Core number	E8a	F3a	F4	F6	F8	F9	F10	G4	G6
Mud			- 2.9	- 6.4	- 7.8	- 6.6	- 3.6	- 3.2	- 6.5
Transition			- 3.2	- 6.8	- 8.4	- 6.9	- 5.2	- 3.8	- 6.8
Recent marine clay	- 4.7	- 1.8[b]	- 3.8	- 7.7	- 8.9	- 7.2	- 5.4	- 4.2	- 8.0
Peat				- 20.0		- 20.2	- 10.6		
Volcanic ash				- 22.5					
Victoria clay	- 5.3	- 3.7[a]	- 5.6				- 16.9	- 7.0[a]	
End of core	- 5.5	- 4.6	- 6.5	- 23.0	- 13.1	- 21.2	- 17.1	- 9.6	- 23.5

a - Weathered Victoria clay.
b - Mottled 1/2-3/4" gobbets of yellow, brown and grey clay.

Core number	G7	G8	G9	G10	G11a	H3a	H4	H4a	H5
Mud	- 8.1	- 8.7	- 7.0	- 3.0	- 2.0[b]	- 2.8	- 3.5	- 3.1	- 3.6
Transition	- 9.2	- 9.1	- 7.2	- 3.5	- 2.2	- 3.2	- 4.0	- 3.8	- 4.1
Recent marine clay	- 10.0	- 9.6	- 7.5	- 3.8	- 2.5[c]	- 4.2	- 5.8	- 4.3	- 4.9
Peat					- 3.2		- 8.8	- 7.7	- 9.2
Volcanic ash									
Victoria clay					- 5.1	- 9.2	- 17.0	- 12.5	- 16.8
End of core	- 19.7	- 21.3	- 19.7	- 9.3[r]	- 5.2	- 9.8	- 18.8	- 14.6	- 23.4

b - Sandy mud.
c - Clay with sand.
r - Rock terminated coring.

Core number	H6	H7	H8	H9	H10	I3a	I4	I5	I6
Mud	- 5.4	- 8.6	- 8.3	- 8.0	- 2.8	+ 0.6[d]	- 4.4	- 3.8	- 4.0
Transition	- 5.8	- 9.2	- 9.3	- 9.4	- 3.2		- 4.9	- 4.2	- 4.5
Recent marine clay	- 6.5	- 9.8	- 9.7	- 9.8	- 3.4[c]		- 5.6	- 4.4	- 4.8
Peat							- 8.9	- 16.2	
Volcanic ash								- 19.5	
Victoria clay	- 25.4					- 0.4	- 13.9		
End of core	- 27.0	- 19.6	- 17.7	- 18.9	- 4.4	- 6.0	- 23.4	- 23.8	- 22.7

c - Clay with sand.
d - Pebbles to 1 1/2" diameter, clay with sand.

Core number	I7	I8	I9	J4	J5	J6	J7a	J8
Mud	- 5.1	- 7.3	- 6.2	- 0.5	+ 2.4[e]		- 1.6	
Transition	- 5.5	- 7.9	- 7.9					
Recent marine clay	- 6.0	- 8.5	- 8.7		+ 1.15	- 4.1	- 2.4	- 3.6[f]
Peat					- 3.2	- 20.0	- 14.6	
Volcanic ash					- 4.0			
Victoria clay				- 0.7	- 6.36[a]			- 9.4
End of core	- 23.9	- 22.5	- 23.4	- 2.3	- 10.0	- 20.8	- 16.7[r]	- 14.1[r]

a - Weathered Victoria clay to 7 ft.
e - Soil developed from recent marine clay
f - Granules 1/8" or less
r - Rock terminated coring

APPENDIX IV

THE PORTAGE
between
PORTAGE INLET AND ESQUIMALT HARBOUR

As indicated by the article quoted in the main body of the report there has been interest in the relatively narrow neck of land (See Fig. 8) between Portage Inlet and Esquimalt Harbour for over 100 years. While the name of the inlet suggests active use of a path from one shore to the other in the early days of settlement, the idea that the site is suited to the construction of a canal between the two bodies of water seems to have been the concept receiving the most attention.

Since an expenditure of $2,000,000 for a canal for pleasure boaters is hardly a realistic proposal and the value of using the canal to introduce Esquimalt Harbour water into Portage Inlet is in doubt, the site appeared to be of no interest to this report. This view changed, however, when it was realized that a revival of interest in canoeing had resulted in some individuals portaging between the harbour and the inlet.

Contact with the Victoria Canoe Club produced the information that there is current interest in the 11 mile loop trip through Victoria and Esquimalt Harbours which the portage makes possible. This trip can be traced in Fig. 3 and is considered of sufficient interest to canoeists to warrant inclusion in a brochure describing canoeing in British Columbia being prepared by the Canadian Canoe Association (British Columbia Division) for possible publication by the British Columbia Government Travel Bureau. Mr. R. P. Copeman, of the Canoe Club, very kindly supplied a draft of his notes describing the trip together with a proposal for an annual canoe race and some personal impressions of the Gorge waterway. All of this material is reproduced in the following pages.

Fig. 8

The fact that most of the portage is across private land suggested a general examination of the potential of the area to see if its acquisition could be justified. The result was a very definite feeling that it could be and purchase has been recommended. The factors justifying this are:

1. It is expected that private canoeing will increase substantially through increased interest and a general increase in population. In addition, canoe rentals may easily return to the Gorge and form a major attraction for residents and tourists alike. With the element of exploration being one of the attractions of canoeing, the ability to travel into Esquimalt Harbour to investigate its continually varying activities could prove of considerable interest and value. It only seems sensible to ensure the permanent availability of the portage.

2. A continuing increase in the number of tourists visiting the city could lead to enough business to justify a commercial launch trip around the 11 mile loop. While this would involve the use of more than one boat (but not necessarily more than one operator since alternate trips could run in opposite directions and the operator could move from boat to boat), and would require relaxation of the suggested prohibition of motor boats in favour of a responsibly operated commercial venture, it is possible that the length and varied nature of the trip could make it most popular. At present, operation of a trip from Victoria Harbour to Esquimalt Harbour and back

is described as not too successful but time alone is highly likely to change this picture. A change to a loop trip may easily shorten the time required and it seems that some expenditure to acquire the land which forms a vital part of the route can easily be justified if only as a protective measure in view of the difficulty of predicting future developments.

3. The idea that the place to meet the recreational needs of a community is within the urban area can be applied to the trail system proposed in the current regional park report. The concept certainly suggests that the trail shown in Fig. 9 might well be considered as worth development. The length of 3½ miles,* its loop nature, and the varied terrain, scenery and activities along the route, all point to it being of general interest. Attention has been drawn to the potential of this trail because the land which controls the portage provides access to Thetis Cove. The use which would be made of the beach if the footpath became a reality would be high, and points to acquisition of more than a footpath between the harbour and the inlet.

4. The possibility of developing the scheme shown in Fig. 10 also points to purchase of as much land as possible. While the

*4½ miles if the proposed footbridge near the foot of Austin Avenue is not available.

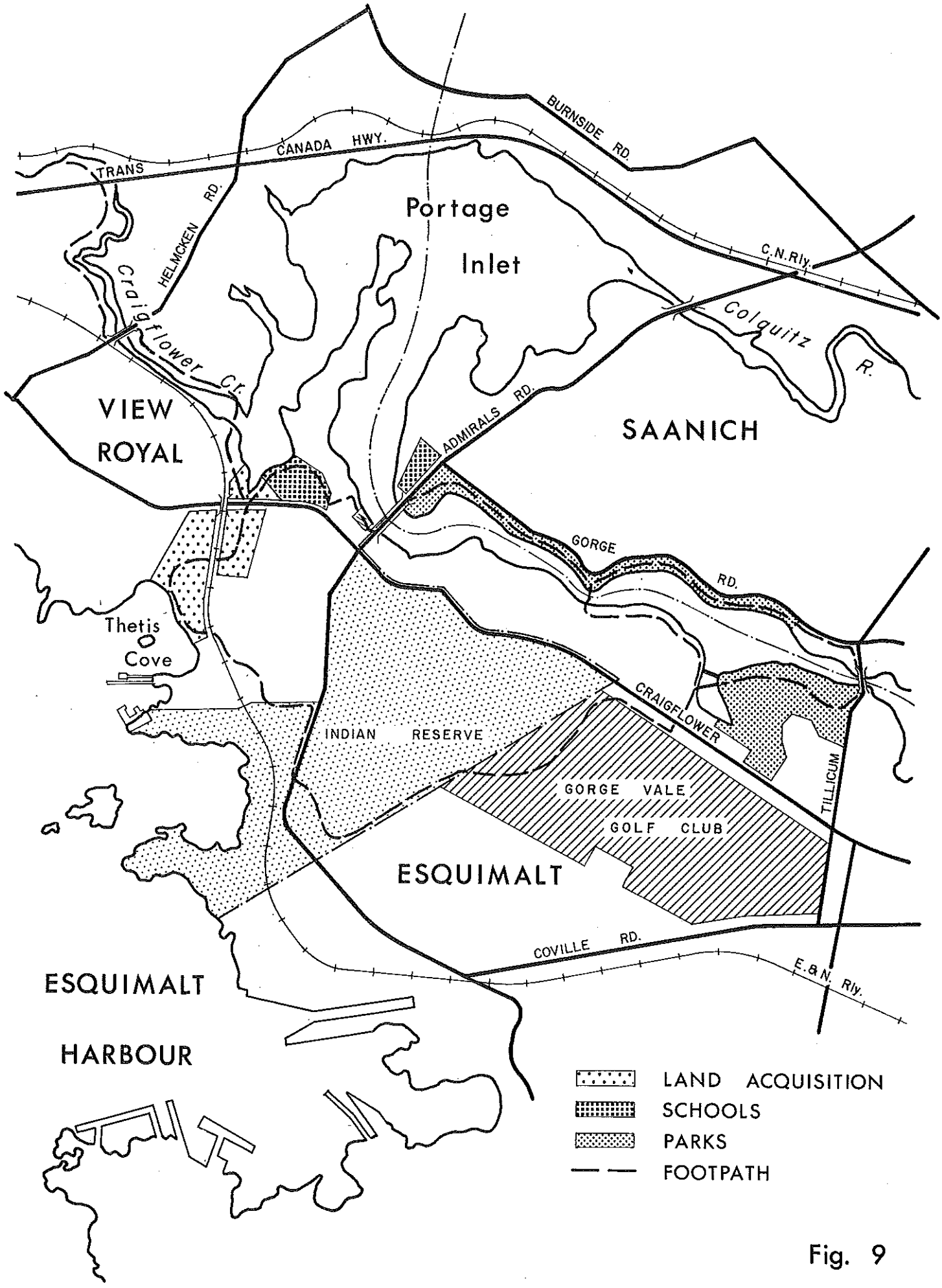

BURNSIDE RD.
CANADA HWY.
TRANS
HELMCKEN RD.
Craigflower Cr.
Portage Inlet
C.N.Rly.
Colquitz R.
VIEW ROYAL
ADMIRALS RD.
SAANICH
GORGE RD.
Thetis Cove
INDIAN RESERVE
CRAIGFLOWER
TILLICUM
GORGE VALE GOLF CLUB
ESQUIMALT
COVILLE RD.
E.&N. Rly.
ESQUIMALT HARBOUR
LAND ACQUISITION
SCHOOLS
PARKS
FOOTPATH

Fig. 9

proposal might be considered idealistic if it was intended to serve canoeists only, it is obvious that the developed site would be a distinctive feature of the proposed trail. It would also provide a most valuable local park.

556 Ker Avenue,
Victoria, B.C.
January 10, 1970.

Mr. F.E. Neate,
Saanich Engineering Dept.,
770 Vernon Ave. Victoria, B.C.

Dear Mr. Neate:

I am enclosing the copy of "Victoria Canoe Trip" and the original proposal I made in 1958, as per our conversation of last Thursday. Copy and use what you wish but please return the copies.

I will never forget the impression that the beautiful Gorge waterway made on my wife Bess and myself on our first visit to Victoria in July 1951.

As ardent canoeists and outdoor people from Edmonton we were completely fascinated by all the recreational possibilities that this area offered. The very thought of a waterway threading its way through such a delightful variety of scenery and the abundant marine life that it harbored was more than we could resist.

We returned to Edmonton on completion of our holiday, I gave my notice to the firm where I was employed, put our home up for sale and two months later returned to Victoria for good.

By good fortune we found a small home with a large lot that backed into the Colquitz River about half a mile from Portage Inlet. Here, I soon built a canoe house and jetty out over the water and the big rock at the tip of Christie Point soon became my favorite swimming hole.

The ducks, swans and herons that share this delightful environment with us are a continuing source of enjoyment. The parklike area across the river provides cover and feed for a great variety of shore birds from pheasants to finches. We dread the thought of this ever changing.

We would like to express our thanks to the Saanich Council and Engineering Department for their efforts to curb the ever-escalating effects of pollution and to preserve some of the treasures of our magnificent heritage.

In my early days of canoeing on the swift flowing water of the North Saskatchewan River our youthful dream of Utopia was a river that ran both ways, upstream on one side and downstream on the other, a favoring current which ever way you wished to travel. Here on the Gorge this impossible dream seems to have come true. The incoming tide can carry me from the open Pacific to my back door and the outgoing tide speeds me along to whatever adventures I care to undertake.

Bob Copeman

VICTORIA CANOE TRIP

TRIP A scenic and challenging canoe trip through the City of Victoria

GRADE Tide water - both sheltered and open

LENGTH 11 miles (approx.)

WIDTH From 50 yards to 18 miles

ALLOW 4 hours minimum

DISTANCE TO
NEAREST COMMUNITY All through settled and park area

CAMPING Gorge Road trailer and auto camps - ½ mile
Goldstream Campsite (B.C. Government) - 8 miles

MAP City of Victoria

DESCRIPTION

An ideal place to start this trip is from the Gorge Park. Ample parking and easy access to the water is available. Tide information is very helpful.

Paddle up the Gorge, under Craigflower Bridge and into Portage Inlet. Continue around Christie Point and into the bay along the E & N right-of-way. At low tide this bay is a shallow mud flat and landing is messy. Try and catch two or three feet of tide.

This well protected part of the trip offers the parklike and garden settings of the many fine homes along the waterway.

From the bay we portage about four-tenths of a mile to Thetis Cove in Esquimalt Harbour. It is best to climb the bank to the rail line and cross over the 1A highway on this overpass. About a hundred yards along, a trail will be noted to the right. This leads to a well-defined roadway to the water.

Embark here among the log booms of a busy mill and plywood plant. If at this point the weather is favorable and the wind poses no threat, paddle on past Constance Cove where you can view many ships of the Royal Canadian Navy. Your canoe will seem very small as you pass by these titans of the deep.

Around Duntze Head and behind Brothers Island along a rocky rugged shoreline that invites a little exploration, we continue past Saxe Point Park and Macaulay Point. It is nice to time this part of the trip to catch an incoming tide.

Follow the shoreline abeam of the breakwater and into Victoria Harbour where a great variety of industrial plants, the Fishermans Wharf and the magnificence of the Parliament Buildings and the Empress Hotel, seldom seen from this angle, offer a spectacular view.

Be on the alert for fast moving motor boats or great ocean going vessels with heavy wake.

From here on we have a waterway which runs both ways, depending on tide level. Heavy industrial plants and wharfage to all manner of ships, scows and barges mark this as an unusual and interesting part of the trip.

Once past the Selkirk Waters the Gorge narrows to a beautiful rugged waterway with great fir and arbutus trees crowning the rocky shores. The back yards of these fortunate cliff dwellers offer sheltered moorage to a host of craft of all shapes and sizes.

At the Gorge Bridge, just below our starting point, we encounter the narrows with the well known reversing falls.

With an incoming tide at fairly high level, one can paddle on up without any difficulty but under less favorable conditions a wall of foaming water may necessitate a short portage to reach the shore of the Gorge Park from whence we started our trip.

For experienced and weather wise canoeists this trip offers an endless variety of conditions. Once you have made it you will eagerly look forward to doing it again.

VICTORIA GORGE PROPOSED ANNUAL CANOE RACE

The inception of this race, which has all the potential of becoming the canoeing classic of this continent would by its' very nature, tie in very well with our Centennial Year program.

Our forefathers, who depended so much on the canoe as a means of transportation in the early life and exploration of this country, have implanted in many of us a deep love for this mode of travel.

It was a common practise in the early days for a returning party of voyageurs to break into a spontaneous race for the last few miles to the home fort. The recognition of physical strength and canoemanship was reward enough for their efforts.

The graceful glide of the canoe, driven by powerful muscles of the paddlers, always seems to draw a deep feeling of kinship from the spectators.

This race would be typically "Victoria" for nowhere else on the continent could a more scenic route be found. From the "eyes" of the T.V. cameras, the rugged, rocky shoreline, overshadowed by mighty firs, oak, maple and arbutus, lies behind scenes of modern warships, great lumber mills with their belching stacks and Victoria Harbour with the Parliament Buildings and the Empress Hotel as though they were transposed on pictures of the past. These picturesque scenes would probably find their way to all parts of the continent. This event would hold spectator interest at a high pitch for its duration because of the fact that there are many points along the route that would provide visual contact with the race and many would follow its course from start to finish.

The approximate 11 miles of the course, including portage, could be covered in less than 3 hours which would make it an ideal event to be run in conjunction with May 24th celebrations, mass strait swims, or any other gala occasion. On its own merit it could well be scheduled for a time of its own.

We are fortunate here on the West Coast to have a number of our Indian population who are keen and skilled canoemen who would add a lot of local color to the event.

With proper publicity buildup there is no reason why such cities as Toronto, Hamilton, Winnipeg, Edmonton, as well as our neighbors to the South, would not have entries in this race.

The stimulus to public interest towards canoeing in general and the Gorge Waterway in particular, would provide fresh impetus to the efforts of those civic minded groups who are doing so much towards the restoration and improvement of nature's grand endowment to us, the Gorge Waterway.

This event is proposed as a double (2 man) canoe race, any canoe except racing shells, single blade paddles.

The proposed course is to start from the Gorge, abeam Colquitz Avenue or thereabouts, up to Portage Inlet, around the peninsula to the bay at a point near the old highway by the E & N Railway overpass. Portage over to Thetis Cove and up Esquimalt Harbour, around Duntze Head, into Victoria Harbour, and on up the Gorge to the starting line. Approximately 11 miles paddling, four-tenths of a mile portage.

There are a number of technical factors pertaining to the race and the course to which the writer has given studied consideration which can be gone into in greater detail when a more definite stage is reached.

Being a charter member of the Voyageurs Canoe Club of Edmonton, having competed in some of the toughest canoe races ever attempted, I feel that I may present this proposal as more than a fanciful whim, and with a strong conviction, backed by over 30 years of canoeing, that it could be made a great success.

Bob Copeman

BIBLIOGRAPHY

Brown, S., D. Grey and P. Lambert. An Ecological Survey of Portage Inlet, Unpublished paper, University of Victoria, Department of Biology, 1966.

Capital Region Planning Board. The Gorge. 1964.

Knoke, K.M. and K. E. Rauchert. Preliminary Study of the Zooplankton and Their Distribution with Reference to Salinity in the Waters of Portage Inlet, Gorge Waters, and Victoria Harbours. Unpublished paper, University of Victoria, Department of Biology, 1966.

Lambert, P. The Biology and Distribution of the Native Oyster, Ostrea lurida, and the Japanese Oyster, Crassostrea gigas in Portage Inlet, B.Sc. Thesis, University of Victoria, Department of Zoology, 1967.

Marshall, P.W. A Geomorphological Analysis of Portage Inlet, B.A. Thesis, University of Victoria, 1969.

Raudsepp, V. Proposed Canal from Thetis Cove to Portage Inlet. British Columbia Department of Lands and Forests, Water Rights Branch, 1951.

Ross, J. The Life of a Recreational Asset.* Unpublished paper, University of Victoria, Department of Geography, 1968.

Smith, L, and R. Faulks. The Challenge of the Gorge. Brief to Canadian Centennial Celebration Committee, 1965.

Waldichuk, M. Eutrophication Studies in a Shallow Inlet on Vancouver Island. Journal of the Water Pollution Control Federation, Vol. 41, No. 5, Part 1, 1969, pp. 745-764.

Willis and Cunliffe Engineering Ltd. The Gorge Waters, 1967.

PHOTO CREDITS

Fig. 1	Don Ryan Photos	
Fig. 2	F. Neate	July 9, 1968
Fig. 6	F. Neate	July 9, 1968
Fig. 8	Enlarged from Provincial Government Air Photograph-B.C. 7119-120	March 24, 1969

*This paper contains extensive references to newspaper articles and other sources of information of a historical nature.