



ENVIRONMENT CANADA  
ENVIRONMENTAL PROTECTION SERVICE

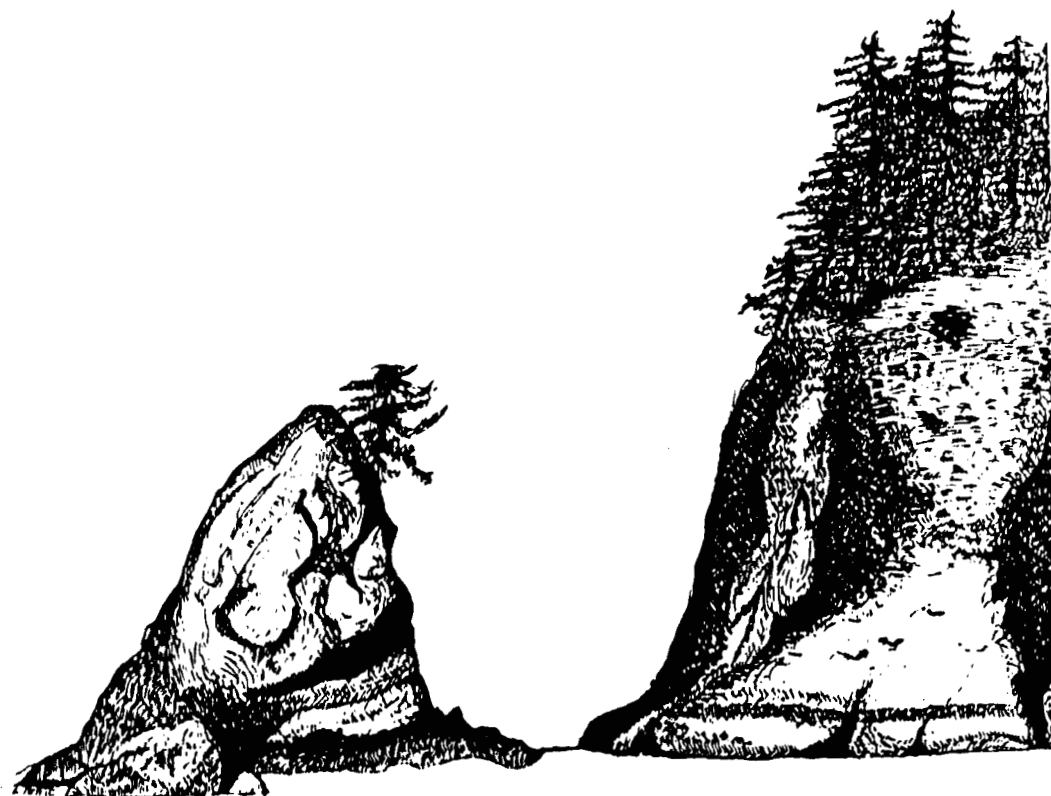
EL10447181

83-4A

# SHORELINE PROTECTION AND CLEAN-UP MANUAL

**BAMFIELD TO ESQUIMALT-VANCOUVER ISLAND**

LIBRARY  
ENVIRONMENT CANADA  
CONSERVATION AND PROTECTION  
PACIFIC REGION



DEPARTMENT OF ENVIRONMENT  
ENVIRONMENTAL PROTECTION SERVICE  
ENVIRONMENTAL EMERGENCY BRANCH  
PACIFIC AND YUKON REGION

SHORELINE PROTECTION AND CLEANUP MANUAL  
BAMFIELD TO ESQUIMALT, VANCOUVER ISLAND  
REGIONAL PROGRAM REPORT: 83-4A

## PREAMBLE

This shoreline protection and cleanup manual was prepared by the Environmental Protection Service, Pacific and Yukon region. Its purpose is to supplement existing contingency plans with information applicable to actual response actions in the field, should a spill occur. While every effort has been taken to make the manual precise and complete, errors and omissions may be noted.

To reduce this possibility, early drafts of the manual were circulated to marine scientists and oil spill experts for their review. Their comments have been incorporated and their assistance is gratefully acknowledged. While Environment Canada endorses the concepts employed in this manual, its contents do not necessarily reflect the official policy of the department.

# TABLE OF CONTENTS

	<u>Page</u>		<u>Page</u>
PREAMBLE	-i-	6.0 OPERATIONAL MAP SET	
TABLE OF CONTENTS	-ii-	6.1 Bamfield - Pachena Bay	17
LIST OF FIGURES	-iii-	6.2 Pachena Point	23
		6.3 Nitinat Lake	25
1.0 INTRODUCTION	1	6.6.1 Nitinat Narrows	31
1.1 Physical Environment	1	6.4 Carmanah Point	34
1.2 Resource Sensitivity	2	6.5 Walbran Creek	38
1.3 Access	2	6.6 Port San Juan	41
1.4 Countermeasures	3	6.7 Sombrio Beach	45
1.5 Acknowledgements	4	6.8 San Simon Point	48
		6.9 Point No Point	51
2.0 REGIONAL MAP SERIES	6	6.10 Otter Point	55
3.0 OPERATIONAL MAP SERIES	8	6.11 Sooke Basin	59
4.0 ADDITIONAL INFORMATION	9	6.11.1 Whiffen Spit - Sooke	64
		6.12 Becher Bay	68
5.0 REGIONAL MAP SET		6.13 Royal Roads	73
5.1 Bamfield to Carmanah Point	11	6.13.1 Esquimalt Lagoon	77
5.2 Carmanah Point to Sheringham Point	13		
5.3 Sheringham Point to Esquimalt	15	7.0 SELECTED BIBLIOGRAPHY	79

## LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	<u>OVERVIEW MAP - REGIONAL STRATEGY MAP SERIES</u>	5
2	<u>OVERVIEW MAP - REGIONAL OPERATIONAL MAP SERIES</u>	7
3	REGIONAL STRATEGY MAP I - Western Portion - Bamfield to Carmanah Point	10
4	REGIONAL STRATEGY MAP II - Central Portion - Carmanah Point to Sheringham Point	12
5	REGIONAL STRATEGY MAP III - Eastern Portion - Sheringham Point to Fisgard Light	14
6	OPERATIONAL MAP 1 - Bamfield - Pachena Bay	16
7	OPERATIONAL MAP 2 - Pachena Point	22
8	OPERATIONAL MAP 3 - Nitinat Lake	25
9	TACTICAL MAP 3A - Nitinat Narrows	30
10	OPERATIONAL MAP 4 - Carmanah Point	33
11	OPERATIONAL MAP 5 - Walbran Creek	37
12	OPERATIONAL MAP 6 - Port San Juan	40
13	OPERATIONAL MAP 7 - Sombrio Beach	44
14	OPERATIONAL MAP 8 - San Simon Point	47
15	OPERATIONAL MAP 9 - Point No Point	50
16	OPERATIONAL MAP 10 - Otter Point	54
17	OPERATIONAL MAP 11 - Sooke Basin	58
18	TACTICAL MAP 11A - Whiffen Spit - Sooke	63
19	OPERATIONAL MAP 12 - Becher Bay	67
20	OPERATIONAL MAP 13 - Royal Roads	72
21	TACTICAL MAP 13A - Esquimalt Lagoon	76

## 1.0 INTRODUCTION

This shoreline protection and cleanup manual was prepared by the Environmental Protection Service, Pacific Region. It is a compilation of information relevant to the response operations which would ensue following a major oil spill on the British Columbia coast. The area chosen for this initial effort is the south-west shoreline of Vancouver Island between Bamfield Inlet and Esquimalt Harbour. This area was chosen because it has most of the shoreline characteristics found along the Pacific coast of Canada and because it is subject to a high degree of oil spill risk from deep sea shipping in transit through the Strait of Juan de Fuca.

The manual presents a broad range of information that is relevant to oil spill response. This information is arranged in a systematic manner which guides the user from a general overview of the possible impact to particular methods appropriate to the response. It is presented at scales of 1:250,000, 1:50,000 and greater where detailed data is warranted. Information falls into the following general categories.

### 1.1 Physical Environment

Each regional and operational map in the manual contains general information on the physical environment such as topography, general bathymetry, currents and shoreline character. There is a description of shoreline types on the 1:250,000 strategic maps and a more detailed inventory of these shorelines on the 1:50,000 operational maps. Shorelines are described as bedrock cliff, rock platform, mixed sediment, sand tidal flats and estuaries. A sixth categorization has been used to describe a coastal feature common to the study area where a repetitive sequence of rocky headlands and pocket beaches occur too closely to be separately distinguished on the map scales used. Knowledge of shoreline types is important for effective response, and cleanup of specific shorelines is therefore discussed in the text.

## 1.2 Resource Sensitivity

The 1:250,000 strategic maps are intended to highlight areas of biological, recreational, social or economic sensitivity. The study area is particularly significant in all these categories, a fact which has been recognized in the candidacy of the West Coast Trail area as an addition to Pacific Rim National Park. Sites of exceptional merit have been prioritized according to an appreciation of their vulnerability to oil contamination and rated as either areas of primary concern year round, primary concern during some seasons or secondary concern. Resources are not depicted on the 1:50,000 operational map series in order to avoid confusion with logistics symbols but are discussed in a text which accompanies each map in this series.

## 1.3 Access

Rapid marine, land and air access to an area threatened with oil contamination is extremely important if oil spill countermeasures are going to succeed. Unfortunately, the study area, like most exposed shorelines on the British Columbia coast, has extremely limited terrestrial access while marine and air access is highly dependent on atmosphere and sea conditions. The manual user is therefore advised to be extremely cautious before attempting access to many localities described in the 1:50,000 operational map set. Weather and tidal conditions must be well appreciated in advance of any deployment of men and machinery.

The 1:50,000 operational map series depicts roads, trails, docks, launching ramps, staging areas, float plane landings, helicopter pads and marine access points. The list is not exhaustive nor are all of these usable at all times. The manual user should therefore refer to the resource material referred to in the legend for detailed information on specific areas of potential response activities. The access portion of the text should then be consulted for additional guidance on accessibility.

#### 1.4 Countermeasures

The 1:50,000 operational map series and text combine operational and tactical aspects of the oil spill response. Where additional detail is required, supplemental tactical maps of larger scale have been provided. The primary purpose of this series is to recommend countermeasures appropriate to the sites of concern identified in the 1:250,000, regional map series and to other sites which may be affected in the same area. Countermeasures are discussed under three main headings; spill response, protection and cleanup.

Spill Response provides an overview of the threatened area. Response techniques such as chemical dispersion, containment and recovery, slick diversion and sacrificial beaching are offered as possible first response alternatives. Their feasibility is extremely dependent on weather conditions, sea states and other unpredictable circumstances which cannot be pre-determined.

Protection is more specific in that it suggests techniques and operations which might mitigate contamination of specific areas. Some techniques such as damming inlets and erecting earth works on beaches have not been extensively tested and in some circumstances may have unacceptable impacts on the environment. Their inclusion with other, more traditional protection techniques, is intended only to stimulate an innovative approach to the difficult problems which will likely confront response teams in the field.

The third field of response activity discussed in the countermeasures section is that of oil spill cleanup. Should offshore response and inshore protection fail to prevent contamination of shorelines, extensive efforts may be required to remove oil from the various beach types that occur in the study area. Cleanup operations may also necessitate a certain amount of rehabilitation if damage is severe. The manual emphasizes cleanup of those shorelines where contamination will directly affect biological and socio-economic



resources or where it will resist natural cleaning. It discusses shoreline character and offers suggestions on the most appropriate methods of cleanup for each type found in the study area. In many portions of this coast, manual cleanup may be impractical and possibly of greater impact on the environment than the effects of oil contamination. Areas where rapid self-cleaning is likely to occur have been identified in the text. Other subjects addressed include disposal, oiled debris, persistence and re-contamination.

The subject of oil spill protection and cleanup is too extensive and complex for exhaustive treatment in a manual of this type. It is therefore anticipated that the user will have some familiarity with the subject. A select bibliography is provided at the end of the manual with some useful references on the protection and cleanup of shorelines.

#### 1.5 ACKNOWLEDGEMENTS

This manual was prepared by the Environment Emergency Branch, Environmental Protection Service, Pacific and Yukon Region. Its format, shoreline classification and organization are derived from a report especially prepared for this study by Dr. E. Owens and Dr. J. Harper of Woodward-Clyde Consultants Ltd. The draft was prepared by Mr. F. Beech and reviewed by Mr. W. Robson and Mr. S. Pond, of E.P.S. Significant inputs were received from Mr. M. Dunn of Environment Canada, Lands Directorate and Ms. P. Benson of Parks Canada. Field assistance was provided by Captain Montgomery and Mr. D. Guy of Transport Canada. Local knowledge was obtained from lighthouse personnel at Bamfield, Cape Beale, Pachena Point, Carmanah Point, and Victoria. Ms. K. Simpson of E.P.S. was responsible for much of the field work and cartography. The draft was typed by Ms. R. Lauer, Ms. P. Wakeman and Ms. J. Aylsworth of the Environmental Protection Service.

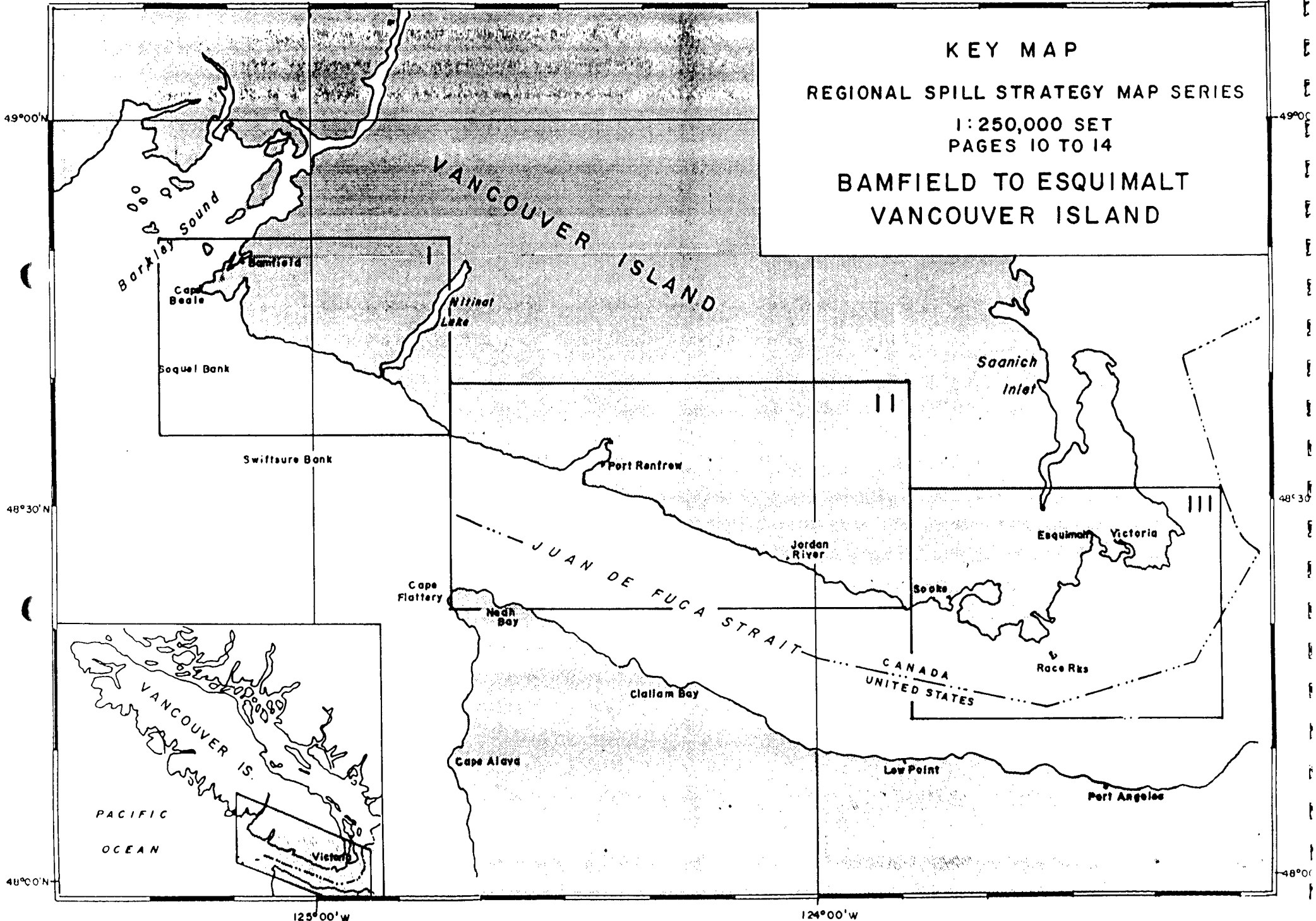
# KEY MAP

REGIONAL SPILL STRATEGY MAP SERIES

1:250,000 SET

PAGES 10 TO 14

## BAMFIELD TO ESQUIMALT VANCOUVER ISLAND



## 2.0 Regional Map Series

The primary purpose of the three regional maps is to locate potential problem areas and to identify the timing of possible adverse effects. The information shown is designed to assist in reaching those decisions concerning where response actions may be needed and to identify the resources which may be disturbed.

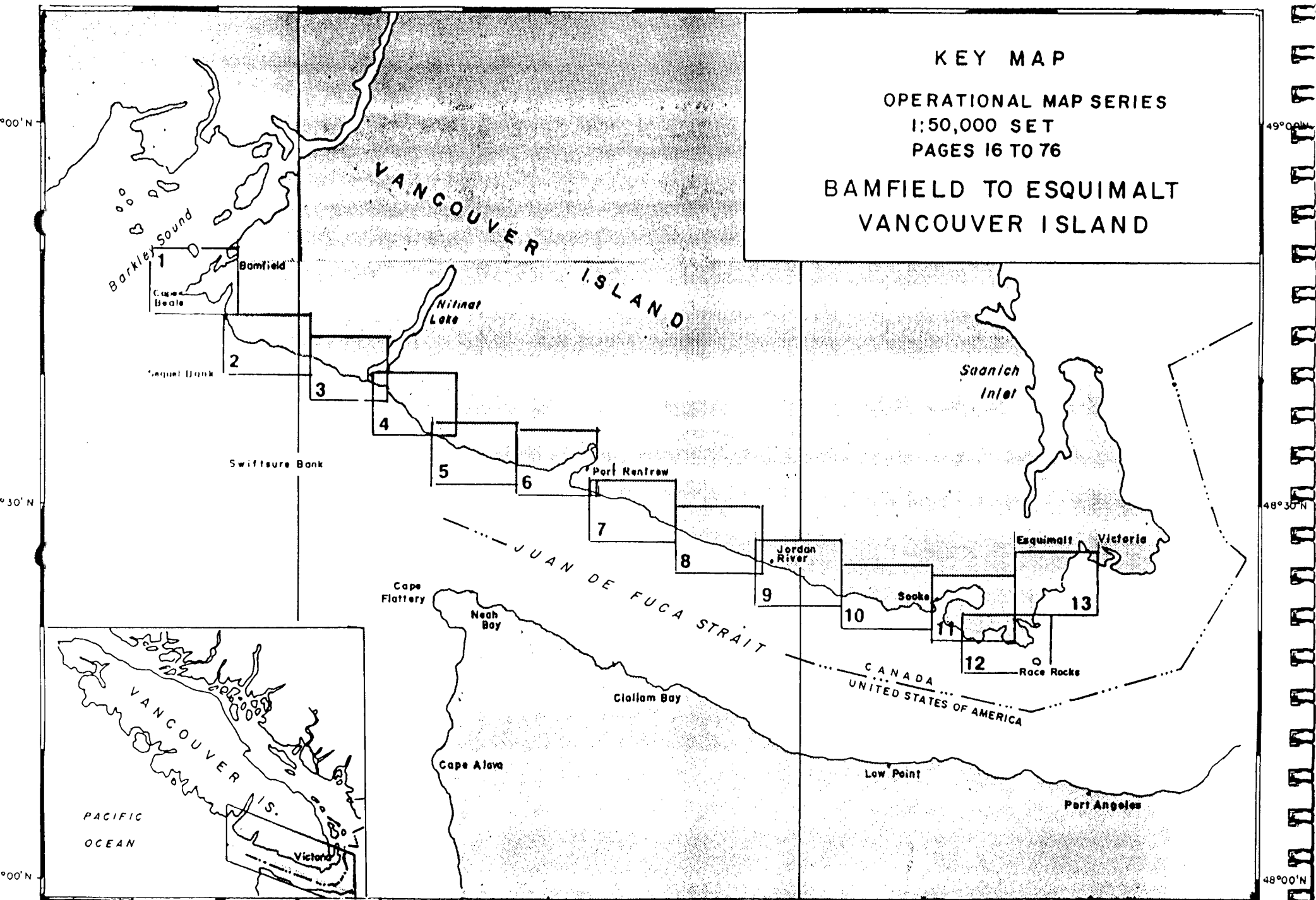
The definition of adverse effect of oil or oiling relates primarily to biological communities and human activities. At this scale, sensitive sites include such features as wildlife sanctuaries, estuaries, and bird and sea mammal colonies, coastal settlements, parks, waterfront industries and the like.

Each sensitive coastal site has been identified with the level of concern which is appropriate to its protection and cleanup. Sites of primary concern are those which might be severely disrupted, regardless of the type of oil or the time of year. In such circumstances, a cleanup and protection response would probably be necessary.

In some instances, sites of primary concern are only exposed to disruption at certain times of the year. At this second level of concern it is necessary to account for cycles of biological activity (ie. breeding seasons, migrations, growth cycles) and the seasonality of human activities (ie. beach recreation, commercial fisheries). Protection and cleanup in such cases may only be necessary if the disruption coincides with a peak period of biological or human activity.

A secondary level of concern has been assigned to areas where the impact of oil contamination is less serious. Coastal sites classed as such may only be identified by default after other more important sites have been attended to. Although not considered subject to severe disruption, they may be sufficiently vulnerable to warrant some degree of response if time, manpower and equipment is available.

Identification of areas of primary concern provides, for a decision maker, the location of those sites to which personnel should be directed at the time of a spill situation. At this regional level the development of broad scale response actions requires a knowledge only of the sites of concern, not a knowledge of the nature of the problem itself. The approach taken is simplistic but directs attention immediately to sites or areas where protective countermeasures would be required.



### 3.0 Operational Response

The purpose of the thirteen operational maps is to provide a finer degree of detail on oil spill response activities in the study area. These maps comprise the main component of the protection and cleanup manual and are accompanied by a text which discusses spill response, protection, cleanup, access and resource sensitivity.

The maps and accompanying legend depict such features as shoreline character, topography, bathymetry, current direction and speed, logistics, channel widths, staging areas and references for marine charts, topographical maps and video tapes. In some instances these operational maps are accompanied by tactical maps which depict critical areas at a larger scale with better detail. A key map locates the position of each operational map in the study area.

The operational response component of the manual is designed to present much of the information required during an oil spill response that would otherwise require considerable time to gather. It also offers recommendations on protection and cleanup techniques which may be useful in certain situations. The user should bear in mind, however, that weather and sea conditions in this particular area may impose severe limitations on response capability and may even create situations where response activities may be unacceptably dangerous. Caution and a good appreciation of local conditions is therefore strongly advised before labour and equipment is deployed in the field.

A further note of caution is applied to some of the protection and cleanup techniques suggested in the manual. Damming inlets and erecting extensive earthworks on beaches are unusual and have not been extensively tested for effectiveness or impact on the environment. Their inclusion is mainly aimed to provoke an innovative approach to the solution of difficult problems which are certain to crop up should a spill actually occur.

#### 4.0 ADDITIONAL INFORMATION

Although this manual has attempted to present an accurate and complete description of the biological, social and physical resources at risk from oil spills, it should be recognized by the user that there is no substitute for local knowledge in an oil spill response, particularly when the seasonal variation of fish and wildlife populations is a factor. Similarly, changes in countermeasures techniques and equipment are occurring all the time. It is therefore advisable that agencies with specific responsibilities be quickly informed when a spill has occurred so they can marshal the additional information and resources necessary to augment the manual. These agencies have been listed below:

##### Federal

###### Department of the Environment

- Environmental Protection Service 666-6100 (Vancouver 24 hours)
- Parks Canada - Pacific Rim National Park 726-7721 (Ucuelet)
- Canadian Wildlife Service 946-8546 (Delta)

###### Department of Fisheries and Oceans

388-3252 (Victoria)  
666-2185 (Vancouver 24 hours)

###### Department of Transport

- Canadian Coast Guard 666-6011 (Vancouver 24 hours)
- 642-3431 (Victoria 24 hours)  
726-7777 (Ucuelet 24 Hours)

###### Department of National Defense

- Rescue Coordination Centre 388-1543 (Victoria)

###### Institute of Ocean Sciences

656-8341 (Victoria)

###### Pacific Geoscience Centre

656-8421 (Victoria)

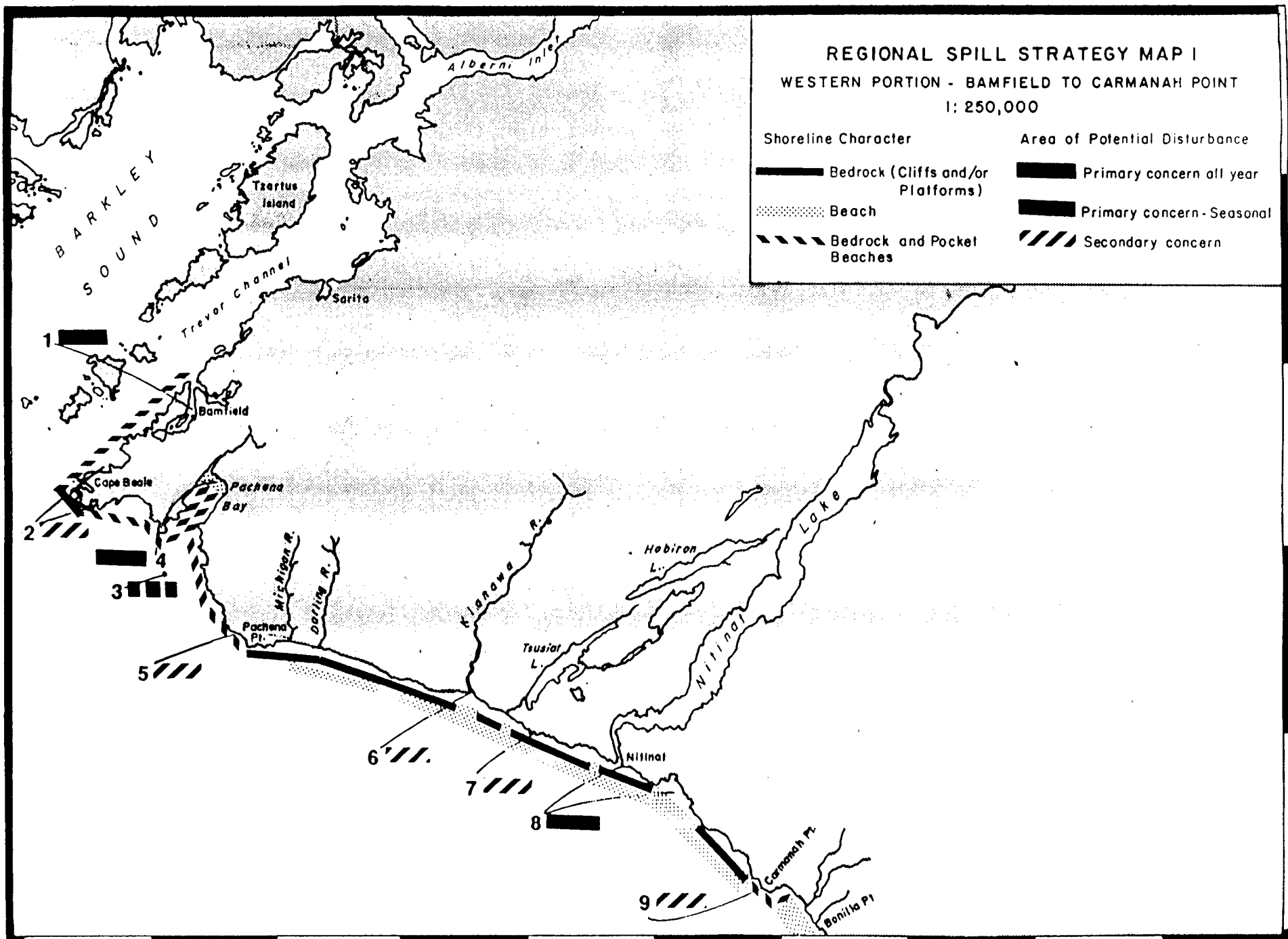
##### Provincial

###### British Columbia Ministry of Environment

- B.C. Marine Resources Branch 387-1537 (Victoria)
- Provincial Emergency Program 387-5956 (Victoria 24 hours)
- Waste Management Branch 387-4321 (Victoria)

# REGIONAL SPILL STRATEGY MAP I WESTERN PORTION - BAMFIELD TO CARMANAH POINT 1: 250,000

Shoreline Character	Area of Potential Disturbance
Bedrock (Cliffs and/or Platforms)	Primary concern all year
Beach	Primary concern - Seasonal
Bedrock and Pocket Beaches	Secondary concern



125°30'W

125°00'W

REGIONAL SPILL STRATEGY MAP - WESTERN PORTION - BAMFIELD TO CARMANAH POINT  
1:250,000

Sites and Areas of Potential Human and/or Biological Disturbance

1. Bamfield and Grappler Inlets

- commercial and recreational marine facilities
- townsite; Bamfield Marine Station
- year round seabird habitat; migratory waterfowl
- shellfish and crustaceans; extensive inter-tidal mud flats

2. Cape Beale/ Trevor Channel

- sea bird colony; marine mammal haulout
- extensive herring spawn in bays in March
- recreational area; sand and mud flats

3. Seabird Rocks

- up to 1200 pairs of breeding seabirds during the spring and early summer
- grey whales and orca transit the area, especially during early summer

4. Pachena Bay

- recreational beach; river estuary; northern terminus of West Coast Trail; Indian Reserve
- grey whales and orca forage close to shore in this area
- camping on beach from May to September
- fishing vessel anchorage and first port of refuge between Barkley Sound and Port Renfrew

\* 5. Pachena Point

- California and northern sea lion haulout
- campsites at Michigan Creek and Darling River
- light house and weather station

\* 6. Klanawa River Mouth

- extensive use by hikers from May to September
- salmon spawning river

\* 7. Tsusiat Falls

- extensive use by hikers from May to September
- aesthetic attraction - natural feature; beach

\* 8. Nitinat Lake/ Clo-oose

- extensive salmon escapement; commercial and native food fishery
- many Indian Reserves - some occupied
- extensive recreational use - May to September
- seabird and waterfowl habitat; bird colonies
- shellfish, crabs - estuarine environment in lake
- archaeological sites

\* 9. Carmannah Point




- shellfish, abalone and dungeness crab
- sea lion haulout






# REGIONAL SPILL STRATEGY MAP II

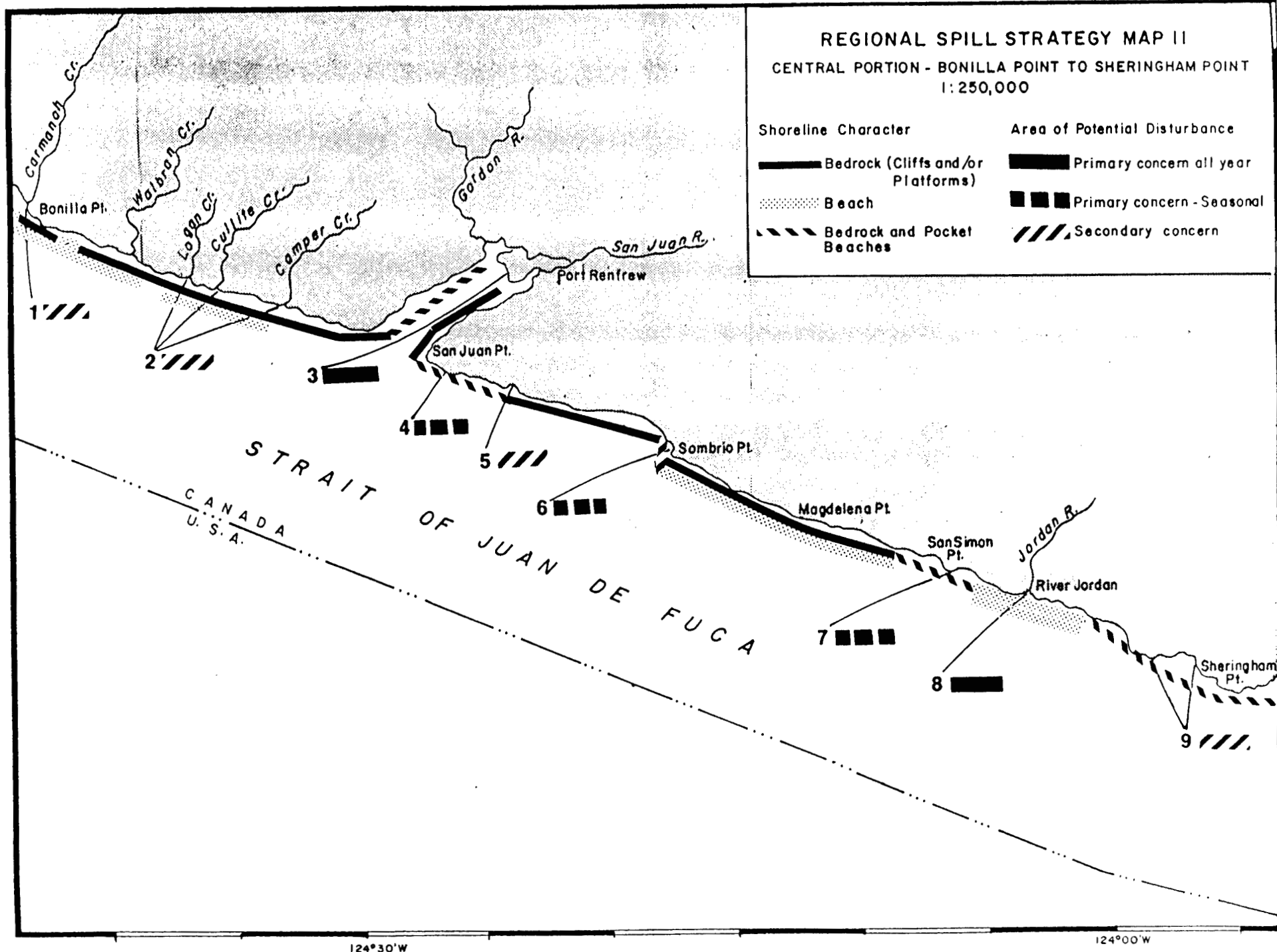
CENTRAL PORTION - BONILLA POINT TO SHERINGHAM POINT  
1:250,000

## Shoreline Character

-  Bedrock (Cliffs and/or Platforms)
-  Beach
-  Bedrock and Pocket Beaches

## Area of Potential Disturbance

-  Primary concern all year
-  Primary concern - Seasonal
-  Secondary concern



REGIONAL SPILL STRATEGY MAP - CENTRAL PORTION - CARMANAH POINT TO SHERINGHAM POINT  
1:250,000

Sites and Areas of Potential Human and/or Biological Disturbance

//// 1. Carmannah Creek

- shellfish, abalone and dungeness crab
- abundant and diverse inter-tidal habitat
- harbour seals and some sea lions in area
- West Coast Trail Camping area

//// 2. Walbran, Logan, Cullite Creeks - Camper Bay

- extensive and abundant inter-tidal zone
- camp sites at creek mouths and bays

■ 3. Port San Juan/ Port Renfrew

- extensive estuaries at Gordon River and San Juan River mouths
- large salmon escapements
- high productivity in shellfish and crabs
- extensive foreshore and water use by the forest industry
- commercial and recreational marine facilities
- large inhabited Indian Reserve on San Juan River Delta
- southern terminus of West Coast Trail

■ 4. Botanical Beach

- highly productive and extensive inter-tidal zone
- educational and recreational attractiveness
- former site of a biological research station

\* // 5. Providence Cove

- \* - harbour seal haulout
- \* - Pelagic Cormorant nesting site

\* ■ 6. Sombrio Beach

- \* - recreational beach activities, particularly during the summer
- \* - extensive inter-tidal sandstone shelves with an abundant and diverse biota

\* ■ 7. San Simon Point/ China Beach

- \* - sea lions and harbour seals
- \* - provincial park at China Beach - recreational use
- \* - some seabird nesting sites

\* ■ 8. Jordan River

- \* - waterfowl and seabird habitat
- \* - log booming in Jordan River estuary
- \* - recreational beach used year round
- \* - seaside community

\* // 9. Sheringham Point

- \* - provincial park; scuba diving
- \* - light house and weather station
- \* - harbour seals

# REGIONAL SPILL STRATEGY MAP III

Eastern Portion - Sheringham Point to Fisgard Light

1:250,000

Shoreline Character

Areas of Potential Disturbance

bedrock (cliffs and/or platforms)

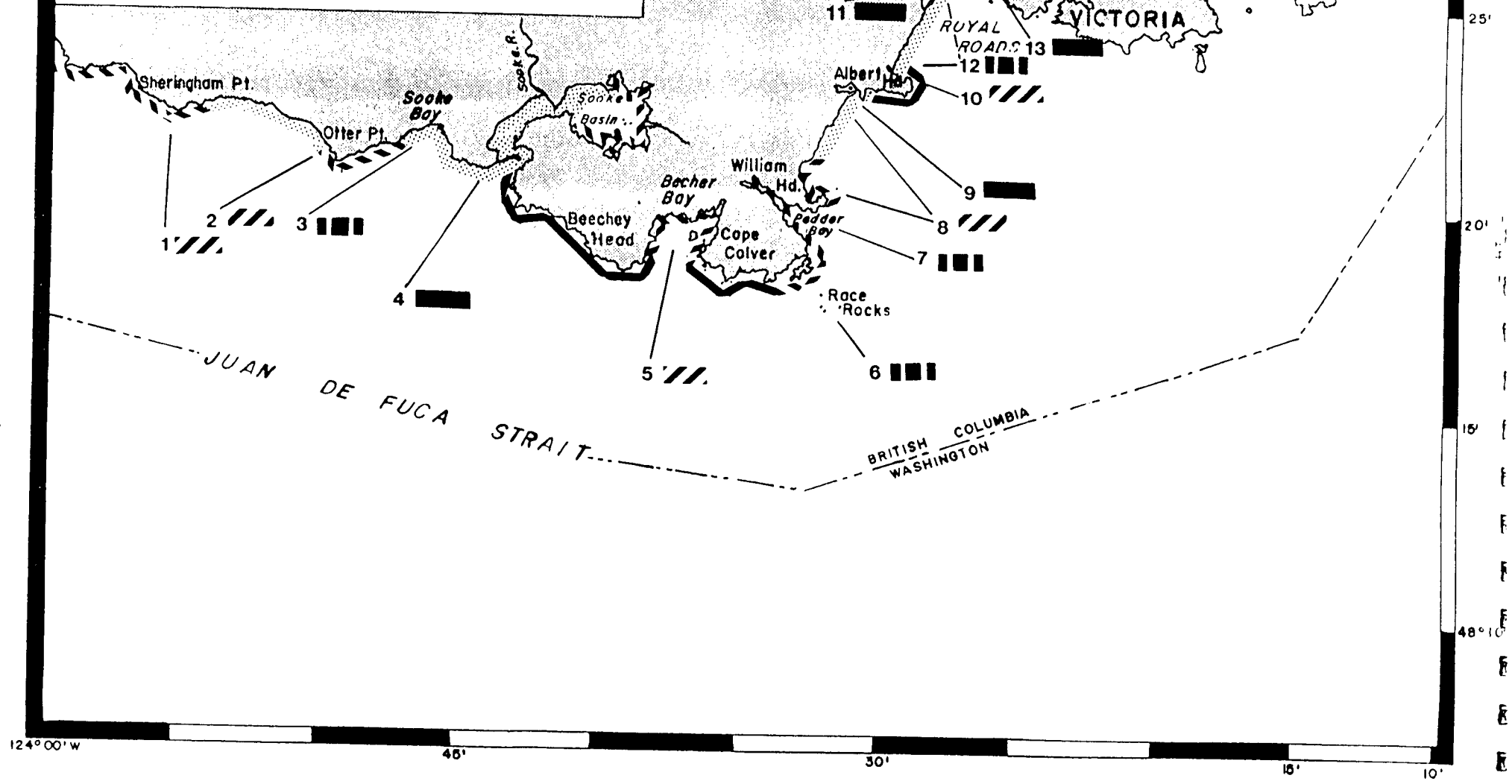
primary concern all year

beach

primary concern-seasonal














bedrock and pocket beaches

secondary concern



REGIONAL RESPONSE MAP - EASTERN REGION - SHERINGHAM POINT TO ESQUIMALT HARBOUR  
1:250,000

Sites and Areas of Potential Human and/or Biological Disturbance

-  1. Sheringham Point/French Beach
  - provincial park at French Beach
  - productive inter-tidal shelves; harbour seals
  - lighthouse and weather station at Sheringham Point
-  2. Otter Point/Gordons Beach
  - residential and recreational beach use
  - archaeological sites
  - recreational salmon fishing - juvenile salmon
-  3. Sooke Bay
  - residential and recreational area; indian reserve
  - seabird and waterfowl wintering area
  - prawn, shrimp and geoduck fishery
  - small log booming area in Sooke Bay
-  4. Sooke Harbour/Sooke Basin
  - oyster aquaculture; shellfish, crab, prawns, shrimp and herring spawn locations
  - seabird wintering area and migratory bird stop over
  - commercial and recreational marine facilities
  - extensive log booming and barge activities
  - fish processing plants; marine industries
  - residential and recreational shoreline use
  - townsites at Sooke, Milnes Landing, and Saseenos
  - several important estuaries
  - large Sooke River salmon escapement
  - indian reserve at Sooke River Delta
-  5. Becher Bay
  - marinas, launch ramps; log booming and storage
  - indian reserve and residential shore use
  - wintering area for seabirds and waterfowl
-  6. Race Rocks
  - ecological reserve; sea lion and seal haulout
  - bird colony and roosting area
  - diverse and abundant inter-tidal and sub-tidal biota
  - lighthouse and weather station
-  7. Pedder Bay
  - estuary; shellfish and crab; squid spawning
  - seabird and waterfowl wintering area
  - recreational marina; Lester Pearson College
-  8. Weirs Beach/Wittys Beach
  - recreational beach use in summer
-  9. Wittys Lagoon (Metchosin)
  - bird sanctuary; saltmarsh environment, shellfish
  - recreational and residential area
-  10. Albert Head Lagoon
  - bird sanctuary; greatest disturbance in spring and fall
  - recreational beach activities
-  11. Esquimalt Lagoon
  - important bird sanctuary; prime sensitivity during spring and fall; less sensitive during summer and winter
  - mid flats and marsh vegetation; clam beds
  - aesthetic and recreational beach activities
  - residential areas; Royal Roads Military College
-  12. Esquimalt Spit Beach (seaward side)
  - extensive beach use during summer but popular recreational site year round
-  13. Esquimalt Harbour
  - major naval base; graving dock
  - commercial, recreational and industrial marine facilities
  - log booming, barging and lumbering activities

# BAMFIELD / PACHENA BAY

Source : NATIONAL TOPOGRAPHICAL MAPS

Height : Feet - 100' Intervals

Depth : Fathoms

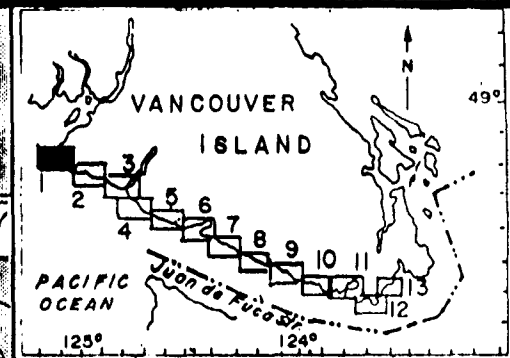
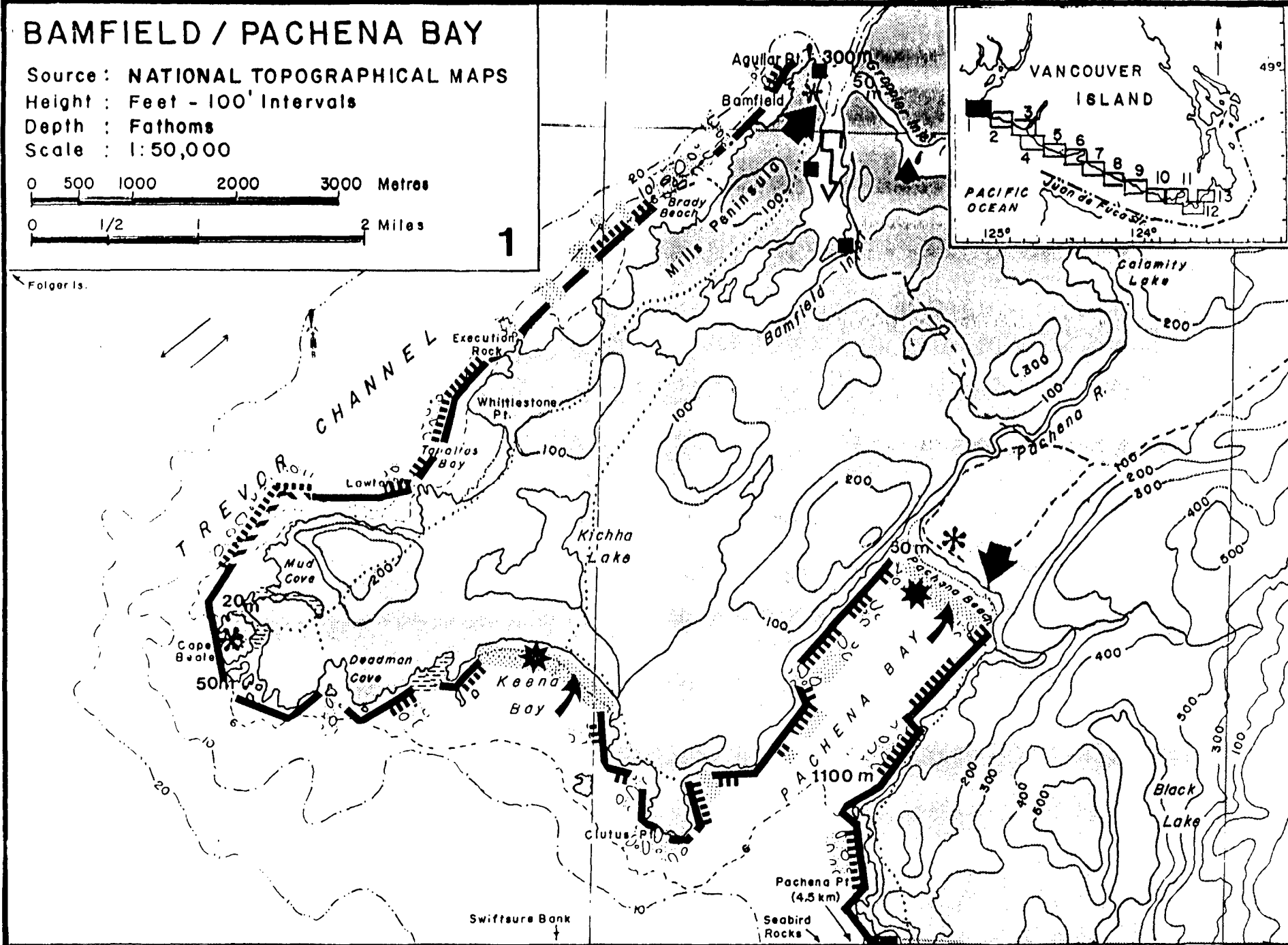
Scale : 1:50,000

0 500 1000 2000 3000 Metres

0 1/2 1 2 Miles

1

Folger Is.









125°10'









125°05'

Legend

Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

Resource material

Hydro. charts	3646/3637/3627
Topo. maps	92 C/14
Video tape	#3

Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

Map 1 Bamfield - Pachena Bay

Spill Response

Offshore response should concentrate on the containment and recovery of free-floating slicks before they enter Trevor Channel or Pachena Bay. If oil is sufficiently fresh to allow dispersants to be applied, the timing of their application should coincide with the ebb tidal flow out of Trevor Channel. Diversion of slicks onto sacrificial shorelines may also be necessary. The headland from Cape Beale to Clutus Point is the most appropriate area as it's exposure to high wave energy is conducive to rapid natural cleaning.

Protection

Bamfield Inlet and Grappler Inlet can be protected with approximately 200 metres of boom. Officials of the Bamfield Marine Station should be advised to monitor their salt water intake for oil contamination. Mud Cove, near Cape Beale can be easily boomed if weather conditions allow boat access. Other bays on Trevor Channel should be protected with diversion boom if possible. Diversion booming requires close attention to the tidal cycle to permit re-deployment on reversing tides. Tug operated booms stationed in the semi-protected waters of Pachena Bay may be useful in trapping incoming slicks before they strand ashore. Failing that, the Pachena River outlet must be boomed to forestall upstream contamination. Diversion of oil onto Pachena Beach may be necessary, provided that a thorough cleanup follows.

Seabird Rocks, two miles south-west of Pachena Bay, off this map must be protected if at all possible. Diversion of slicks past these rocks may be successful when sea conditions are calm. Dispersion is an alternative.

### Cleanup

Should protection fail, it is essential that Seabird Rocks be cleaned. The urgency of this work depends on the approach of the seabird breeding season in late spring. In the event of a spring or summer spill, care must be taken to minimize disturbance to nesting seabirds.

The Bamfield waterfront and marine installations must be carefully cleaned. The sand and mud flats at the head of Bamfield Inlet should be flushed with water at low pressure. Extensive mud flats in Grappler Inlet must also be cleaned, preferably by the low pressure flushing method. Clean up crews are cautioned to avoid excess foot and vehicular traffic on oiled mud flats. Oil is easily mixed in with mud particles and is virtually impossible to remove. Shallow draft floating platforms may be useful to work from in this situation.

With the exception of Keena Bay and Pachena Beach, shorelines between Aguilar Point and Pachena Point are predominantly bedrock cliff or bedrock platform, interspersed with occasional sand and gravel pocket beaches, or mud flats. Trafficability is poor due to impassable rocky headlands or steep inter-tidal zones. Shoreline cleanup will therefore be labour intensive although many exposed rocky shorelines may be best suited to natural cleaning by wave action.

Pachena Beach and Keena Bay are exceptions. Here, the use of heavy machinery such as graders, scrapers and front end loaders may be practical. Barge access to Keena Bay requires calm sea conditions but Pachena Bay can be reached by road at any time.

As oil will tend to accumulate on beaches as it is weathered away from exposed areas, beach cleanup should not commence until this weathering process has removed most of the contamination. On amenity beaches, however, it may be prudent to remove oil as it accumulates to avoid the problems of burial and infiltration.

### Access

Land access to the Bamfield-Pachena Bay area is provided by logging roads through Port Alberni or Cowichan Lake. These roads terminate at Pachena Bay and Bamfield. A network of trails in the area provides foot access to Cape Beale, Clutus Point, Keena Bay, Pachena Point and beaches along Trevor Channel. Marine access to Bamfield is facilitated by docking facilities that can accomodate small coastal freighters and barges, as well as small craft. Pachena Bay and Keena Bay are suitable for landing small craft and barges when sea conditions permit. There is no aerodrome in this area, but seaplane landings can be affected near Bamfield and in Pachena Bay during fair weather. Many of Bamfield Inlet beaches are accessible to foot and vehicular traffic from roads and landing craft. The shoreline from Aguilar Point to Cape Beale is impassable, except on Tapaltos Bay. Keena Bay can be used by well-tractioned vehicles but the shoreline from Clutus Point to the Pachena River is impassable. Pachena Beach provides excellent traction for cleanup equipment but headlands between there and Pachena Point, on map 2, make foot access extremely difficult and vehicle access impossible. There is a helicopter pad at the Cape Beale lighthouse.

### Resources

Biological resources in the Bamfield-Pachena Bay area are abundant and diverse. Trevor Channel is the eastern passageway into Barkley Sound and is highly productive of shrimp, prawns, abalone, sea urchins, geoduck clams and other shellfish. A large spawn of herring takes place in late February and March in bays along this channel and it is common to find large schools of juvenile salmon congregating off headlands during May, June and July.

Marine birds are plentiful during the winter and summer in sheltered inlets, offshore islets and near isolated rocky headlands. Species include swans, geese, ducks, gulls, alcids, divers and other pelagic seabirds. Offshore flyways are heavily used by migrating waterfowl during the fall and spring.

A major seabird colony at Seabird Rocks, due south of Pachena Bay, has up to 1200 pairs of breeding birds



during the spring and early summer. Other colonies exist at Cape Beale, Folger Island and Haines Islet in Trevor Channel.

Marine mammal populations include a winter haulout of 200 to 500 Stellar and California sea lions at Folger Island, three miles west of Wittlestone Point. Harbour seals are quite common throughout the year in sheltered waterways and there is an annual migration of up to 1.5 million fur seals anywhere from twenty to five hundred miles offshore during the spring. Up to 11,000 grey whale pass as close as 1 mile from shore in their summer migration and some have been reported to enter Pachena Bay while foraging. A pod of approximately 20 killer whale regularly transit these waters.

The most important estuary in this area lies at the mouth of the Pachena River, but extensive sand and mudflats in Bamfield Inlet, Grappler Inlet and at Cape Beale are highly productive. A major seabird colony at Seabird Rock due south of Pachena Bay, has up to 1200 pairs of breeding birds during the spring and early summer. Other colonies exist at Cape Beale, Folger Island and Haines Islet in Trevor Channel.

Offshore, Swiftsure and Soquel Banks are important groundfish habitats and the use of dispersants is not advisable when currents are likely to carry the oil plume over them.

In summary, areas of prime ecological importance are Bamfield Inlet, bays of Trevor Channel, Mud Cove, Deadman Cove and the Pachena River estuary.

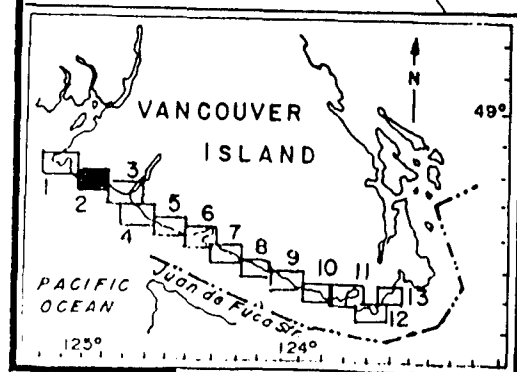
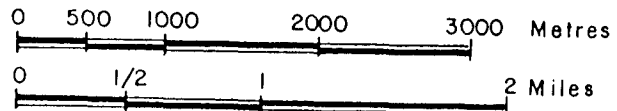
Socio-economic aspects of this area centre on Bamfield Village and Pachena Bay. Bamfield has a population of approximately 500 persons and its economy and culture is oriented towards the sea and the forest. It has a fish plant and supports the requirements of both local and transient fishermen. The Bamfield Marine Station occupies the site of the old Pacific Cable Station at the entrance to Grappler Inlet and conducts research in the marine ecology of the West Coast. It supports several year round residents and an influx of students during the summer.

Bamfield has become increasingly involved with the tourist industry as the popularity of the West Coast Trail has brought a large number of hikers and recreationists to this northern terminal of the trail. Recreational fishing and diving activities in Barkley Sound are also based out of this village.

Pachena Bay is the northern terminus of the West Coast Trail and is a popular camping and rest spot, particularly during the summer. The Indian Reserve at the mouth of the Pachena River has a population of about 100 persons and the Fort Ross bible camp at the eastern end of the bay is inhabited year round. Other Indian Reserves exist at Clutus Point, Keeha Bay and between Whittlestone Point and Brady Beach, although these are not continuously inhabited.

## 48° 45'

2









125°05'









125°00'

# Legend

## Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





## Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

## Resource material

Hydro. charts	3627/3652/3607
Topo. maps	92 C/11
Video tape	#2

## Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 2 Pachena Point

Shorelines in the Pachena Point area are not highly vulnerable to oil contamination. While oiling of shorelines should be avoided if possible, the exposed, high energy aspect of this coast and its lack of sheltered inlets and bays mean persistence of oil on the shore will be short-lived and probably not traumatic to shore zone biota. If offshore control operations are feasible, they should centre on limiting oil loss from the casualty and treating or recovering slicks. The aerial or marine spraying of approved dispersants is a viable option, particularly if their use coincides with the strong ebb tidal flow out of Juan de Fuca Strait. Carefully plotted trajectories will be required to avoid excessive contamination of waters over Swiftsure, Soquel and La Perouse Banks.

## Protection

While there are no sites within this map area that require absolute protection, the on-scene commander is reminded that Seabird Rocks, identified in the preceding map section, is a critical habitat for several species of marine birds.

## Cleanup

The Shoreline in this area is backed by a steep bedrock cliff below which extends a flat bedrock platform covered in some instances with a mantle of mixed sand and cobble sediment. In a few instances creek outlets have formed sand and cobble pocket beaches.

Most of this shoreline can be left to self-clean unless the on-scene commander has excess response capability at his disposal. Exceptions exist at the outlets of Michigan Creek and Darling River where hikers on the West Coast Trail often

camp during the summer. In addition, Seabird rocks should be well cleaned particularly when there is a danger that nesting waterfowl may be affected. It may also be prudent to remove oil contamination from the shoreline adjacent to the Pachena Point lighthouse reserve.

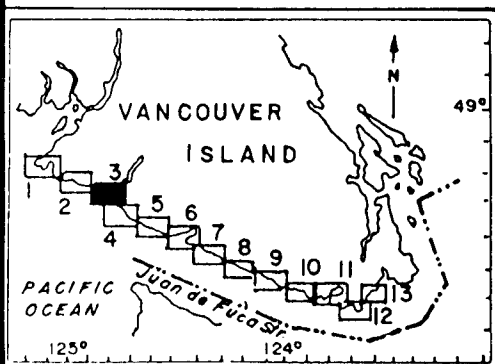
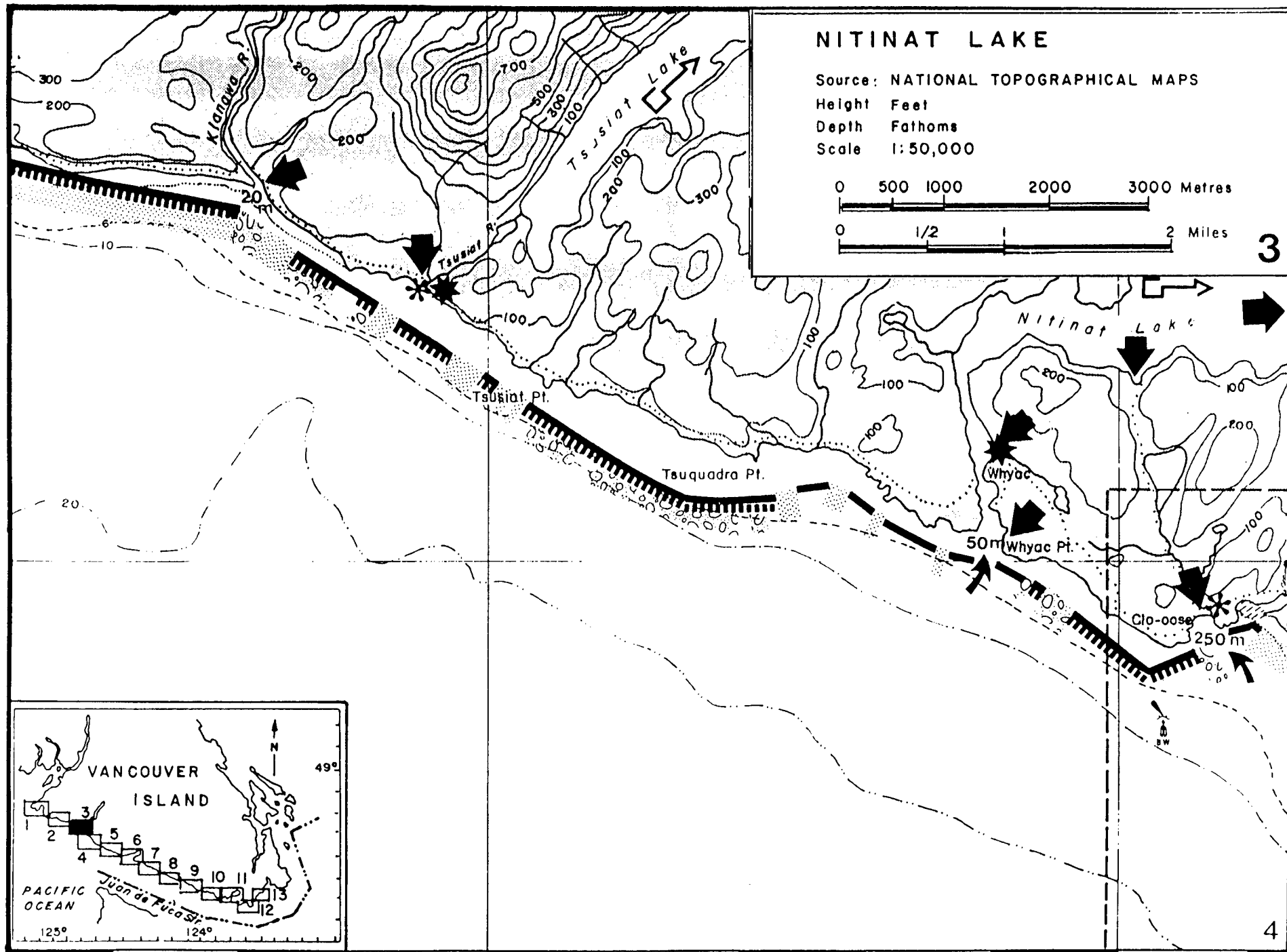
#### Access

Access to this area is extremely difficult. The West Coast Trail from Pachena Bay provides foot access but only reaches the shore front at a few isolated locations. Seaplane access to this coast is impossible except when sea and swell conditions are completely calm. Boat landings are similarly restricted but at certain times may be feasible at Pachena Point and at the larger creek and river outlets. There is a helicopter pad at Pachena Point lighthouse.

#### Resources




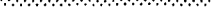
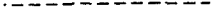

Pachena Point is the only site in this map area which has been identified as sensitive due to the presence of up to 190 sea lions during the winter. Harbour seals have been reported in the mouth of the Darling River and doubtless they may be found at other freshwater outlets. During the summer, up to 100 diving seabirds are recorded throughout the area and as many as 1000 or more gulls feed on rocky intertidal platforms during the summer.

Pachena Point Lighthouse is the only permanently inhabited site although during the summer months there are likely to be hikers camped out at Michigan Creek and Darling River. The lighthouse reserve and an uninhabited Indian reserve two miles north west of Pachena Point are the only distinct land divisions in this map area.










## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	

### Access





Road	
Trail	

Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3607/3647/3627
Topo. maps	92 C/10
Video tape	#1/#2

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 3 Nitinat

### Spill Response

The shoreline from Klanawa River to Clo-oose is particularly sensitive owing to its popularity with hikers, its occasional use by natives, and its high biological productivity. Extensive efforts should be employed to recover or disperse oil slicks while they are still a sufficient distance from shore to prevent beach or sea bottom contamination. In the event that slicks do threaten shorelines, efforts to divert them onto sacrificial beaches should be attempted. Generally, fine-grain, sandy beaches are preferable as they can be cleaned more effectively than coarser grain beaches or rock faces.

### Protection

Nitinat Lake is a tidal water body with access to the sea through Nitinat Narrows. Tidal currents through the narrows average three knots, occasionally rising to eight knots. Outflow currents generally exceed inflow currents particularly during periods of heavy precipitation in the Nitinat watershed. Protecting this water body is considered essential but currents in excess of the design limitations of modern day containment boom mean special techniques are required to prevent intrusion of oil slicks. It is recommended that oil slicks be diverted onto beaches at the entrance to Nitinat Lake in the vicinity of Whyac and Whyac Point.

Other sites which warrant protection are Clo-oose Village, Klawana River and Cheewhat River.

### Cleanup

Shorelines in this area are mainly bedrock cliffs abutted to bedrock platforms, some of which are covered with a veneer of coarse grained sediments. This type of shoreline is difficult to clean owing to its poor trafficability, its isolation and to its innate oil trapping textural quality. There is also the danger that crews may be trapped against steeply rising cliffs by incoming tides.

The exposure of this shoreline to high wave energy enhances its natural cleaning ability, particularly during the winter months when cleanup efforts are impractical. At other times of the year, this coastline is extensively used by hikers on the West Coast Trail and some cleanup efforts will doubtlessly be expected, especially near campsites at Klanawa River, Tsusiatic Falls, Whyac and Clo-oose. On sandy beaches, oil removal with manual tools and small air-portable machines should pose few problems. On bedrock platforms, oil concentrations could be removed from rock pools and fissures with sorbents and small pumps. Natural surf activity over broad inter-tidal platforms will probably be most effective in removing light contamination. Heavy log and debris concentrations in the backshore may be oiled from surf spray or during exceptionally high tides. As the upper shore zone is rarely subject to natural cleaning from wave activity, oil will tend to persist in this environment for a considerable length of time. Remedial measures include scrubbing logs, burning them or removing them (by truck or helicopter) to a central collection point. Care must be exercised not to cause excessive disturbance of the back shore zone, particularly where sand dunes and dune vegetation may be affected.

In summary, cleanup activities should concentrate on areas where they have the greatest chance of effectiveness. The main exception is at the shoreline on either side of the entrance to Nitinat Narrows. Here there is a distinct danger that natural removal of oil contamination will result in its re-deposition within Nitinat Lake. Fairly intensive cleanup efforts should therefore be applied wherever there is a source point for re-contamination. Specific recommendations for the protection and cleanup of this area follow in Tactical map 3A.



### Access

There is no road access to the shoreline in this map area although vehicles may reach the B.C. Forest Products Logging Camp on the east side of Nitinat Lake where marine launching facilities are available. Access to this camp is through either Cowichan Lake or Port Alberni on forest company roads.

Seaward marine access to shorelines may be hampered by rough sea conditions. During calm weather, landings at Clo-oose, Whyac, Tsusiatic River, and Klanawa River should be possible. Shallow draft vessels may enter Nitinat Lake during high water and landings are possible on either side of Nitinat Narrows and at many places within Nitinat Lake itself. Mariners should exercise great caution when entering Nitinat Narrows.

### Resources

Biological resources in this area include shellfish and groundfish, harvested by the local native population and recreationists. The Nitinat Lake salmon run is harvested both in the lake and offshore by commercial fishermen and by native food fishermen.

There are several colonies of breeding birds at the mouth of Nitinat Narrows and local populations of trumpeter swan, pelagic cormorants and various diving seabirds. Up to 5000 gulls have been counted feeding on the broad inter-tidal sandstone ledges that occur east of Tsuquadra Point.

Nitinat Lake is a tidal waterbody having varying degrees of salinity during the year. Marshes near the lower end of the lake should be considered highly productive and therefore warrant good protection and extremely careful cleanup if oiled.

The area around Nitinat Narrows/Clo-oose has been inhabited since ancient times and there has been little disturbance of the many archaeological sites in the vicinity. Great care should be exercised to avoid

disturbance of cultural and archaeological sites during clean-up operations. Parks Canada personnel from Pacific Rim National Park should be consulted before very extensive beach activities take place.

At present, Whyac and Clo-oose have few residents, and these mainly during the summer when salmon are running up Nitinat Narrows. There are many uninhabited Indian reserves in the area, especially near Whyac and Clo-oose. Hikers on the West Coast Trail usually stop at overnight camps near Whyac, at Tsusiatic Falls and at Klanawa River. This area is considered to be the most essential part of the proposed West Coast Trail component of Pacific Rim National Park.

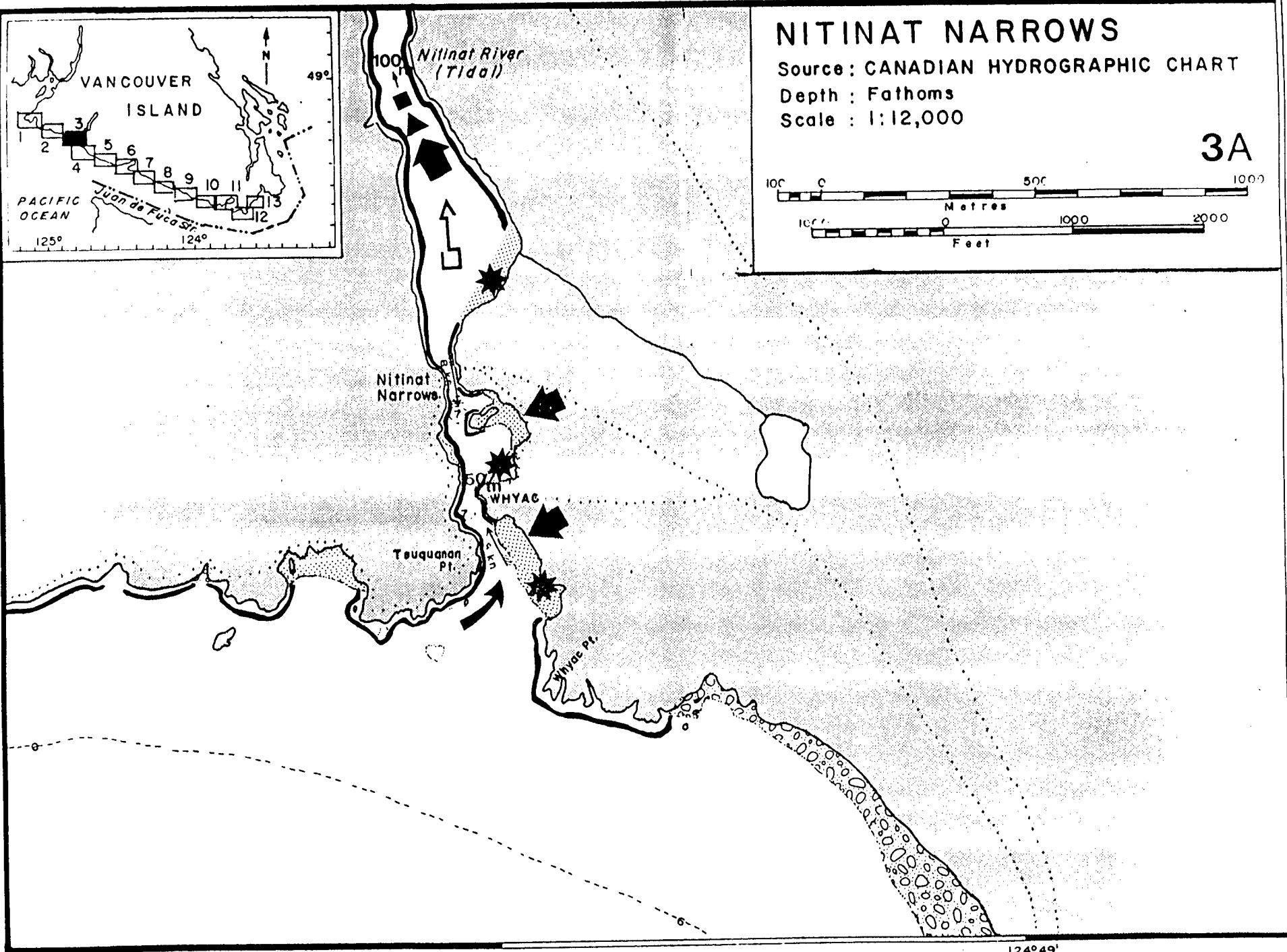
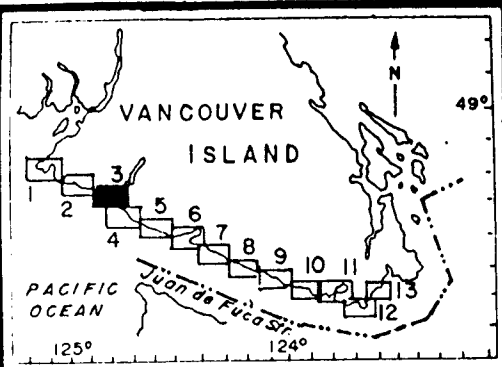
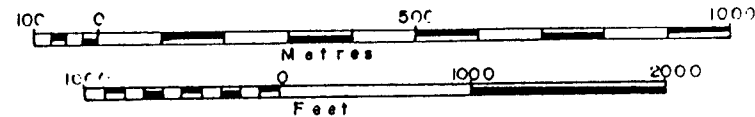
# NITINAT NARROWS

Source : CANADIAN HYDROGRAPHIC CHART

Depth : Fathoms

Scale : 1:12,000

3A









124°50'

124°49'









48°40'

## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3647/3607
Topo. maps	92 C/10
Video tape	#1

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 3A - Nitinat Narrows and Nitinat Lake

### Protection Strategy

There are three areas in which protective deployment of booms can be made to prevent or minimize contamination of Nitinat Lake. Actual weather and sea conditions will determine the success of each option and must be well known at the time of the spill response.

During ideal conditions of low wave heights and moderate wind, booms and skimmers should be positioned well out from the entrance to Nitinat Narrows to avoid the wave surge zone and the zone of high current velocity at the mouth of the Narrows. The most effective boom deployment configuration will be to simply divert oil slicks away from the entrance to the lake into skimmers or onto adjacent sacrificial beaches. The actual orientation of the boom will depend on the direction of the current and the wind.

Heavy sea conditions seaward of Nitinat Bar at the entrance to Nitinat Narrows may preclude any deployment of boom outside. At the same time, currents within the Narrows may approach a velocity of eight knots during certain stages of the tide cycle, preventing simple exclusion of oil with boom. If the on-scene commander feels that deflection boom could be effective in this area, (because tides do not always run at maximum speed) it should be deployed such that oil slicks are stranded in the two east side embayments of Nitinat Narrows near Whyac. While the beach material on these bays is not optimum for either self-cleaning or manual cleanup, their temporary sacrifice is preferable to the contamination of Nitinat Lake itself.

A third alternative is to allow oil slicks to enter Nitinat Lake. At the lower end of the lake, Nitinat Narrows widen and the current drops off appreciably.

Containment and recovery of oil slicks by conventional techniques is most likely to be successful in this protected area, especially if bad weather in Juan de Fuca Strait prevents marine operations. Some contamination is unavoidable, but this third alternative may be the only recourse open to cleanup crews during inclement weather.

#### Cleanup

Cleanup in and around Nitinat Narrows should be conducted intensively to lessen the long term effects of oil contamination on the local environment. Cleanup actions should proceed in a methodical fashion that is cognizant of the risk of re-oiling previously-cleaned shorelines. It should be borne in mind that cleanup activities have an environmental impact that in some cases can be more destructive than the oil contamination itself. The professional guidance of biologists and shoreline geomorphologists should therefore be solicited to minimize the effects of cleanup operations.

Cleanup activities should commence at potential re-oiling source points. In this particular case, oil stranded on high energy shorelines outside of Nitinat Narrows is likely to be removed by wave activity and redeposited on lower energy shorelines. The sequence of cleanup should therefore proceed from beaches outside Nitinat Narrows, through the Narrows itself and finally, to sites within the lake that have been oiled.

Bedrock shorelines may be high-pressure water blasted, steam cleaned or manually scraped, preferably during ebb tides when any oil, not corralled by containment boom at the water's edge, will be swept out to sea instead of into Nitinat Lake. Cobble beaches should be flushed with water to remove oil which can be collected at the water's edge. Heavily-contaminated cobble beaches may require excavation and replacement with compatible material. The few sandy beaches in this area can be manually cleaned with rakes and shovels. Mud flats and marshes inside Nitinat Lake are susceptible to damage from foot and vehicular traffic which may grind surface oil deep into fine mud sediments. Low pressure water flushing of mud flats and marsh areas is likely to be the least damaging method of removing oil. Cutting or burning oiled marsh vegetation is a cleanup alternative that requires caution and expert advice.

# CARMANAH POINT

Source: NATIONAL TOPOGRAPHICAL MAPS

Height: Feet

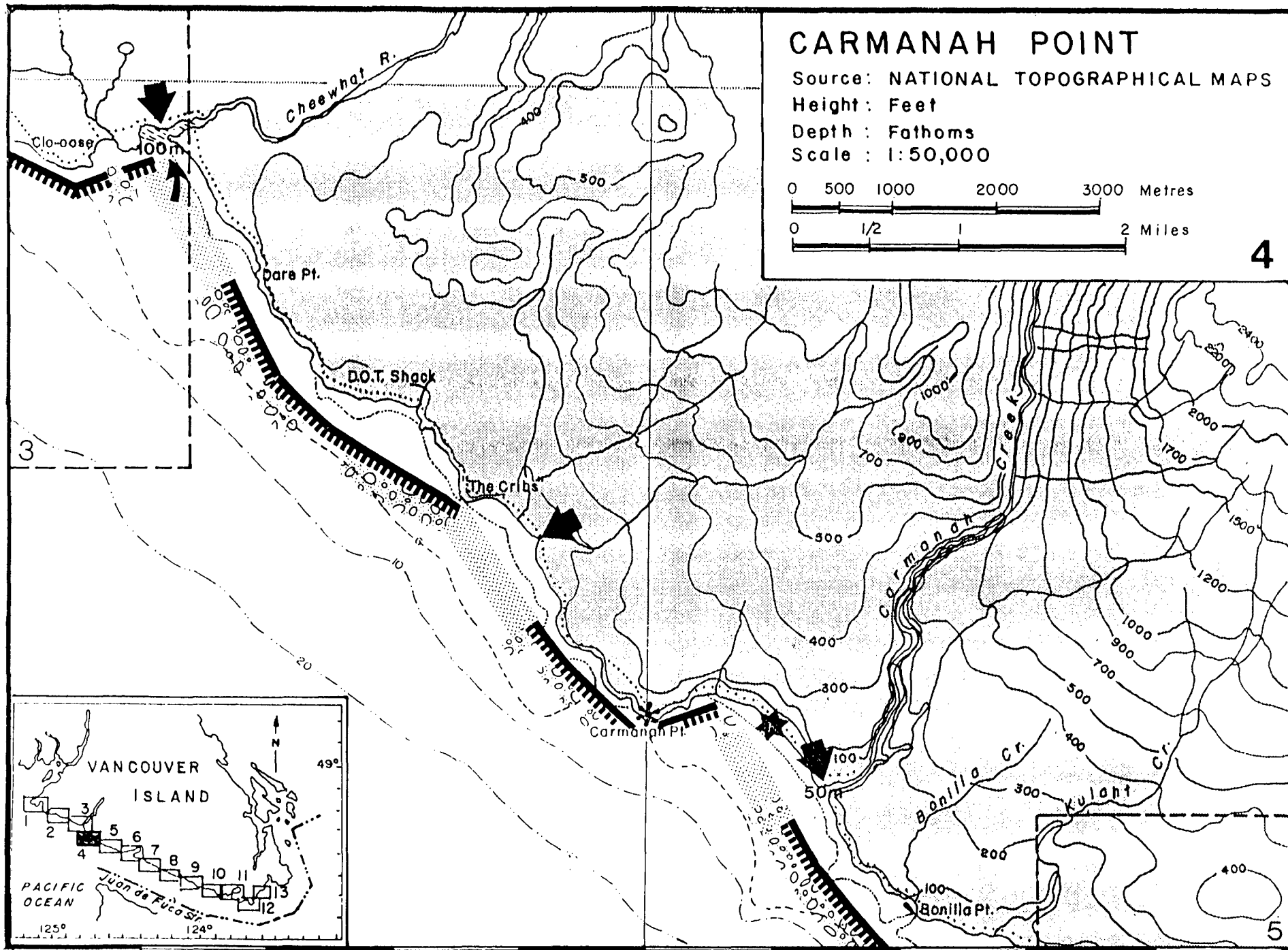
Depth: Fathoms

Scale: 1:50,000

0 500 1000 2000 3000 Metres

0 1/2 1 2 Miles

4





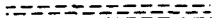



124°50'









124°45'

## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3607
Topo. maps	92 C/10
Video tape	#1

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 4 Carmanah

### Spill Response

This high energy coastline has no extremely sensitive areas, although there are highly productive beach shelves that are rich in intertidal life. Efforts to control oil slicks offshore should be made during periods of calm weather with containment and recovery equipment. Dispersants could be used bearing in mind that the sea bottom slopes off very gradually here. The six fathom line is up to 1 kilometer offshore throughout much of this map area. Depending on the direction of winds and currents, slicks may be diverted onto sacrificial beaches near the Cheewhat River and Carmanah Creek.

### Protection

The Cheewhat River has an extensive marsh upstream that might be inundated by oil during spring tides and storm surges. One hundred metres of boom would be sufficient to prevent oil from entering this marsh. Careful placement and continuous supervision is necessary to adjust this boom during tide changes. Carmanah Creek is less sensitive, but should be protected with approximately 50 metres of boom to forestall oil intrusion on rising tides. Numerous sandstone shelves such as "the Cribbs" are aesthetically and biologically important. While booming may not be feasible due to wave conditions, they should be protected if possible, when weather conditions permit.

### Cleanup

The predominant beach type in this map area is bedrock cliff with wide rocky inter-tidal platforms and mixed sediment beach. Regular intervals of long, gently sloping sandy beaches occur between rocky headlands. The West Coast Trail generally follows these sandy sections but avoids the cliff portions by moving up into the forest.

Cleanup activities should concentrate on removing oil from sandy beaches, particularly where hiking and camping activities take place. Poor accessibility means cleanup will have to largely rely on manual labour unless heavy equipment such as graders and front end loaders can be landed by barges. Heavy oil contamination on rocky shorelines may be left to natural cleanup unless exceptional weather conditions permit marine access. Cleanup crews should be cautioned to avoid cliff-backed shorelines where they may have no means of escape from incoming tides.

In an area such as this, there is a strong likelihood that re-contamination of cleaned sandy beaches may occur as oil is washed off adjacent sections of coast. There is also a possibility that oil may become buried as subsequent layers of sand are pushed up by wave activity over contaminated beaches. Both of these should be taken into account before the on-scene commander commits extensive resources to beach cleanup. Specific areas where beach cleanup is desirable are Clo-oose, Cheewat River estuary, Carmanah Point lighthouse reserve, the Cribs, and Carmanah Creek. With the exception of Carmanah Point, all these sites are sand or pebble beaches.

Extensive amounts of contaminated logs and other organic debris are likely to be encountered at various times of the year. This can be burned in situ or removed, possibly by helicopter to a central disposal or burning location. As the presence of debris contributes to the stability of beaches, clean-up supervisors are cautioned to solicit the advice of beach experts before removal of debris and sediments is attempted.

#### Access

There is no road access to this area. The West Coast Trail traverses this area and provides access to the beach from Bonilla Point to Carmanah Point, at the "Cribs", and between Dare Point and Clo-oose. It may be possible to barge equipment down Nitinat Lake to Browns Cove and then haul it overland 2 1/2 kilometers to Clo-oose if a road can be cleared. Shallow draft barge landings from Juan de Fuca Strait can be made at Clo-oose and .5 kilometres southeast of "The Cribs". Seaplane landings are limited to Nitinat Narrows



and Nitinat Lake unless exceptional weather conditions make it possible to land off open shorelines.

#### Resources

Clams, abalone and dungeness crabs are found throughout this area. Extensive areas of shallow sub-tidal and inter-tidal sea floor are extremely productive in marine organisms. Carmanah Point is commonly used by sea lions as a haul out, particularly during the winter. Up to 200 harbour seals have also been counted around the Carmanah Headland. The mouth of the Cheewhat River is used by pelagic cormorants. Other species found in this map area include swans, diving ducks and puddle ducks.

#### Socio-Economic

The village of Clo-oose is not inhabited year round but several structures remain livable. There are many archaeological sites in the vicinity, some of which apparently date back to the earliest cultures in pre-historic America. These have been identified by Parks Canada but are not listed owing to their sensitivity and lack of protection. No major operation should be undertaken in this area until Parks Canada has been consulted. The Carmanah Point Lighthouse is inhabited year-round and there are several cabins nearby which are sometimes used by hikers.

# WALBRAN CREEK

Source: NATIONAL TOPOGRAPHICAL MAPS

Height: Feet - 100' Intervals

Depth: Fathoms

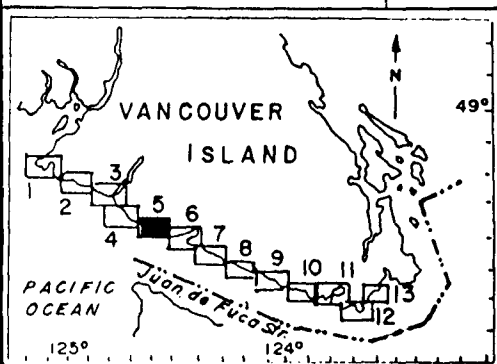
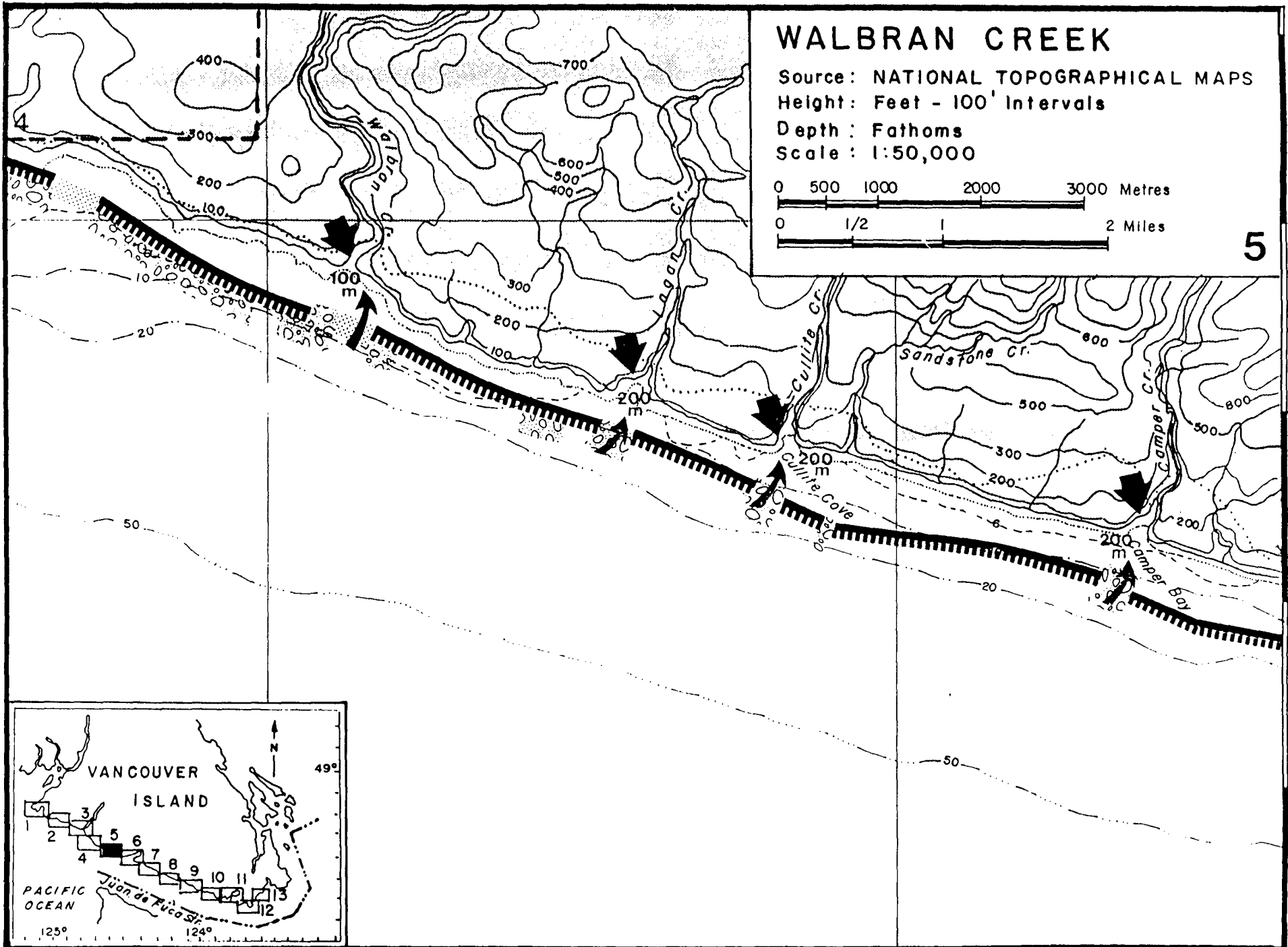
Scale: 1:50,000

0 500 1000 2000 3000 Metres

0 1/2 1 2 Miles

5

48°32'





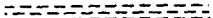



124°40'









124°35'

## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3607
Topo. maps	92 C/10
Video tape	#1

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 5 Walbran Creek

### Spill Response

Map area 5 has much in common with the preceding area. A highly productive intertidal sandstone shelf extends throughout the area except where it is dissected by creeks and inlets. Walbran Creek, Logan Creek, Cullite Creek and Camper Creek all flow out into small embayments that provide some relief to an otherwise uniform coastline. Since protection and cleanup are impractical, offshore response is the key to successful operations in this area. Dispersants could be useful outside the fifty fathom line and possibly inshore as close as the twenty fathom line. Offshore containment and recovery is limited to periods of calm seas. Much of this area will cleanse itself naturally during winter storm conditions.

### Protection

If sea conditions permit, Camper Bay, Cullite Cove, Logan Creek and Walbran Creek might be boomed. No other area on this coastal section stands out for priority protection.

### Cleanup

Virtually the entire length of shoreline in this map area is bedrock cliff abutted by a wide, shallow, rocky platform. A few mixed sediment pocket beaches occur in small embayments, usually at creek outlets. Due to the danger and impracticability of attempting extensive cleanup, it may be the best strategy overall to leave this shoreline to the natural cleaning capability of waves, and monitoring it's progress. Cleanup activities may further disturb the rich and diverse inter-tidal shoreline common to high energy platforms of this type. Some cleanup activities may be warranted in the small pocket beaches at Camper Bay, Cullite Cove, Logan Creek and Walbran Creek owing to their summer use as

campsites by hikers on the West Coast Trail.

#### Access

Land access is by trail from Port Renfrew only. Water landings do not seem advisable due to many offshore rocks and reefs. Landings may be possible west of Walbran River but individuals with local knowledge should be consulted. Seaplane landings are not feasible but a possible helicopter landing area has been identified in a marshy area between Cullite Creek and Logan Creek. Beach trafficability appears to be poor east of Walbran River but better to the west of it.

#### Resources

While this map area has extremely productive shorelines owing to its wide, shallow, inter-tidal sandstone shelf, there are no high priority biological concentrations of major consequence. Creek mouths and bays are used by seabirds sheltering and a large population of gulls frequents the areas coastline, particularly during the summer. Extensive kelp beds are present just offshore.

There is a small, uninhabited Indian reserve three kilometres west of Walbran Creek. The West Coast Trail does not follow the beach east of Walbran Creek but there are access and camping sites at Logan, Cullite and Camper Creek mouths.

# PORT SAN JUAN

Source: NATIONAL TOPOGRAPHICAL MAPS

Height: Feet

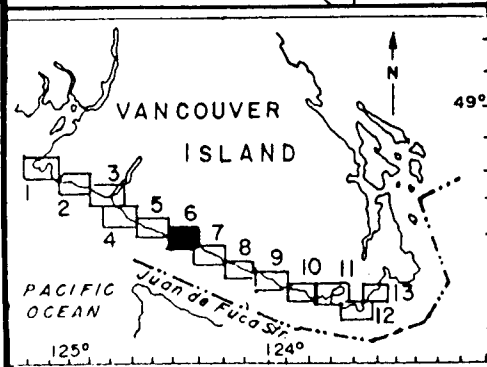
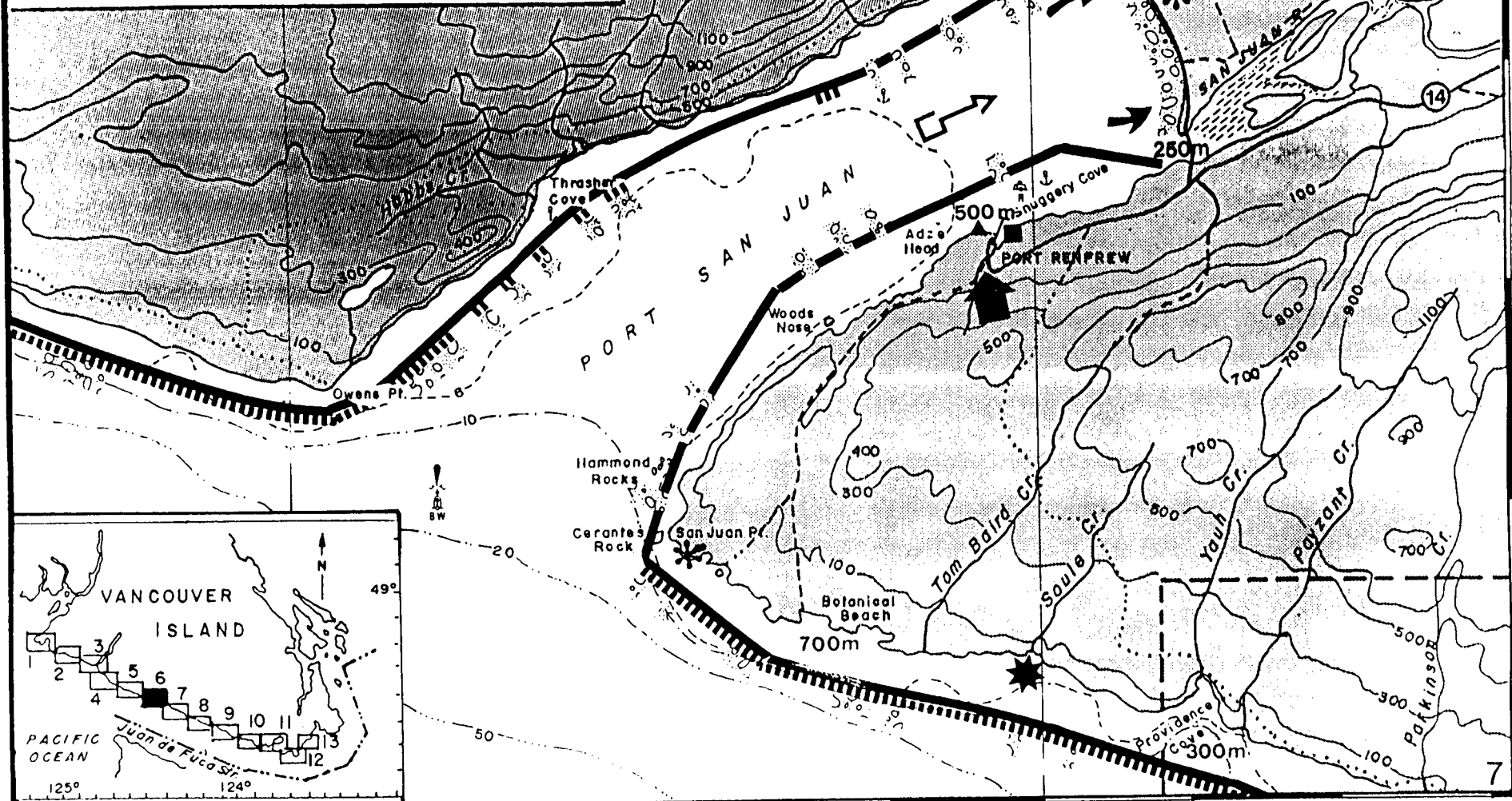
Depth: Fathoms

Scale: 1:50,000

0 500 1000 2000 3000 Metres

0 1/2 1 2 Miles

6



124°30'







124°25'

48°35'

7







Legend

Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	

Access





Road	
Trail	

Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

Resource material

Hydro. charts	3607/3647
Topo. maps	92 C/10
Video tape	#4

Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

Map 6 Port San Juan

Spill Response

Spill response in the Port San Juan area is complicated by several factors which will influence the on-scene commanders approach to the operation. As the only feasible protected anchorage between Victoria and Barkley Sound, it is possible that the use of this port as a security anchorage for the vessel in distress may be necessary, except during south-west gales. In the event such a request is approved, it will be necessary to bring enough oil spill equipment into the port to collect oil escaping from the vessel while emergency repairs and off-loading are taking place. In any case, Port San Juan provides a sheltered environment in which oil spill operations can take place protected from heavy seas and strong currents.

Protection

The sites of highest concern are the San Juan River Estuary, Gordon River Estuary, Port Renfrew townsite, Botanical Beach and Providence Cove. Boom protection should be provided at the northern and southern exits of the San Juan River to protect the upstream estuary against oil intrusion on rising tides. The beach front of the San Juan River Delta may be used as a collection point for diverted oil slicks, provided rigorous cleanup follows the operation. Protection or diversion booming should be installed to protect the townsite and marinas at Port Renfrew. Breaking surf at Botanical Beach and Providence Cove may prevent deployment of protection boom. If the swell offshore is not too steep, diversion boom should be deployed to direct slicks past these sites into skimmers or onto adjacent sacrificial beaches.

### Cleanup

Exposed south-west oriented shorelines outside of Port San Juan are mainly rock platforms or bluffs with scattered pocket beaches that are usually associated with creek exits. Botanical Beach and Providence Cove are the main areas to be cleaned outside of Port San Juan.

Inside Port San Juan, priority cleanup should take place in the estuary; if oiled, low pressure flushing and manual pick-up are recommended. The delta front at the head of the port should be cleaned with heavy equipment such as scrapers and front end loaders. The north-west shore of Port San Juan consists mainly of heavy cobble and pocket beaches. Manual cleanup may be arduous and dangerous due to slippery rocks. High and low pressure flushing from pump barges moored offshore are suggested. Flushed oil can then be recovered from the waters edge with skimmers and sorbents.

The south-east shoreline of Port San Juan is fairly accessible by road but is too rugged for heavy machinery to operate. Breakwaters and docks at Woods Nose and Snuggery Coves should be well cleaned to prevent re-oiling of vessels and shore facilities. High pressure hot water flushing and/or steam cleaning is recommended where required.

The shoreline from Adze Head to Cerantes Rock has several pocket beaches that should be cleaned. Rocky headlands in this area should have excessive oil contamination removed. The B.C Waste Management Branch have designated an oily waste disposal site in the Port Renfrew area.

### Access

Road access to Port Renfrew is available from Victoria on Highway 14, from Shawnigan Lake over B.C. Forest Products Company roads, from Cowichan Lake over Western Forest Industries road and from Port Alberni over MacMillan Bloedel Company roads. Highway 14 is the best route of the four. The San Juan River delta and the south east side of Port San Juan have road access as far as Botanical Beach. The northwest side of the port is accessible by water and at Thrasher Cove where a branch of the West Coast Trail reaches the waterfront.

Marine access to Port Renfrew is excellent. A 48 metre berth at the Government dock allows vessels of up to 18 feet draught to land. Smaller docking facilities nearby can be used by small craft. Small craft and shallow draft barges can land at Thrasher Cover, on the San Juan River Delta, near Woods Nose, and during calm weather, at Providence Cove. Beach trafficability is good on the San Juan River delta front for heavy machinery, but elsewhere, impassable headlands and rough terrain make foot traffic difficult and vehicle traffic impossible. Seaplane charter service to Port Renfrew is available from Victoria.

#### Resources

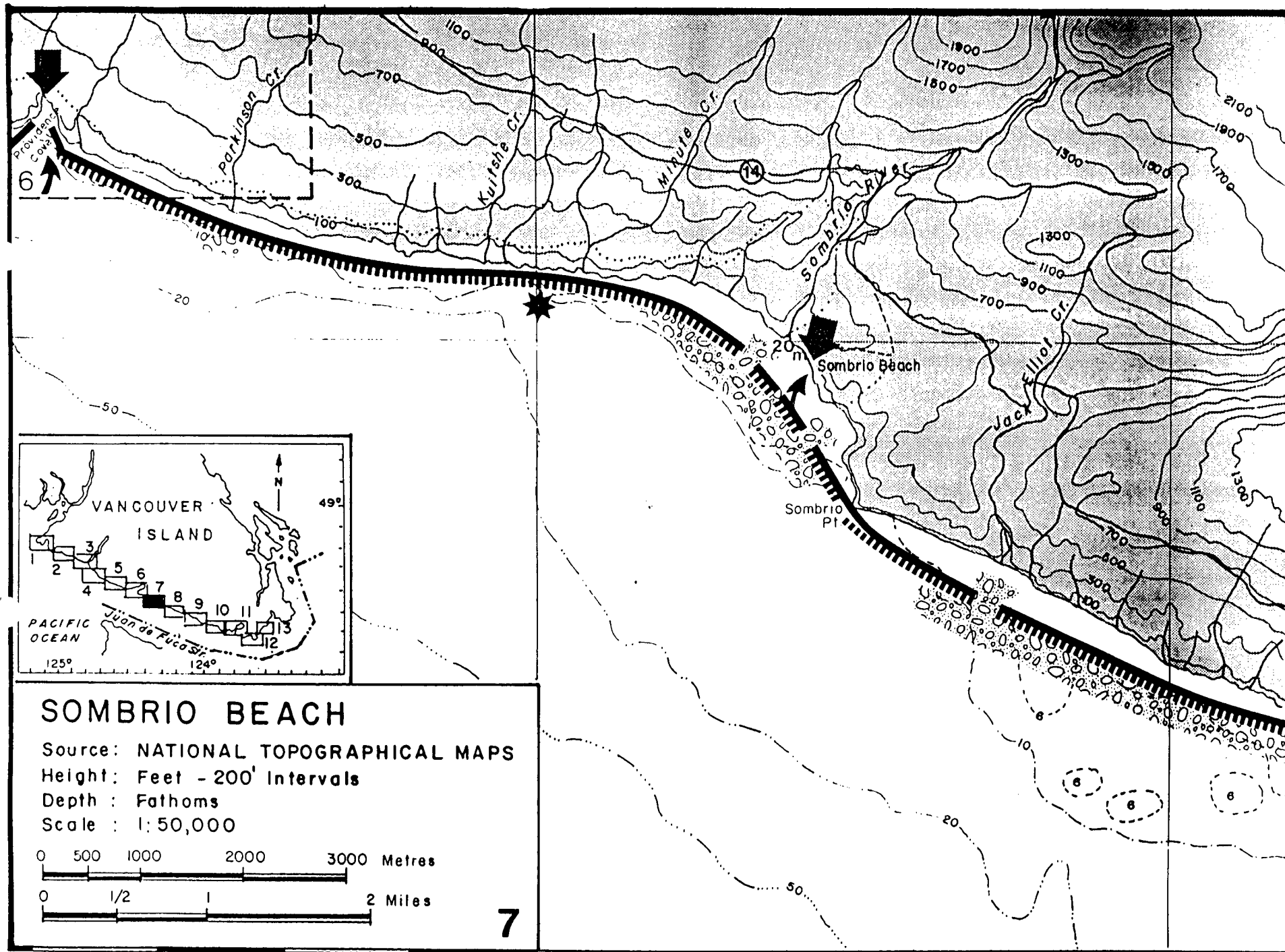
The delta of the San Juan River is an important habitat for juvenile salmonids, birds and other salt marsh biota. Port San Juan is highly productive of shellfish, dungeness crabs, groundfish and squid.

Botanical Beach, 1 kilometre east of San Juan Point was the site of a biological research station, now abandoned. The inter-tidal shoreline is unique and richly endowed with a broad spectrum of marine life that attracts naturalists and researchers.

Providence Cove, 2.5 kilometres to east of Botanical Beach, is reported to be a haulout for harbour seals from February to April and a nesting site for pelagic cormorants in late spring and early summer.

Port Renfrew is a small town on Port San Juan mainly occupied with forestry and to a lesser extent, fishing. The port is a base for transient commercial fishermen engaged in the west coast Vancouver Island salmon and herring fisheries during the spring and summer. Marinas at Snuggery Cove and Woods Nose service both recreational and commercial craft. The Pacheenaht Indian Band occupies two large reserves at the mouth of the San Juan River. British Columbia Forest Products Limited operates a 300 man dry land sort and logging camp at the mouth of the Gordon River. Some log booming takes place in the San Juan River estuary. Most of the waterfront lands between Port Renfrew and Parkinson Creek at the eastern extremity of the map are held by British Columbia Forest Products Ltd. or individual private landowners. Waterfront lands between Gordon River and the westernmost point of the map have been reserved for future inclusion in Pacific Rim National Park.





## SOMBRIO BEACH

Source: NATIONAL TOPOGRAPHICAL MAPS

Height: Feet - 200' Intervals

Depth: Fathoms

Scale: 1:50,000

0 500 1000 2000 3000 Metres

0 1/2 1 2 Miles

7

124°20'

124°15'

## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	

### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3607
Topo. maps	92 C/10 92 C/9
Video tape	#4/#5

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 7 Sombrio Beach

### Spill Response

Offshore containment and recovery coupled with judicious application of approved oil spill dispersants are likely to be the most practical and effective methods of combatting oil slicks that threaten to come ashore in this area. The exposed nature of this coast makes inshore response difficult if not impossible during most weather situations but also implies that natural self-cleaning should take place fairly rapidly.

### Protection

If sufficient boom is available and weather conditions are ideal, efforts may be made to protect the extensive sandstone shelves that project out from the shoreline in the Sombrio Point area and at Sombrio Beach. Diversion booming of oil slicks onto sacrificial beaches appears to be the most feasible technique. The mouth of the Sombrio River can be protected with a short length of boom to prevent oiling of the small estuary.

### Cleanup

With the exception of the mixed sediment shoreline at Sombrio Beach this entire area consists of a steep bedrock cliff abutted by a wide, rocky platform. Prospects for extensive cleanup are poor. During the winter, storm activity may remove much stranded oil from high energy shorelines, possibly redepositing it in areas such as Sombrio Beach. Here, the on-scene commander may elect to mount a reasonably intensive cleanup operation due to public beach use during the summer. The cleaning of mixed sediment beaches such as this may require excavation and replacement of material which has been contaminated. Pocket beaches should also be cleaned when the threat of re-oiling has abated. Oiled logs and other organic debris should be removed or burned in situ, especially at

Sombrio Beach.

Access

Highway 14 to Port Renfrew parallels the coastline throughout this map area but road access to the beach is infrequent. There are at least two gravel roads that approach to within several hundred yards of the beach near Sombrio River which may be pushed through to permit passage of heavy equipment. There are also trails to the waterfront in several places, most of which are indicated on the map. A logged over area between Parkinson Creek and Kuitshe Creek indicates the presence of old logging roads that might be easily opened.

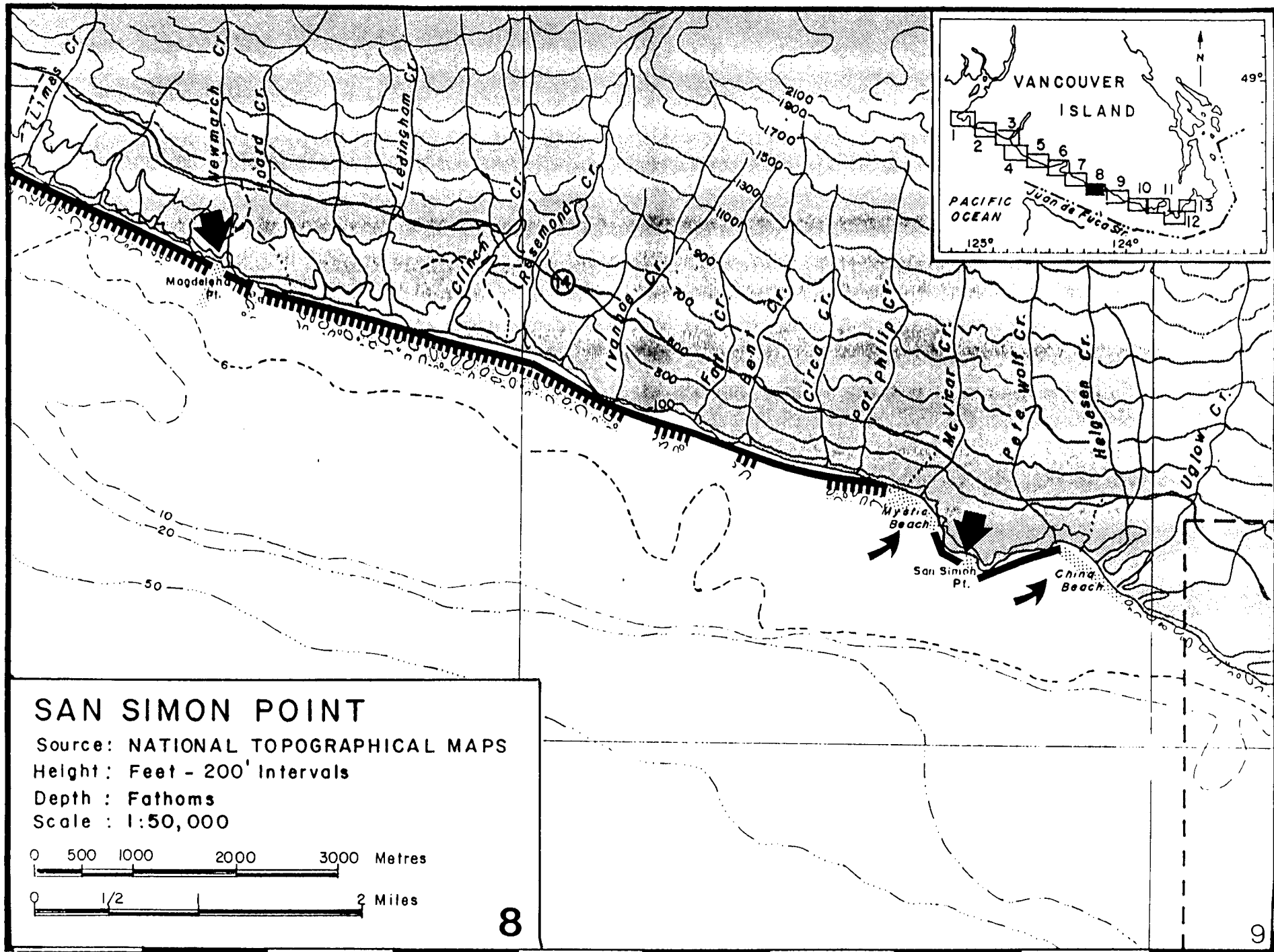
There are no existing facilities which can be used for marine access and much of the coastline appears to be unsuitable for landing craft. Sombrio Beach may allow offloading of equipment during calm weather but its westerly exposure to swell conditions will likely prevent landings during much of the year. There are no protected seaplane landing areas but helicopters should have no difficulty landing in the area, especially at low tide.

Resources

In winter, Sombrio Point is a haulout for up to 100 sea lions. Gulls are the main bird residents during most of the year and can be found feeding on the extensive inter-tidal sandstone platforms.







There are no settlements or Indian reserves in this map area, but Sombrio Beach is used year round by recreationists. There are several seashore cabins between Sombrio River and Sombrio Point.

Rayonier Canada Limited owns land on both sides of the Sombrio River and manages tree farm licence #25 from there to a point 3 kilometres west of Magdalena Point on Map 8; land to the west of Rayoniers holdings at Sombrio River are owned by MacMillan Bloedel Ltd.











# Legend

## Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





## Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

## Resource material

Hydro. charts	3607
Topo. maps	92 C/8
Video tape	#5

## Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 8 San Simon Point

### Spill Response

Spill response in the San Simon Point map area should centre around preventing oil from reaching China Beach Provincial Park and Mystic Beach. Extensive inter-tidal rock shelves throughout the area will be exceedingly difficult to clean once oiled. Offshore containment and recovery or dispersion should therefore be attempted.

### Protection

China Beach should be protected with inshore boom when weather conditions permit. Booming in other parts of this area is not feasible except under ideal weather conditions. Lined trenches and berms could be constructed to prevent excess oiling of upper beach levels if sediments are sufficiently adhesive to prevent collapse. Oil collected in such trenches can be pumped out for disposal.

### Cleanup

The predominant shoreline characteristic in this map area is its steep bedrock cliff, abutted by a wide inter-tidal rock platform and mixed sediment beach. Poor access and difficult terrain make extensive cleanup efforts impractical and possibly harmful to the shore environment. Low pressure water flushing and oil removal from accumulations in pot holes and crevices with pumps and sorbents may be the only feasible response during the short period between high tides.

There are two areas of sandy beach in this map area which will require thorough cleanup. China Beach Provincial Park, to the east of San Simon Point is a popular recreational shorefront from which all oil should be removed, especially during the summer. There is no road access but it may be possible to move

equipment along the beach from Jordan River during low tides. Oiled sand should be scraped into windrows and then removed with front end loaders. Cleanup crews should be on guard against re-oiling, asphalt formation and oil burial by wave activity.

The small sandy beach to the west of San Simon Point should also be cleaned once the danger of re-oiling has passed. Limited accessibility means cleanup must rely on manual methods.

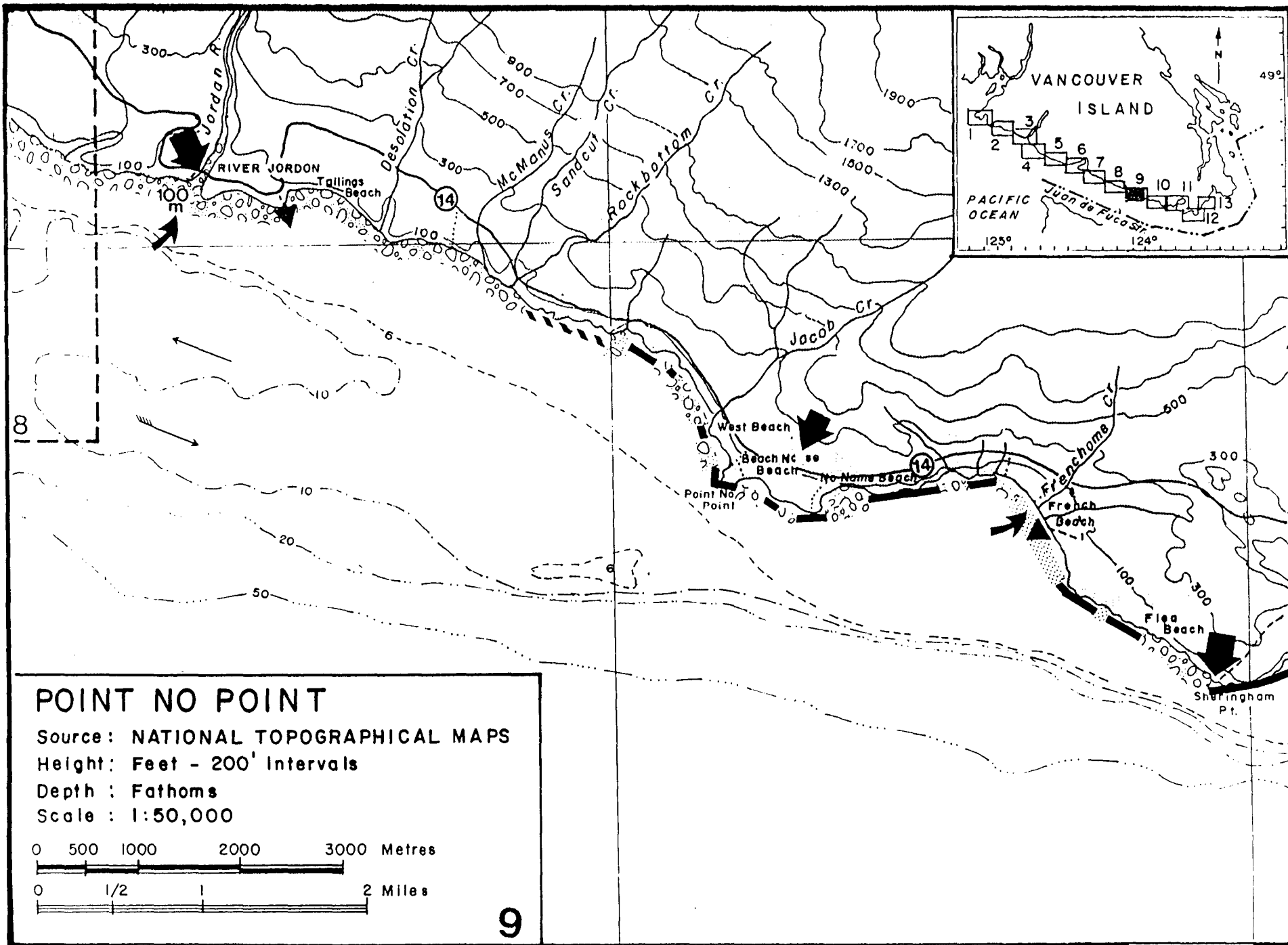
#### Access

Highway 14 parallels the shoreline in this map area but vehicular access to the China Beach from Jordan River (Map 9) is possible, depending on tidal conditions. There are trails to China Beach and Mystic Beach leading down from parking lots adjacent to Highway 14. Overgrown logging roads in the Magdalena Point area may exist that could be re-activated to allow access to the beach. Cleanup crews should be alerted to the fact that they may be trapped by incoming tides unless they have made provision for escape routes.

#### Resources

Stellar sea lions, California sea lions and harbour seals frequent surf zones during fall, winter and spring. Up to 30 individuals have been counted hauled out at Magdalena Point. San Simon Point is a nesting area for pelagic cormorants and various seagulls. The extensive inter-tidal rock shelves are biologically productive and attract feeding gulls during low tides. As many as 500 have been counted between San Simon Point and Jordan River, concentrated mainly at the mouths of the many small streams. Shellfish in small quantities are likely to be found in scattered pocket beaches.

With the exception of China Beach Provincial Park, all waterfront lands in this area belong to Rayonier Canada Limited. While this company encourages visitors, it is advisable to consult them regarding access and cleanup operations.









124°00'









123°55'

## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3607
Topo. maps	92 C/8
Video tape	#5/#6

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 9 Jordan River

### Spill Response

Response to a major spill affecting this area should be conditioned by the presence of many recreational beaches between River Jordan and Sheringham Point and the highly productive zone of shallow water extending out from the coastline. Outside the 50 fathom contour, consideration to the use of dispersants should be given. Inside, containment and recovery of oil slicks may be the only alternative, if weather and sea conditions permit.

### Protection

The outlet of the Jordan River should be boomed off to protect the estuary and log storage area near the highway bridge. This boom can be deployed across the tidal channel from the banks during rising tides. Outflow during falling tides will be sufficient to prevent intrusion of oil slicks. Heavy surf may prevent deployment of offshore boom in this area but during calm sea conditions it may be feasible to protect No Name Beach, Flea Beach and French Beach with diversion or exclusion booms.

### Cleanup

Extensive shoreline cleanup will be required throughout this area. The following recreational beaches should be cleaned in order of priority, depending of course on the location and degree of contamination: French Beach, West Beach, Flea Beach, Tailings Beach, Beach House Beach, No Name Beach, River Jordan Beaches and the beach at the outlet of Sandcut Creek. Sheringham Point and Point No Point headlands should also be cleaned, particularly if large amounts of oil have accumulated in rock crevices and pools. No beaches should be cleaned until the risk of re-contamination is past. It is therefore important that when beach cleaning priorities are established they are ordered in such a way that



re-contamination is minimized.

As the main beach type throughout this shoreline is mixed sediment, oil removal will be difficult. Low pressure flushing, possibly with dispersants may remove some oil contamination. Heavier concentrations of oil may necessitate excavation of beach sediments for cleaning or replacement. Good road access and beach trafficability make mechanized operations feasible, although rocky headlands and high tidal levels may interfere with movement.

Point No Point is mainly bedrock with mixed sediment pocket beaches. Due to its use as a recreational resort, manual cleanup of rock faces and beaches will be necessary. Careful attention to safety must be provided to ensure that workers on slippery rock faces are protected.

The only extensive sandy beach in this map area is at French Beach. Good road access here will allow machinery such as scrapers and front end loaders onto the beach.

#### Access

Waterfront road access exists at Sheringham Point, French Beach, Beach House Beach and Jordon River. From Jordan River it should be possible to move tracked or balloon tired vehicles west along the beach as far as China Beach and east as far as Rockbottom Creek (3.5 km east of Jordan River). Impassable rocky headlands block further progress and high tides may interfere with movement in some areas. High water in creeks may also limit access. Escape routes should be pre-determined in case rising tides trap men and equipment on steep-to beaches.

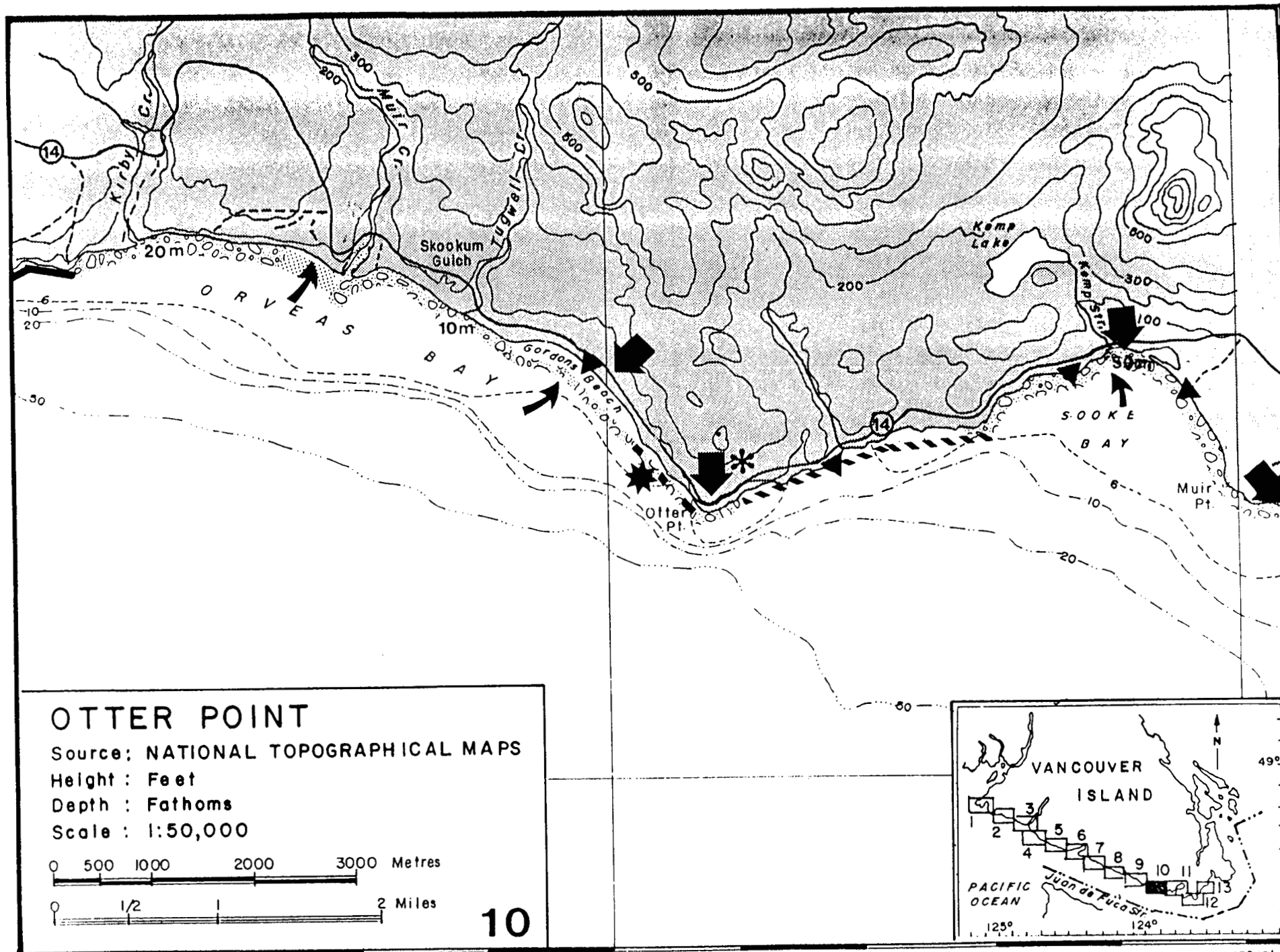
Marine access to Jordan River is feasible for shallow draft vessels. Small tugs frequently enter the river mouth to tow logs out on high tides. Beach landings should not be difficult anywhere that sufficient water depth is present to allow landing barges close inshore. The good road access, however, lessens the need for marine access.

### Resources

Biological resources in this map area include puddle and diving ducks, herons, gulls, grebes and cormorants in the Jordan River area, harbour seals at Sheringham Point and Jordan River and several of the shallow sandstone shelves that are productive in inter-tidal marine life.







Recreational beaches with excellent access are a public amenity that are used extensively throughout the year. Sheringham Point is a federal lighthouse reserve in a park-like setting that attracts many visitors. French Beach is a Provincial Park and Point No Point is a private waterfront vacation resort.

Waterfront land between River Jordan and No Name Beach is owned mainly by the Rayonier Corporation, although there are some private holdings at West Beach and Rock Bottom Creek, and between No Name Beach and French Beach.











# Legend

## Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





## Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

## Resource material

Hydro. charts	3641/3642/3607
Topo. maps	92 B/5
Video tape	#6

## Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

# Map 10 Otter Point

## Spill Response

This highly visible and accessible stretch of coastline is liable to require extensive cleanup efforts if contaminated by oil. Offshore response should therefore concentrate on containment and recovery or possible dispersion of oil while it is still well out to sea. Failing this, oil slicks should be diverted onto beaches west of Otter Point where exposure to swell and wave energy is greatest. Natural cleaning will then augment the efforts of beach cleanup crews.

## Protection

Boom protection is recommended at Kirby Creek, Muir Creek, Tugwell Creek and at the mouth of the small embayment, just east of Kemp Stream at the head of Sooke Bay. Trench and dyke emplacements should be constructed on Gordons Beach, at Skookum Gulch and on beaches in Sooke Bay if waves are small, to prevent oiling of upper beach levels and to facilitate collection of oil and emulsion. It may also be useful to wet beaches prior to imminent oiling to minimize oil adherence to beach sediments and rock faces. If this technique appears to be effective, its use should be extended to other, similar shorelines.

## Cleanup

Southwest facing beaches are prone to self-cleaning, particularly during the winter months but the presence of recreational sites may dictate a prompter beach cleaning effort. In exposed areas oiled beach sediments may be pushed into the surf zone to enhance natural cleaning. Pocket beaches to the east of Otter Point are susceptible to heavy contamination as they form natural traps for suspended and floating material. If cleaning is unsuccessful, beach sediments should be removed and replaced with similar material. Oil collected

in upper inter-tidal trenches can be pumped into sillage tanks for removal.

Considerable quantities of oiled logs and other organic debris are likely to present a disposal problem. Where local conditions preclude in situ burning, material should be removed to a central landfill or burning ground. The British Columbia Waste Management Branch has designated sites in this area for this purpose.

#### Access

Highway 14 runs adjacent to the coastline between Kemp Stream and Muir Creek and provides many access points to Sooke Bay and Orveas Bay. Sideroad access to the water exists at Muir Point and Kirby Creek.

A small vessel launch ramp is in place near the booming ground at Kemp Stream and other private ramps are located along Sooke Bay and Orveas Bay. Surf conditions may prevent vessel launches during south-east or westerly winds. Barge landings can be effected on most beaches when surf conditions allow. The private airstrip between Kemp Stream and Muir Point is no longer usable.

#### Resources

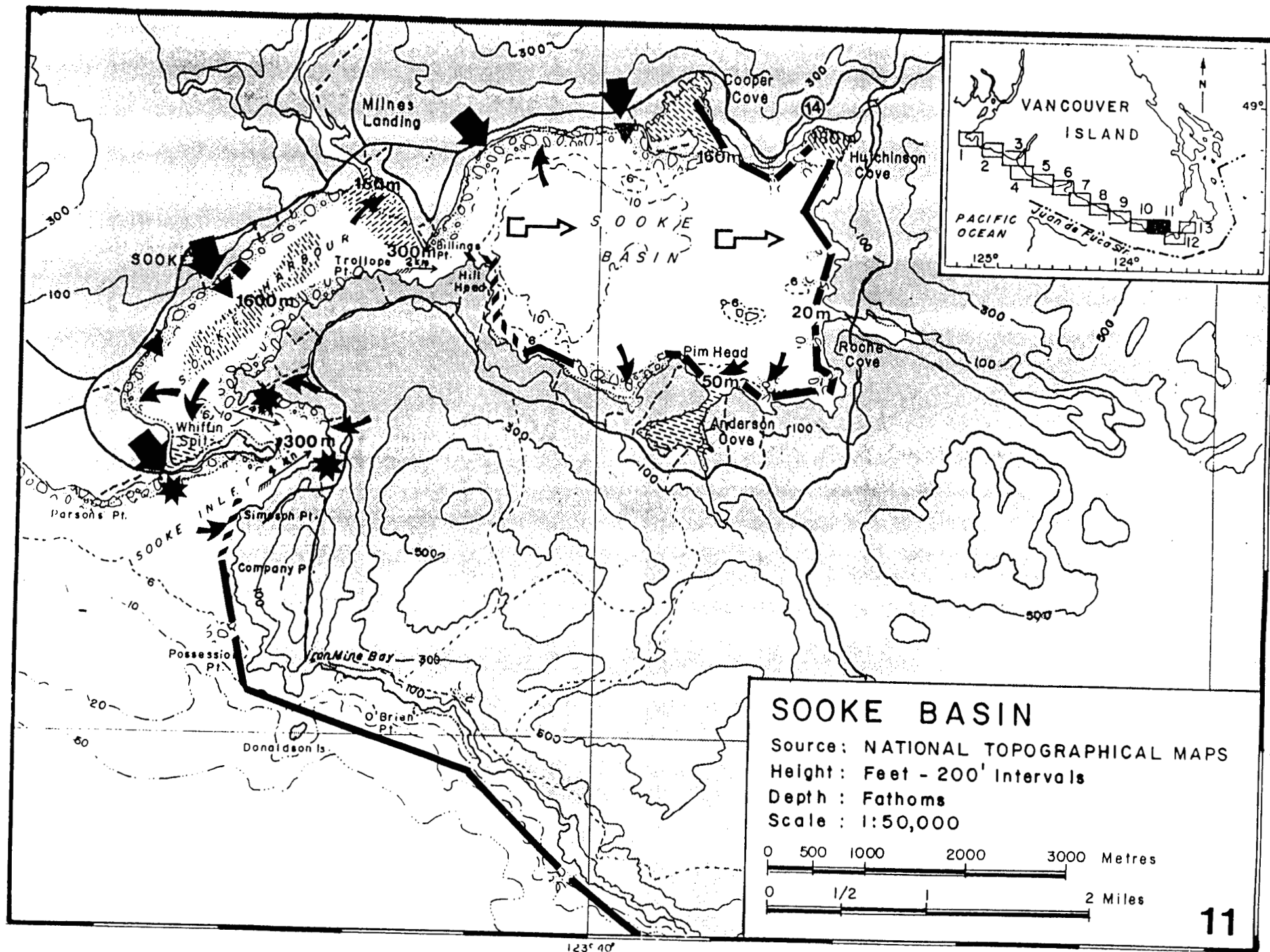
Sooke Bay is a wintering area for diving ducks, loons, grebes, cormorants and gulls. Bird concentrations are most likely to occur at the mouths of small creeks and streams.

Prawns, shrimp and geoduck clams are reported in Sooke Bay year round. Juvenile salmon congregate off Otter Point during the summer. Small estuaries at the mouths of Kirby, Tugwell and Muir Creek are sensitive marsh environments.

Gordans Beach is the main recreational shoreline but good access makes most other beaches in this area







popular. The West Coast Road affords many sightseeing opportunities to tourists. Otter Point is a popular lookout for bird watchers. Residential housing fronts the shoreline of much of Sooke Bay west to Otter Point. Other residential areas overlook Gordans Beach and Skookum Gulch. There is an Indian Reserve at Muir Point and several archaeological sites around Otter Point.

A large log sorting and booming operation owned by B.C. Forest Products Ltd. is in place at the mouth of Muir Creek and a smaller booming ground is located in the small bay just east of Kemp Stream. Most of the waterfront land around this bay is owned by Canadian Pacific Ltd.











# Legend

## Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





## Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

## Resource material

Hydro. charts	3641/3642/3607
Topo. maps	92 B/5
Video tape	#6

## Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 11 Sooke Basin

### Spill Response

Spill response efforts are dictated by the extreme necessity of excluding oil slicks from Sooke Harbour and Basin. This, in spite of the fact that currents flow past the eastern tip of Whiffen Spit at up to 4 knots. Offshore dispersion of oil slicks is not recommended if there is any possibility that the oil-disperant mixture will move into Sooke Basin where it may contaminate cultured and natural oyster beds. If offshore containment and recovery techniques fail to control oil at sea, efforts to strand slicks outside of Sooke Inlet should be attempted. The seaward beach face of Whiffen Spit and the shoreline between Woodward Point and Simpson Point are potential sacrificial beaches.

### Protection

High priority is assigned to the closure of Sooke Inlet to oil slicks. The most practical method appears to be diversion of slicks onto the seaward side of Whiffen Spit and onto the shoreline along the eastern side of the inlet between Woodward Point and Simpson Point. If protection methods fail to prevent oil penetration at Whiffen Spit, a second line of protection booming should be established between Billings Point and Hill Head. At the same time, boom should be deployed around marine installations in Sooke Harbour, at the outlet of the Sooke River and if possible, around the oyster beds northwest of Harrison Point and west of Sooke River.

Finally, should booming fail to prevent oil from entering Sooke Basin proper, immediate steps to boom off Anderson Cove, Roche Cove, Hutchinson Cove and



Cooper Cove should be implemented.

#### Cleanup

Cleanup operations inside Sooke Harbour and Basin must be approached with a great deal of caution. Oil that has coated sand and mud flats can easily be mixed in with fine sediments by foot and vehicular traffic, making it virtually impossible to remove. Gentle flushing with copious amounts of water is likely to be the optimum strategy for cleaning these flats. Once flushed, oil must be collected and removed from receiving waters.

Sooke Basin itself is a low energy environment that will take an excessive length of time to self-clean unless appropriate remedial measures are taken. These include flushing out mud flats and creek mouths, scraping beaches, high pressure hosing rock faces and removing oiled debris for disposal. When partially enclosed coves are cleaned, they should be boomed off until nearby areas are also cleaned to prevent recontamination.

Extensive log booming grounds outside of Cooper Cove will trap a great deal of oil if contaminated. This can normally be removed during the log de-barking process but care should be taken to collect and recover oil and debris as it is washed off. It may be feasible to burn this mixture in a beehive burner.

Marine installations such as docks, breakwaters, floats and buoys may require cleaning with steam hoses or hot water. Solvents and dispersants are not recommended for cleaning purposes as most man-made structures are in the vicinity of natural shellfish beds and oyster leases.

Sacrificial beaches should be cleaned or excavated depending on the degree of contamination. Removed sediments must be replaced with compatible material to avoid destabilization of beaches. The B.C. Waste Management Branch have identified a possible oily waste disposal site in the Sooke area.

### Access

Road access to shorefronts in the Sooke area is excellent except for the coastline south-east of Iron Mine Bay. Marine access is somewhat limited in Sooke Harbour by extensive sand and mud banks. Tugs and barges have no difficulty entering Sooke Inlet but careful reference to marine charts is advised to avoid rocks and sandbars.

There is no airstrip at Sooke but seaplane landings are feasible in several areas of Sooke Harbour and Basin.

### Resources

Biological resources in Sooke Harbour and Basin are highly important to both commercial and recreational users. In Sooke Harbour, extensive eel grass beds on tidal flats coincide with crab grounds. Clams occur throughout the area in coves, pocket beaches, on the Sooke River Delta and along the inner shore of Whiffen Spit. There are oyster leases at Anderson Cove, Goodridge Island and the Sooke River Delta. Oysters are also found in most tidal flats. Shrimp are fished in the west central portion of Sooke Basin. A light intermittent herring spawn takes place at Anderson Cove and there is a recreational salmon fishery near Whiffen Spit and Hill Head.

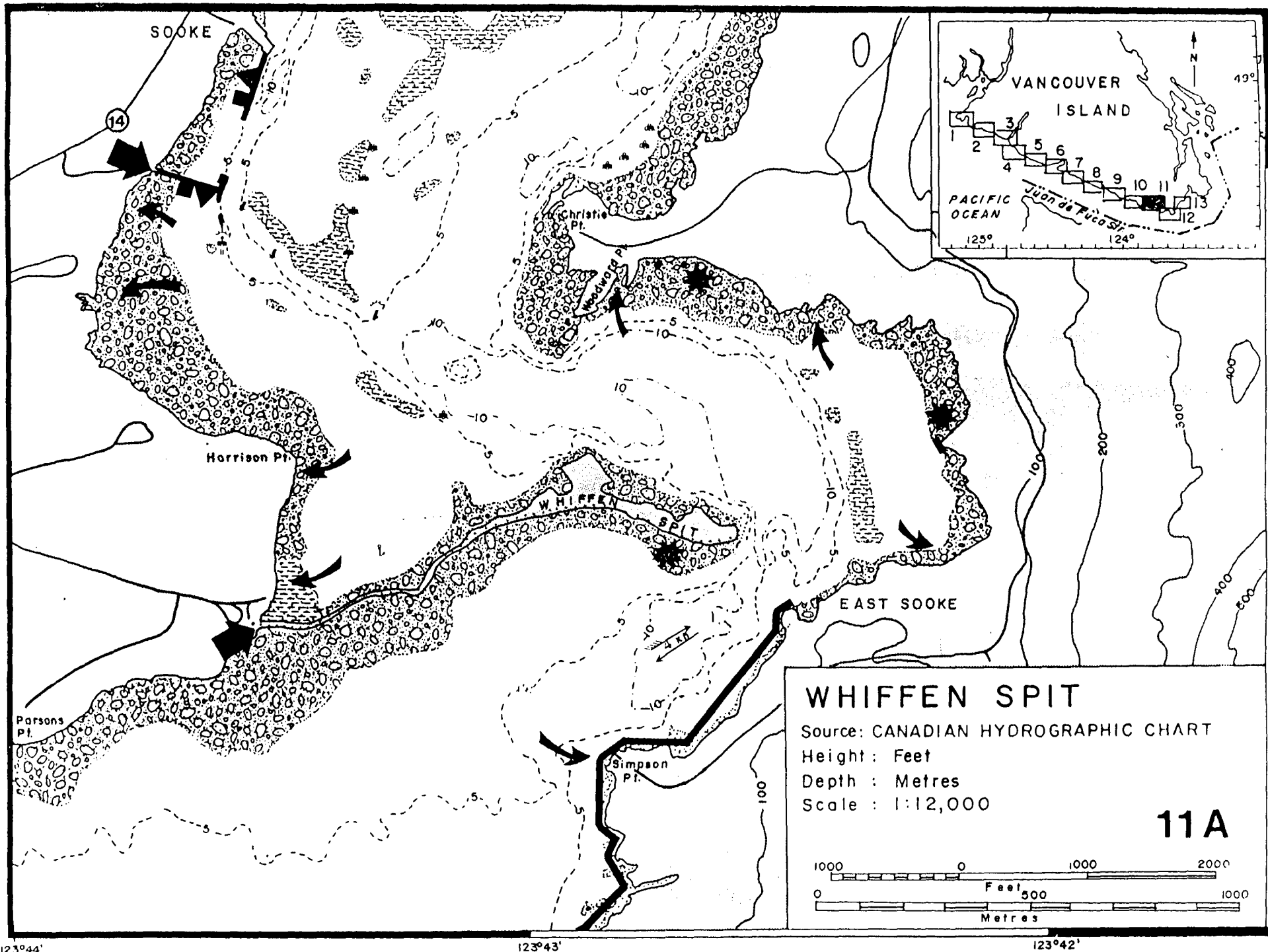
The Sooke River outlet forms the largest estuary in the district but other estuarine type environments occur at Coopers Cove, Roche Cove, Hutchinson Cove and Anderson Cove. Some of the streams entering these coves support runs of chum and coho salmon.

The entire Sooke Basin and Harbour area is considered important to migratory and wintering waterfowl. Species include alcids, divers, dabbling ducks, geese, swan and gulls. The most highly frequented sites lie at stream mouths and on drying sandbars and mudflats.

The exposed shoreline outside of Sooke Harbour is less environmentally sensitive. There are, however several areas of significance. Shellfish beds near Parsons Point, Iron Mine Bay and on scattered pocket beaches east of O'Brian Point should receive protection if conditions permit.







Human use of the Sooke Basin area is fairly intensive. Coopers Cove is the site of a large sawmill operated by Sooke Forest Products Limited. Extensive booming grounds in the vicinity are used for mill storage and by other forest and towing companies. Anderson Cove is the site of a viable oyster growing operation. Other oyster leases have been affected by sewage contamination. Sooke Harbour is the site of several marine companies that service the fishing industry and recreational users. Other marinas exist at Coopers Cove and Billings Spit and there are many private docks throughout Sooke Basin.

Sooke Basin is rich in archaeological sites and great care must therefore be exercised in cleanup operations, particularly with heavy equipment. There is a large Indian reserve on the east side of the Sooke River mouth and much of the foreshore southeast of Simpson Point is part of East Sooke Regional Park. The town of Sooke is the largest community in this district; other seaside communities exist at Milnes Landing and Cooper Cove.











## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3641/3642/3607
Topo. maps	92 B/5
Video tape	#6

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## Map 11A - Whiffen Spit - Sooke

### Protection

The waters of Sooke Inlet on either side of Whiffen Spit are the logical areas for staging protection operations. Current speeds of up to four knots directly east of Whiffen Spit may prevent simple exclusion of oil slicks from Sooke Harbour unless they can be successfully diverted into the lower energy areas indicated on the map.

During periods of westerly and south-westerly winds it is very likely that wave activity will prevent boom deployment seaward of Whiffen Spit. The main focus of slick control should therefore be placed within Sooke Inlet, in the area to the east of Woodward Point. Here, diversion boom should be placed such that slicks are diverted into skimmers or onto sacrificial beaches. Sumps, trenches and mid inter-tidal dykes should be prepared on these beaches so oil can be collected and removed for disposal.

During calm weather and periods of south-east winds, it may be possible to deploy oil spill equipment seaward of Whiffen Spit, outside of the high velocity current zone. Protected by the land mass to the south-east of these waters, it is feasible to attempt both containment and recovery of oil slicks and diversion of slicks into skimmers or sacrificial beaches. The seaward beach face of Whiffen Spit is not optimally suited for either natural or manual cleanup, but its temporary sacrifice is preferable to the contamination of Sooke Harbour and Basin. If possible, Whiffen Spit beach should be prepared in advance to minimize the extent of contamination. If wave conditions permit, trench and dyke emplacements should be constructed at the mid-tidal areas where oil is being diverted to. Lining these trenches with polyethylene sheeting should

limit the oil penetration into coarser sediment beaches. Sufficient pumps, tank trucks and oily water separators should be made available to cope with the amount of oil coming ashore. As this spit is in a state of dynamic equilibrium, great care should be taken to restore it to its original configuration so as to avoid possible breaching during winter storms. Consultation with beach experts to this end is advisable.

### Cleanup

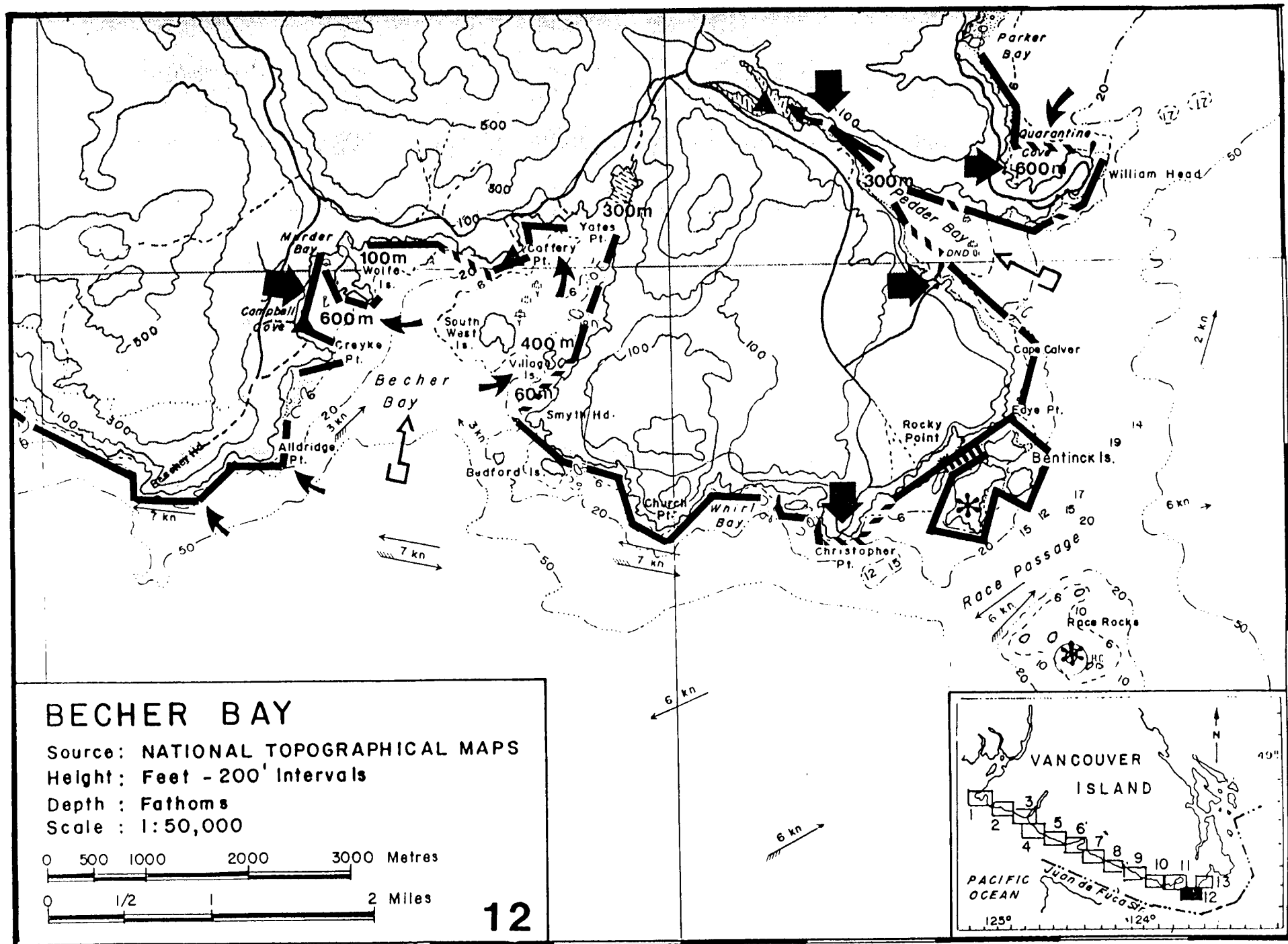
The scope of this section deals only with cleanup recommendations applicable to the beaches around Whiffen Spit and the entrance to Sooke Harbour. Due to the complexity and sensitivity of Sooke Harbour a single, site-specific protection and cleanup plan for this whole area is planned.

The seaward side of Whiffen Spit is susceptible to rapid natural cleaning as is the rocky eastern shore of Sooke Inlet. Oil which is naturally removed however, is likely to be re-deposited in zones of lesser wave energy, perhaps in Sooke Harbour itself. It is therefore recommended that all high energy shorelines adjacent to Sooke Inlet be carefully cleaned, particularly where it has been necessary to divert oil onto sacrificial beaches.

Once the exterior approaches to Sooke Inlet have been fairly well cleaned, oil removal operation should commence inside of Whiffen Spit. Priority cleanup should be assigned to mud flats and sacrificial beaches. If oil has adhered to rock faces, it may be water-blasted, scraped, steamed or sand-blasted off, provided that oil is collected as it is removed. It may be advisable to conduct these operations during the ebb tidal flow out of Sooke Harbour. Oil that escapes collection will then flow out into Juan de Fuca Strait instead of Sooke Harbour. In some instances this type of cleanup may disturb seaside flora and faunal inter-tidal communities. Biologists should therefore be consulted before full scale cleanup operations commence.

The cleanup of mixed sediment beaches will prove to be the most difficult operation. Where sediments are coarse and deep, oil will tend to penetrate. Where this type of beach is not exposed to wave energy, as on the landward side of Whiffen Spit, oil will tend to persist for an inordinate length of time, both on the surface of exposed rocks and to the depth it has penetrated. There is also a possibility that oiled cobble will form a sub-surface pavement that may take years to erode and disappear.

If oiling has not been severe, low pressure water flushing, possibly using dispersant chemicals, may suffice to remove the bulk of the oil contamination from coarse sediment beaches. The only real alternative for cleaning heavily oiled beaches of this type is to remove contaminated sediments with bulldozers, clamshells and front-end loaders. This technique will cause severe disruption to the stability of the beach and have long term consequences for the local ecosystem. Excavated beach sediments should therefore be cleaned and restored or replaced with clean material from other sources. It must be emphasized that an operation of this type should only be performed under the expert guidance of engineers, biologists and shoreline geomorphologists, to ensure that environmental impact is minimized.







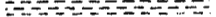

123°40'

123°35'











## Legend

### Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





### Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

### Resource material

Hydro. charts	3448/3452/3422
Topo. maps	92 B/5
Video tape	#6/#7

### Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

## 12 Becher Bay

### Spill Response

Currents in excess of five knots, tide rips and tide whirls make offshore containment and recovery impractical and possibly dangerous. Opposing winds and swell movement often build up confused and treacherous sea conditions that can make deployment of oil spill equipment impossible. Heavy vessel traffic through the offshore reaches of this area may interfere with cleanup operations.

Within these limitations, offshore response will require measures that may be inappropriate in other areas. Aerial and surface application of dispersants may be the only effective method of preventing oil slicks from coming ashore or spreading into the San Juan Islands to the east.

### Protection

Severe tide rips and whirls make protection impossible on the exposed inshore coast, particularly between Christopher Point and Smythe Head and on the coast running west from Alldridge Point. Inside Becher Bay, containment boom should be deployed to protect Campbell Cove, Murder Bay and the bay northeast of Cafferty Point. If weather and tidal conditions permit, the whole northeast shoreline of Becher Bay might be protected by deploying boom between Southwest Island, Village Islet and the point north of Smyth Head. Existing buoys and pilings in this area will facilitate this boom deployment and provide moorage for small craft and barges.

Pedder Bay and Quarantine Cove also warrant boom protection as indicated on Map 12. While excessive currents may preclude oil retrieval, diversion and cascade boom configurations may be effective in preventing oil contamination of Race Rocks and Bentinck Islands by channelling slicks past these sensitive sites.

Great care will be required to adjust boom deployments to changes in tidal direction and to ensure that sufficient time is allowed for men and equipment to vacate this exposed area should weather conditions deteriorate. Response personnel should be aware that Bentinck Island, Rocky Point and William Head are restricted access areas. Permission to land must be procured from Department of National Defense and William Head Penitentiary officials.

#### Cleanup

The dominant shoreline characteristic in this map is that of a steep bedrock inter-tidal zone. As such, shoreline trafficability will be difficult for pedestrians and virtually impossible for machinery. Cleanup will be restricted to such techniques as water-blasting and manual scraping. Sand-blasting or torching are alternatives requiring more caution and expertise.

Within Pedder Bay, Becher Bay and around Bentinck Islands pocket beaches of sand or gravel may be contaminated. In most cases, manual removal with hand tools will be the most practical cleanup technique, especially where oil has remained on the beach surface. Where deep penetration of gravel substrates has occurred, it may be necessary to excavate beaches with front-end loaders or bulldozers.

Shoreline cleanup will be required in Becher Bay between Creyke Point and Smyth Head, in Pedder Bay, Quarantine Cove and Parker Bay, particularly around marinas and creek mouths. Cleanup crews should also be assigned to East Sooke Park, Whirl Bay, Bentinck Island, Race Rocks and William Head. Race Rocks should be cleaned with particular care due to their intensive use by seabirds and marine mammals. Extensive booming grounds on the east side of Becher Bay may present difficult cleanup problems if logs are contaminated.

### Access

Access to shorelines throughout this area is generally good but permission from private and institutional owners may be necessary. Road access to points on the western side of Becher Bay is good to Beechey Head but permission from the Capital Regional District will be required to use forest roads in East Sooke Park. The north side of Becher Bay is paralleled by a road that provides access to Cafferty Point, Yates Point and Yates Point Bay, over Indian reserve lands. The east side of Becher Bay and the adjacent islands are Indian property and accessible only by boat.

The Rocky Point Military Reserve is accessible over roads controlled by the Department of National Defense. The head of Pedder Bay can be reached near Ashe Point and at Lester B. Pearson College. William Head can be reached with permission of prison authorities. Quarantine Cove and Parker Bay are easily reached via the William Head Road.

Water access is available at Campbell Cove, Murder Bay, Cafferty Point, Yates Point Bay, Pedder Bay and Parker Bay. Sheltered small craft anchorages are available in the northern parts of Becher Bay and Pedder Bay. Pedder Bay has a large vessel docking facility at the navy munitions jetty, but approval of National Defense authorities will be required for its use.

### Resources

This map area supports a rich and diverse array of biological resources. Exposed rocky shorelines such as Race Rocks, Church Point, William Head, Alldridge Point and Beechey Head are rich in populations of abalone, geoduck, sea urchin and kelp beds. Race Rocks is a major bird colony and haulout for marine mammals. Juvenile salmon are likely to concentrate near most headlands during the summer. Squid spawn in Pedder Bay. Salt marsh estuaries lie at the outlets of streams flowing into Murder Bay and Pedder Bay.

Shellfish and crabs occur in the sand/mud flats around Bentinck Island, Pedder Bay and in pocket beaches near Beechey Head. Wintering flocks of ducks, gulls, divers and alcids reside in Becher Bay and Pedder Bay.

Much of the marine foreshore has been preserved in this area by inclusion in East Sooke Park, military reserve, Indian reserve, the Lester B. Pearson College grounds and the William Head Penitentiary. While much of this land is not open for public use, its preservation in its existing natural state is highly desirable.

Very little industry takes place in this area except for the log storage grounds on the east side of Becher Bay. There are small craft marinas at Campbell Cove, Murder Bay, Cafferty Point, Pedder Bay and Quarantine Cove.

# ROYAL ROADS

Source: NATIONAL TOPOGRAPHICAL MAPS

Height: Feet

Depth: Fathoms

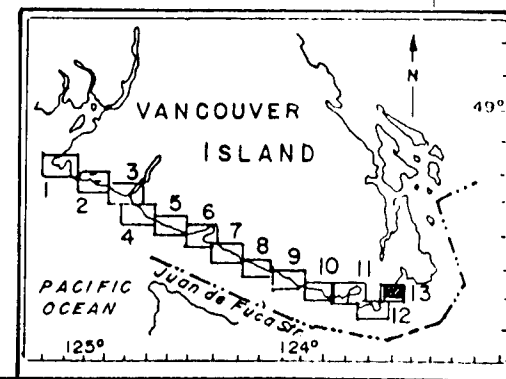
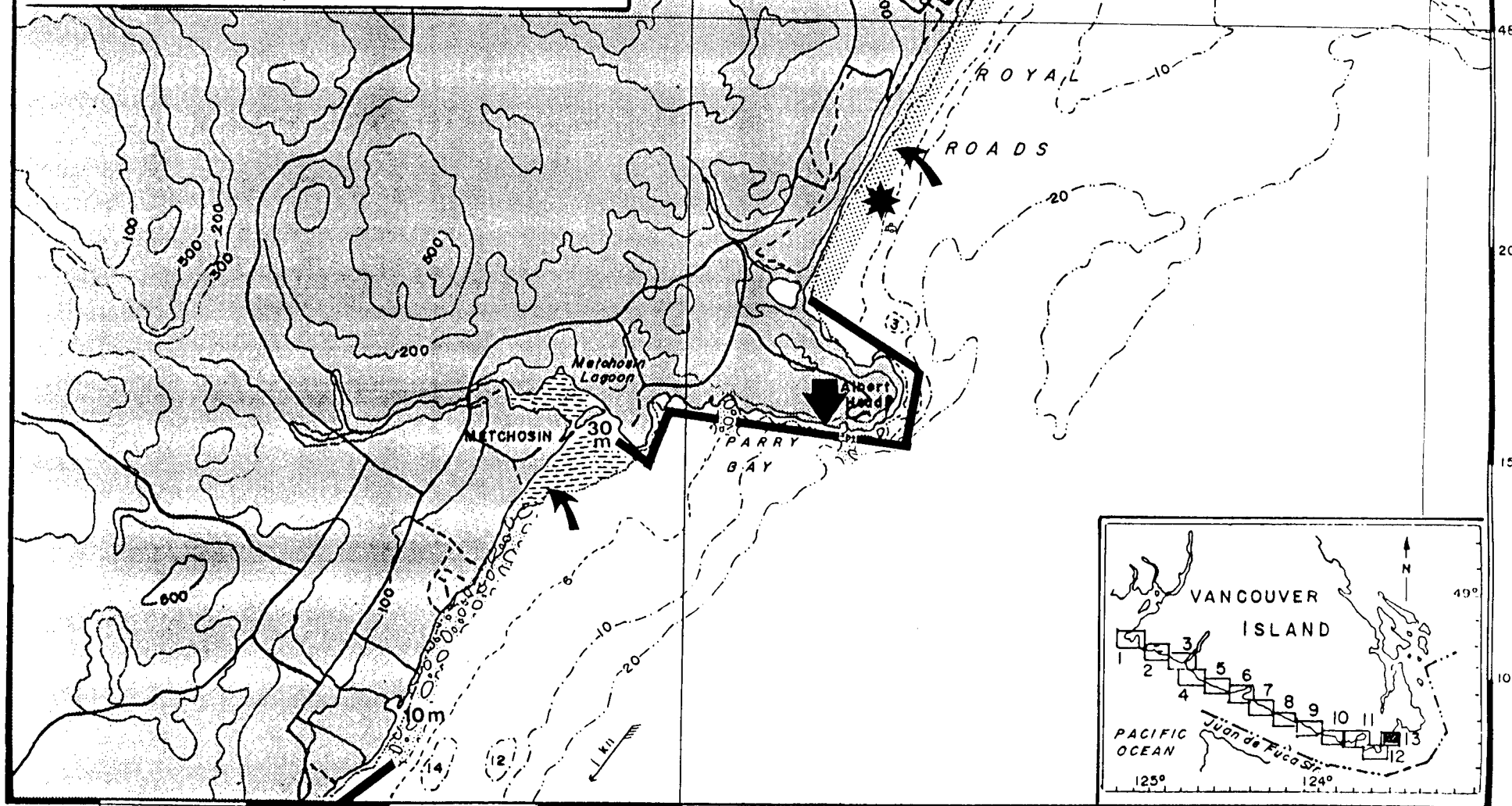
Scale: 1:50,000

0 500 1000 2000 3000 Metres

0 1/2 1 2 Miles

Not for Navigation

13









123°30' W









123°25' W

Legend

Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

Resource material

Hydro. charts	3422/3448/3413
Topo. maps	92 B/5 92 B/6
Video tape	#7

Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

Operational Map 13 Royal Roads

Spill Response

Southeast winds may make offshore response impractical but during calm weather or mild westerly conditions, the operation of boats and other floating cleanup appliances should pose no problems for the on-scene commander. As oil slicks are likely to approach from the south on flood tides, response crews should have sufficient time to prepare for recovery, dispersion and protection operations. As fouling of shorelines in this map area is certain to result in public demand for meticulous cleanup, the on-scene commander must determine early that his containment and recovery equipment will control oil slicks. Aerial and marine application of dispersants may be the only alternative to severe shoreline contamination. The consequences of either option are profound and must be weighed with an appreciation for environmental and social repercussions.

Protection

Metchosin Lagoon and Esquimalt Lagoon are highly sensitive environments that should be fairly simple to protect. Approximately 50 metres of inshore boom will be sufficient to prevent oil from entering either place. A more effective strategy may be to dam their entrance channels with locally borrowed fill until the threat of contamination has passed. This technique requires that a sub-surface culvert be installed to allow clean water to pass back and forth on tidal changes to maintain water temperature and quality.

Esquimalt harbour should be protected with approximately 600 metres of boom at the entrance. As weather conditions and vessel traffic will likely make it impossible to simply install a continuous length of boom, special boom

configurations will be required to permit vessel movement. Diversion and cascade modes are recommended. Extensive beaches north and south of Albert Head probably warrant protection but they may be more useful as sacrificial beaches which can be cleaned or replaced at the termination of the cleanup operation. Trench and dyke emplacements at the mid-tide level may prevent oil from reaching upper beach levels and facilitate oil collection. This technique is not effective when waves are high enough to erode earthworks.

### Cleanup

The cleanup of sandy beaches between Fisgard Light and Albert Head will be fairly straight forward. Graders and elevating scrapers can pile the oiled sand into windrows which can be removed by scrapers or front end loaders. This beach appears to have sufficient bearing capacity to permit access to large-tire vehicles.

The rocky foreshore around Albert Head will likely require manual cleaning with water or steam hoses, sand blasters or scraping tools. The headland is impassable but good access to other sites on this map makes its trafficability unnecessary.

Metchosin Lagoon is a muddy environment on either side of the barrier spit. Vehicular travel should therefore be limited. Oil removal below the high tide line should be done with low pressure water flushing. Sandy super-tidal areas are appropriate for moving machines along the beach.

The mixed sediment beach south of Metchosin Lagoon may pose more complex problems for cleanup crews. If oil contamination is light, flushing with copious amounts of salt water may float oil out of cobble beaches for collection at the waters edge. Heavily contaminated beaches will likely require excavation with front end loaders, bulldozers or clamshell drag lines. Excavated material should either be cleaned or land filled in an appropriate location. Excavated beaches should be restored with clean, compatible material.

### Access

Road access to shorelines is excellent throughout this map area although permission from private owners in

the Metchosin Lagoon area will be required. The sandy beaches north and south of Albert Head are sufficiently stable to permit passage by heavy equipment, particularly at low tides. If necessary, landing barges will encounter few difficulties placing cleanup equipment ashore in the few sites where road access is not available.

#### Resources

Metchosin and Esquimalt Lagoons are low energy salt marsh environments with many estuarian characteristics. They are excellent habitat for diverse aquatic organisms and a haven for a variety of seabirds and waterfowl. Esquimalt Lagoon has been designated as a federal bird sanctuary.

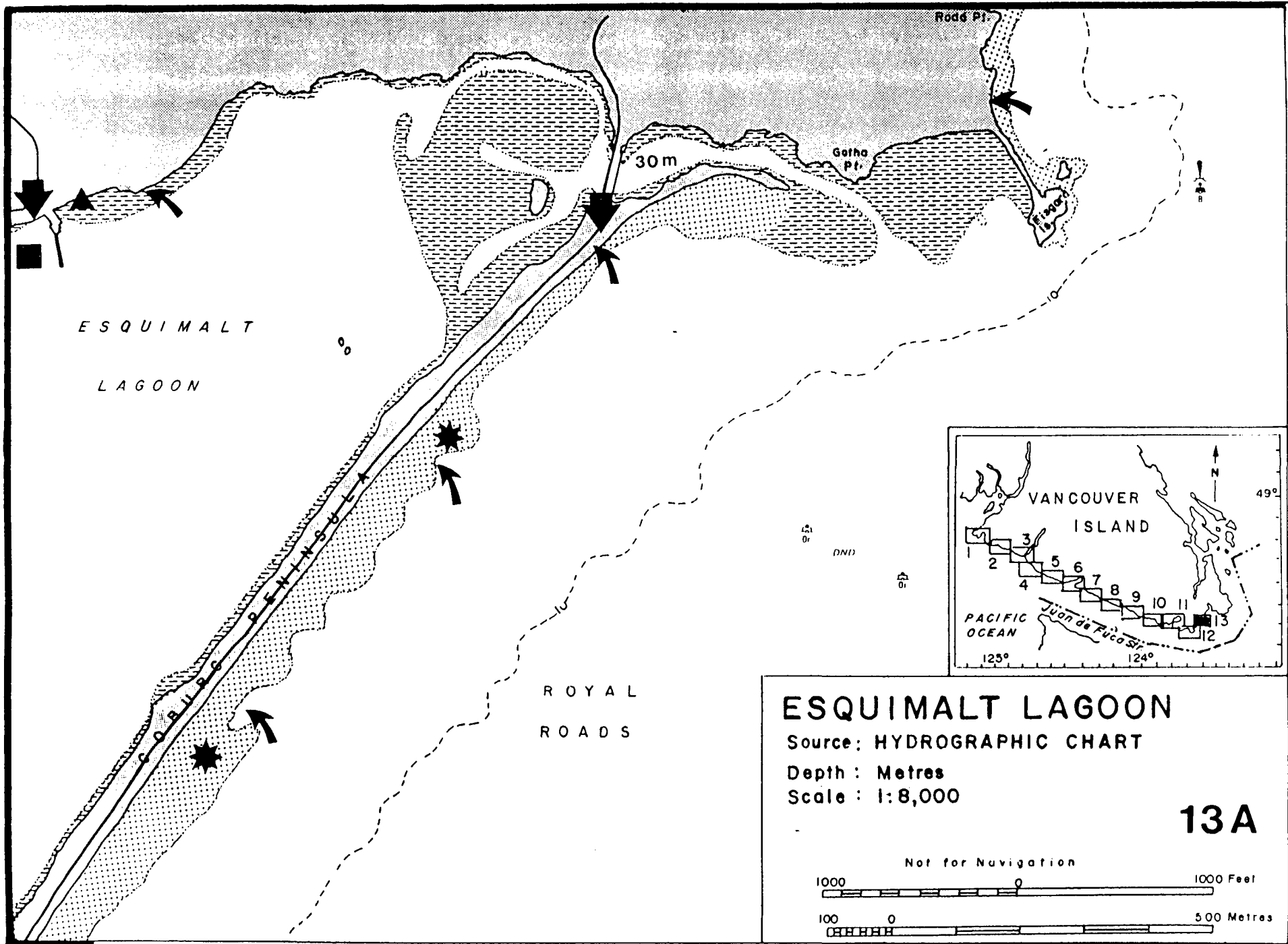
Open seaward beaches are reported to have clam populations while offshore, dungeness crabs and geoduck clams are found. Squid spawn on beaches south of Metchosin Lagoon during February, and smelt spawn is also reported in this area. Juvenile salmon are frequently encountered off Albert Head and Duntze Head during spring and summer.

The natural beauty of this area has made it attractive to sightseers, beach goers and residential users. Metchosin and Esquimalt Lagoons have park and beach facilities as does Fort Rodd Hill Park at the western side of the entrance to Esquimalt Harbour.

Albert Head is owned by the Department of National Defence but public access is permitted. Much of the waterfront land south of Metchosin Lagoon is privately owned and the uplands over Esquimalt Lagoon are part of the Royal Roads Military College. Duntze Head, at the eastern entrance to Esquimalt Harbour is owned and utilized by the Department of National Defense.







The large sand and gravel operation at the southern end of Royal Roads is owned by Construction Aggregates Ltd. If large amounts of fill are required to build dams or replace contaminated beaches, this facility, with its barge loading conveyor ramp, is the logical place to acquire such material.













Legend

Shoreline Classification

Bedrock cliff	
Rock platform	
Mixed sediment	
Sand	
Tidal Flats	
Sequence of rocky headlands and pocket beaches	





Access

Road	
Trail	
Docking facility	
Launch ramp	
Staging area	
Float plane landing	
Helicopter pad	
Marine access	

Resource material

Hydro. charts	3417/3422/3414
Topo. maps	92 B/6
Video tape	#7

Countermeasures

Boom deployment	metres (m)
Sacrificial beach	
Oil collection point	
Oil burning site	
Oil disposal site	

Tactical Map 13A - Esquimalt Lagoon

Protection

Esquimalt Lagoon is protected by a long sand spit except at its northern end where a twenty metre wide channel allows ocean water to pass during tidal changes. If offshore remedies have not been effective in preventing the approach of oil slicks, this channel should either be boomed or dammed to avoid oiling of the lagoon. Damming this narrow channel is likely to be the most effective method of protection, provided that allowance is made for the exchange of water during tide changes, either by constructing a valved, sub-tidal culvert under the dam or by pumping clean sea water directly into the lagoon. It may be unwise to do this if an excessive amount of oil has impacted the seaward side of Coburg Peninsula, due to hydrocarbons in the water column which may taint or distress biota within the lagoon. Conversely, if seawater is not kept in circulation through the lagoon, oxygen depletion or temperature changes may prove harmful to organisms. It is, therefore, important that the on-scene-commander expedites the removal of oil from the adjacent area in order to reopen the lagoon channel as soon as possible.

Cleanup

Cleanup of sandy beaches on the seaward side of Coburg Peninsula should be practical with the use of heavy equipment such as graders, scrapers and front end loaders. The bearing capacity of this beach should be sufficient to permit the passage of tyred vehicles. The use of tracked vehicles should be discouraged as they tend to grind oil deep into beach sediments.

Should oil enter Esquimalt Lagoon, cleanup will require a great deal of caution and care. Substrates within the lagoon are extremely sensitive to human and vehicular traffic which can cause oil to be mixed in with the fine grain sediment mud flats. Removal of oil from this environment may best be accomplished by flushing oil with low pressure water into collection areas. Once an area has been satisfactorily cleaned it should be protected from recontamination as other areas are subsequently flushed. Shallow draft floating platforms may provide the most effective work stations for operations in inaccessible areas of the lagoon, while limiting foot traffic.

During the fall and winter it may be beneficial to burn off areas of oiled vegetation. A biologist should first be consulted to ensure that wildlife are not endangered by the fire.

#### 4.0 SELECTED BIBLIOGRAPHY

Canada, Dept. of Fisheries and the Environment, Small Craft Guide, Vancouver Island, Vol. 1, fourth edition, Institute of Ocean Sciences, Patricia Bay, Sidney, B.C. (1979).

Canada, Dept. of Fisheries and Oceans, Sailing directions, British Columbia Coast, Vol. 1, Southern Portion, Institute of Ocean Sciences, Patricia Bay, Sidney, B.C. (1979).

Fiddy, K. et al., The Juan De Fuca Oil Spill Contingency Study, Canadian Local Initiatives Program, Vancouver, B.C. (1974).

Woodward-Clyde Consultants, Manual of Practice for Protection and Cleanup of Shorelines, Vol. 1 and 2, EPA-600/7-79-1876, Prepared for United States, Environmental Protection Agency, San Francisco. (1979).

Canada, Department of Environment, The Basics of Oil Spill Cleanup, Environmental Emergency Branch, E.P.S., Hull, (1979).

Woodward-Clyde Consultants, Pacific Coast Spill Response Manual, Prepared for Canada, Environmental Protection Service, Victoria, (1981).

British Columbia, Ministry of Lands, Parks and Housing, Sooke Harbour and Basin, Crown Foreshore Plan Victoria, (1980).

Canada, Canadian Forestry Service, Shore and Landscape Analysis on the Western Section of the Capital Regional District of British Columbia, Victoria, (1980).

Bauer, W. and Burns, J., Marine Shore Resource Inventory and Analysis, Western Community Component, for the Capital Regional District, Victoria, (1977).

Capital Regional District, Parks Branch, Parks Booklet, Victoria, (1980).

Lindstedt-Siva, J., Oil Spill Response Planning for Biologically Sensitive Areas in the Northern Puget Sound Sound Region, Los Angeles, (1978).

Canada, Department of Environment, Oil and Chemical Spill Countermeasures Map Series, Environmental Protection Service, Vancouver, (1975).

Woodward-Clyde Consultants, South Vancouver Island Video-Tape Survey, Esquimalt to Bamfield, Prepared for Canada, Environmental Protection Service, Victoria, (1981).

Worbets, B., Shoreline Oil Spill Protection and Cleanup Strategies: Southern Beaufort Sea, Prepared for the Arctic Petroleum Operators Association, Edmonton, (1979).

British Columbia, Ministry of Lands, Parks and Housing, Whiffin Spit, Victoria, (1979).

Oregon, Department of Land Conservation and Development, Oil Spill Protection Plan for the Natural Resources of the Lower Columbia and Willamette Rivers, Portland, (1979)

Canada, Department of Fisheries and Environment, West Coast Offshore Environment, Map Series, Environmental Protection Service Vancouver, (1978).

United States, Department of Transportation, Investigation of Extreme Weather Oil Pollution Response Capabilities, N.T.I.S.C.G.-D-68-78, Falls Church, Virginia, (1978).

L.G.L. Ltd. and E.S.L. Ltd., Map Folio, Vol XVII, Biological Resources of Coastal and Offshore British Columbia: Inventory and Analysis of Sensitivity to Oil Spills, For Trans Mountain Pipe Line Company Ltd., Vancouver, (1980).

B.C. Forest Products, Visitors Guide Map, Renfrew-Cowichan-Nitinat, Vancouver, (1980).

British Columbia, Ministry of Environment, "Southern British Columbia Coastal Wildlife Resources Map, Victoria, (1977).

Concawe, A Field Guide to Coastal Oil Spill Control and Cleanup Techniques, Report No. 9/81, Den Haag, (1981).