ENVIRONMENT CANADA
ENVIRONMENTAL PROTECTION SERVICE

SHELLFISH GROWING WATER BACTERIOLOGICAL AND SANITARY SURVEY OF THETIS ISLAND, KUPER ISLAND, BOAT HARBOUR, DECOURCY ISLAND, DEGNEN BAY, AND FALSE NARROWS, BRITISH COLUMBIA, 1982-1983

Regional Program Report 83-12

By

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ABSTRACT

During June and August 1982 and February 1983, the Environmental Protection Service conducted bacteriological surveys of bivalve molluscan shellfish growing waters in several areas of Stuart Channel, including Gabriola Island, Boat Harbour , Decourcy Island, Pylades Island, Thetis Island and Kuper Island. The surveys were conducted to classify the shellfish growing waters in accordance with federal bacteriological pollution standards for acceptable shellfish harvesting areas. Sanitary surveys were conducted concurrently to identify and evaluate the sources of fecal pollution to the marine waters.

The data collected indicated that the majority of shellfish growing areas met the approved bacteriological standard. However, portions of Degnen Bay, Pirate's Cove, Telegraph Harbour, Clam Bay, and Tent Island are subject to levels of fecal contamination which render the waters unsuitable for shellfish harvesting all or part of the time. As a result, two new closures and two amendments have been added to Schedule I (Contaminated Areas) of the Pacific Shellfish Regulations.

RÉSUMÉ

En juin et août 1982 ainsi qu'en février 1983, le Service de la protection de l'environnement a effectué une analyse bactériologique des eaux où vivent des molluques bivalves, dans plusieurs secteurs du bras Stuart, l'île Gabriola, Boat Harbour, les îles Decourcy, Pylades, Thetis et Kuper. Cette analyse a eu pour objet de classer les eaux où vivent les mollusques selon qu'elles sont ou non propres à leur pêche, par rapport aux normes fédérales de pollution bactériologique. En même temps, on a effectué des analyses sanitaires pour identifier et évaluer les formes de pollution des eaux de la mer par matières fécales.

Les résultats obtenus par les analyses ont révélé que la majorité des zones où vivent les mollusques étaient conformes à la norme bactériologique établie. Cependant, certaines parties de Degnen Bay, Pirate's Cove, Telegraph Harbour, Clam Bay et l'île Tent ont atteint un niveau de pollution fécale tel que leurs eaux sont devenues impropres à la pêche des mollusques, de façon continue ou discontinue. En raison de ces résultats, deux nouvelles zones interdites et deux amendements ont été ajoutés à la partie I (zones contaminées) des "Règlements relatifs à la pêche des mollusques dans le Pacifique".

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DFO	Department of Fisheries and Oceans
EPS	Environmental Protection Service
FC	Fecal Coliform
FS	Fecal Streptococci
G	"greater than"
L	"less than"
m	metres
mL	millilitres
m^3/sec	cubic metres per second
MF	Membrane Filtration
MPN	Most Probable Number
ppt	parts per thousand
$\bar{x}$	arithmetic mean

CONCLUSIONS

1. Degnen Bay, Gabriola Island is subject to fecal contamination from pastureland drainage and vessel sewage discharges.

2. During periods of heavy rainfall, the existing shellfish closure in Degnen Bay is of insufficient size to protect the health of the shellfish consumer.

3. The rainfall recorded during the February 1983 sampling was approximately 2.8 times the average rainfall recorded for Gabriola Island, ie., 255.6 mm vs. 89.5 mm. Therefore, it is difficult to predict whether the extensive fecal contamination observed throughout Degnen Bay in February would be a normal occurrence.

4. The overlying waters of oyster lease L.352 in Degnen Bay are significantly influenced by the streams draining sheep grazing areas, both with respect to salinity reduction and fecal pollution. Due to the observed grazing practices and the proximity of the lease to the drainage streams, it is likely that fecal contamination of this lease would occur under normal February rainfall conditions.

5. Water quality at oyster lease L.359 in Degnen Bay was also contaminated during February but not to the extent observed at L.352. Salinity values were near control levels and the approved growing water status was met when summer and winter data were combined. It is possible, therefore, that fecal contamination may not be observed at this lease during "normal rainfall" in the winter.

6. Water quality at oyster lease UF7 in Degnen Bay was influenced by a stream which resulted in reduced salinities and elevated fecal coliform values. Since the flows observed in this stream were not large, even during the heavy rainfall, the impact of this discharge is considered limited.

7. Sewage discharges from anchored and moored vessels were the only identified pollution sources in Degnen Bay during August.

8. Observed sources of pollution to False Narrows were not considered significant to influence water quality given the considerable tidal action.

9. Marine waters at one location near False Narrows may become polluted due to highly contaminated runoff from pastureland. The culvert is equipped with a flap-gate which prevents the discharge of drainage during high tide. Therefore, the absence of high fecal coliform counts at this location does not necessarily indicate acceptable growing water status.

10. A portion of the Boat Harbour lagoon is subject to fecal contamination due to unidentified sources at the head. Considering the relatively low fecal coliform levels recorded, despite the record-breaking rainfall in Febuary 1983, it is anticipated this area would meet the approved growing water standard most of the time. Notwithstanding this data, the high fecal coliform levels observed in littleneck clams in one EPS sample, and the consistently contaminated samples noted in commercial lots reportedly harvested from this lagoon suggest that sources at the head of the harbour are having an adverse impact on shellfish bacteriological quality, conceivably during ebb and low tides when minimal dilution occurs.

11. The growing waters of commercial oyster leases L.342 (DeCourcy Island) and L.274 (Pylades Island) are of approved quality.

12. Water quality in Pirate's Cove, DeCourcy Island continues to exceed the approved growing water standard due to sewage discharges from anchored vessels.

13. During the summer months, water quality in North Cove lagoon (Cufra Canal) on Thetis Island (including commercial oyster leases L.322, L.41 and L.267) met the approved growing water standard.

14. During the winter, a creek entering at the head of the Cufra Canal may cause localized contamination. The nearest oyster lease, L.267 BlkA, was not affected during this survey. In light of the exceptionally heavy rainfall recorded in February 1983, it is anticipated the water quality would not be worse than observed.

15. The shellstock results collected by EPS and DFO in Cufra Canal are not consistent with the high fecal coliform levels observed in samples of commercially harvested shellfish.

16. The growing waters of commercial oyster leases UNS0356436, L.288, L.332, L.467, L.301 and L.562 are of approved quality.

17. Water quality in the boat anchorage area of Tent Island continues to exceed the approved growing water standard due to sewage discharges from anchored vessels.

18. The water of Telegraph Harbour are subject to pollution resulting from moored or anchored vessels discharging untreated sewage. Although bacteriological contamination was not widespread throughout the Harbour, the potential for significant growing water and shellfish contamination exists. Data collected elsewhere in British Columbia has shown sewage discharges from anchored pleasure vessels is a major pollution source in some shellfish areas.

19. The sewage discharge from the Kuper Island Indian Mission School has been terminated, although small amounts of effluent may be generated

by the Clam Bay shellfish Company, which utilizes part of the former school facilities. The volume of discharge is not considered significant to influence water quality.

20. Shellfish growing waters overlying oyster lease UNS0353953 in Clam Bay are subject to fecal contamination from an unknown source. Contamination occurs during summer and winter and would not appear to be related to a specific high volume freshwater input (Note that mean salinities in summer were less than winter).

21. Shellfish in the Boat Channel are subject to sewage contamination despite the acceptable overlying water quality. Fecal contamination during the summer suggests an influence from the marinas in Telegraph Harbour. Shellfish samples collected in February 1983 were not contaminated although water quality at one station was borderline. It seems likely that boating activity is the main pollution source in summer, while local runoff impairs water quality during winter. Considering the record-breaking rainfall recorded in February, it is likely water quality would not be any worse than that observed.

22. Sewage discharges from anchored vessels may have resulted in water quality deterioration at locations in Clam Bay. Past studies have implicated vessel sewage discharges as major sources of fecal pollution.

23. Local on-shore sources are likely the cause of contamination along the northern shore of Clam Bay. This problem would appear unrelated to contamination noted in other portions of Clam Bay.

24. Although, evidence of freshwater was noted in Porlier Pass and Trincomali Channel, bacteriological water quality along the east coast of Thetis and Kuper Islands, notably Clam Bay, did not appear to be influenced by the Fraser River freshet.

SCHEDULE I CLOSURES

The following additions and amendments to Schedule I (Contaminated Areas) of the Pacific Shellfish Regulations have been recommended to the Pacific Shellfish Standing Committee.

Additions

1. Area 17-8. The tidal foreshore of Gabriola Island, Area 17, lying between the unnamed point 350 m southeast of the foot of Shaw Road and a point on land 200 m northeast of said unnamed point.

2. Area 17-10. The tidal foreshore of Clam Bay, Thetis Island, Area 17, lying inside a line drawn from headland to headland of the unnamed bay immediately southwest of the foot of Clam Bay Wharf Road.

Amendments

1. Area 17-5. The waters and tidal foreshore of Degnen Bay, Area 17, lying inside a line drawn from the beach across at the foot of Gray Road on the west shore to the unnamed point immediately opposite on the east shore, northwest of Josey Point.

2. Area 17-13. The tidal foreshore of Telegraph Harbour, Thetis Island, Area 17, lying inside a line drawn from Donckele Point on Kuper Island to Foster Point on Thetis Island, including the intertidal area of the "boat passage" between Thetis Island and Kuper Island, except that shellfish can be harvested from October 1 to May 31 each year.

Schedule I closures are shown in Figure 1.

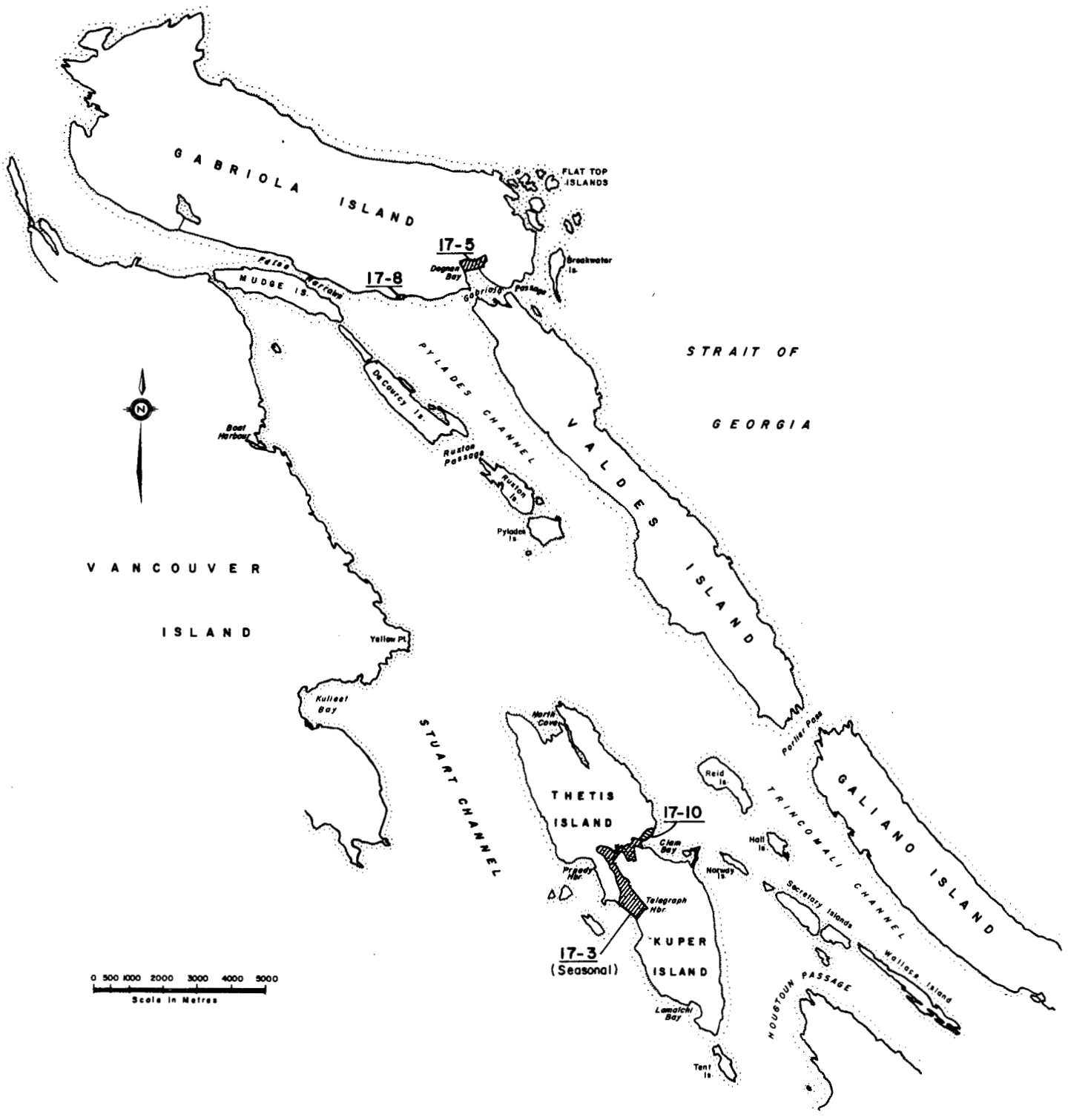

FIGURE 1 RECOMMENDED SCHEDULE I CLOSURES IN THE STUDY AREA

1. INTRODUCTION

The study area described in this report extends from False Narrows in the north to Kuper Island in the south and includes numerous commercially harvested clam and oyster beds. Seventeen commercial oyster leases are presently listed by the Provincial Marine Resources Branch as being in active production. These are located in Degnen Bay, DeCourcy Island, Pylades Island, Dayman Island, Scott Island, Thetis Island and Kuper Island. The study areas, including oyster leases locations, are shown in Figures 2 and 3.

Previous shellfish water quality studies undertaken by the Environmental Protection Service in 1973 (1) and 1975 (2) resulted in closures being imposed in Degnen Bay, Pirate's Cove and Tent Island. A re-assessment of the shellfish growing water classifications in the study area was deemed necessary: (i) to evaluate the increased utilization of tidal and subtidal areas for commercial oyster culture and clam harvesting (ii) to investigate the increasing incidence of contaminated commercial shellfish product reportedly harvested from approved growing areas (iii) to determine the adequacy of existing shellfish closures and (iv) to ensure compliance with the Canadian Shellfish Safety Program, which requires a full re-assessment of commercial shellfish areas every ten years.

Bacteriological and sanitary surveys were scheduled in June and August of 1982 and February 1983 to coincide with a variety of potential pollution conditions. Specifically, the three surveys were designed to assess shellfish growing water quality during (i) Fraser River freshet (June), (ii) a period of increased recreational boating activity and summer home occupancy (August), and (iii) a period of increased precipitation (February).

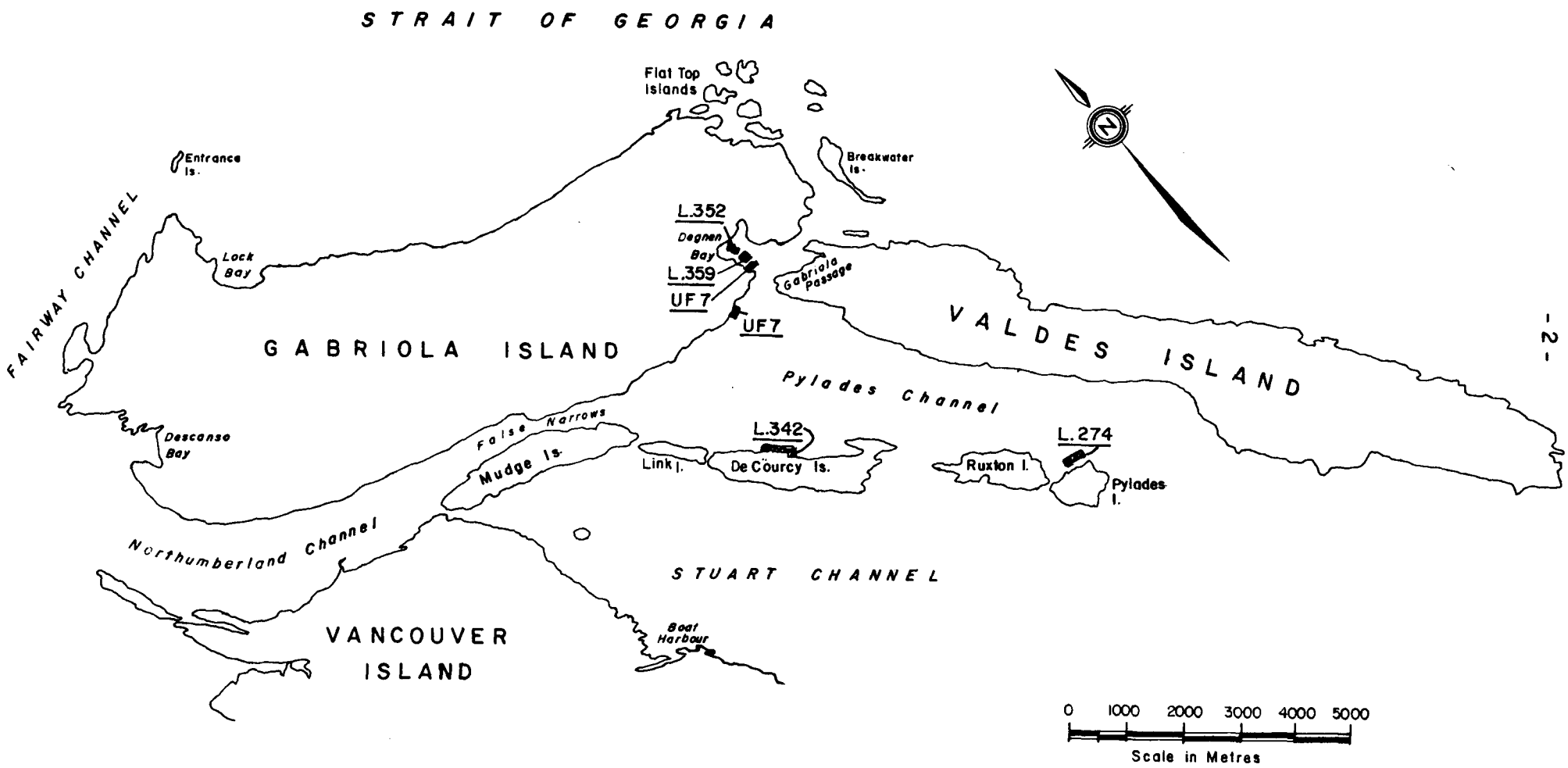

FIGURE 2 STUDY AREA AND OYSTER LEASE LOCATIONS - DEGNEN BAY, FALSE NARROWS, DE COURCY ISLAND, WHALEBOAT PASSAGE AND BOAT HARBOUR

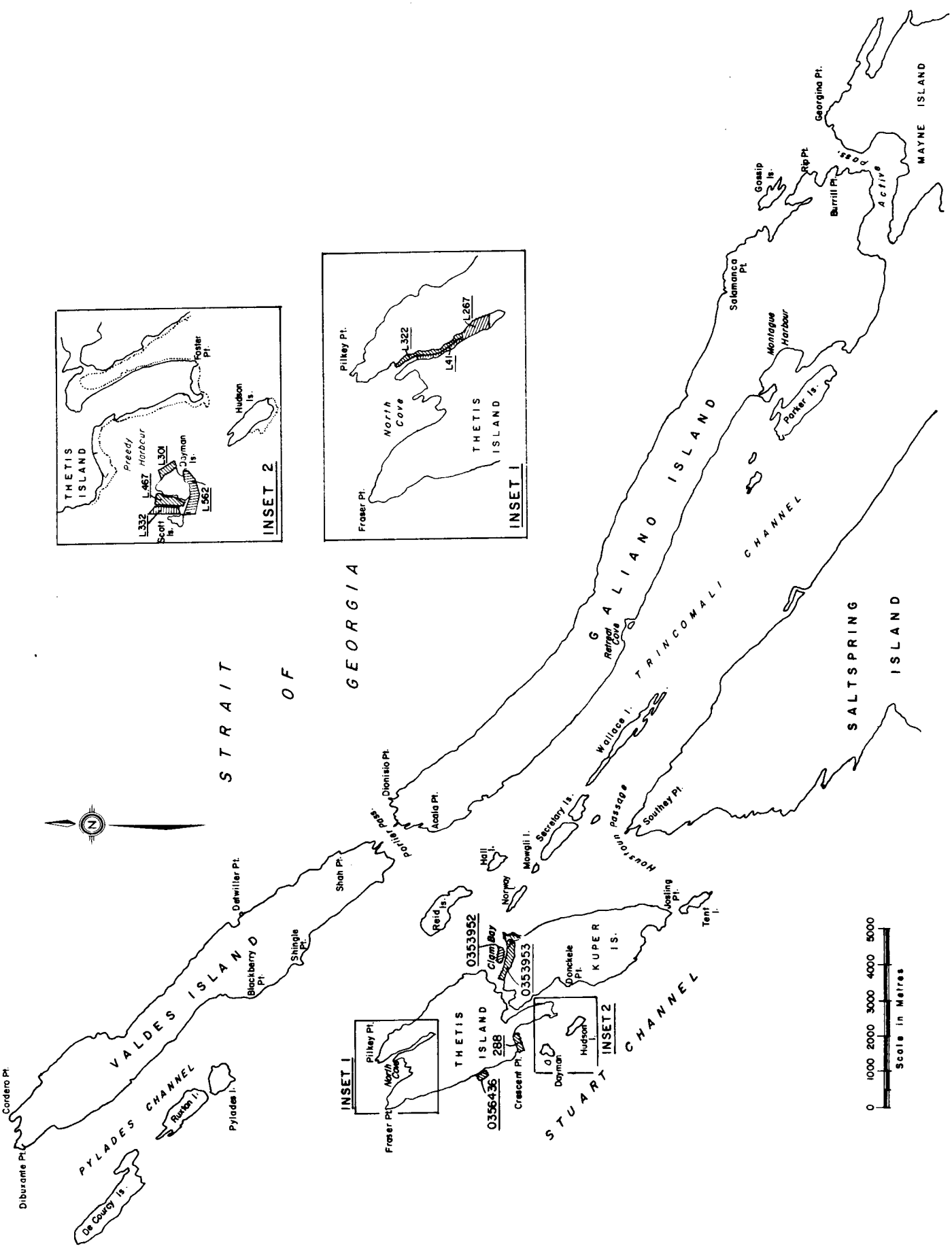

FIGURE 3 STUDY AREA AND OYSTER LEASE LOCATIONS - THETIS AND KUPER ISLANDS

2. SAMPLE STATION LOCATIONS

Marine sample stations were located in commercially harvested oyster and clam areas, including provincially-registered oyster leases. Resource information was obtained from the Department of Fisheries and Oceans and the Marine Resources Branch.

All major freshwater inputs to the study areas were sampled to determine the significance of their bacterial contributions to the receiving waters.

Samples of sediment and shellstock were periodically collected as an adjunct to the water sampling program.

Marine and freshwater sample stations are shown in Figure 4.

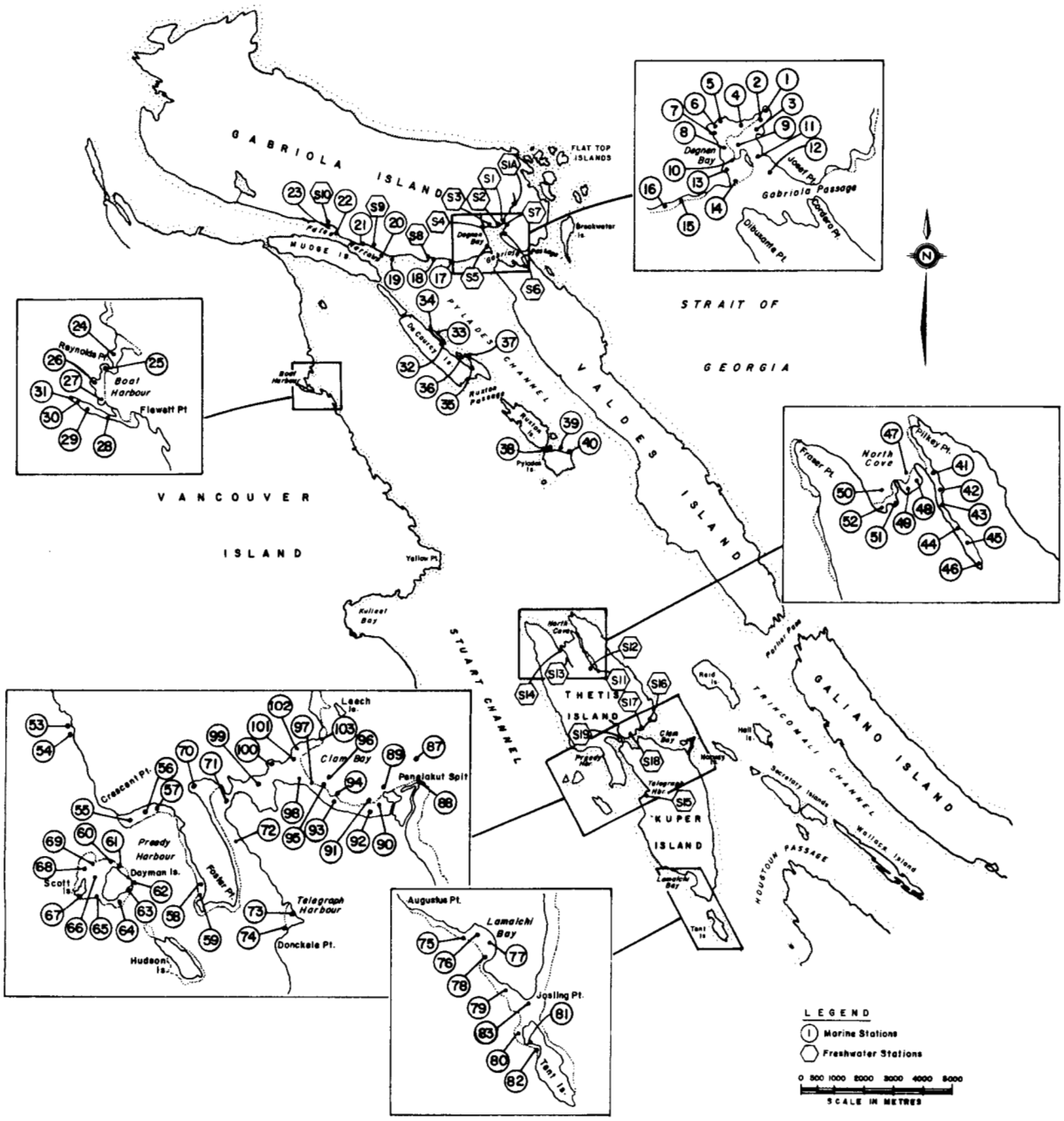

FIGURE 4 MARINE AND FRESHWATER SAMPLE STATIONS IN STUDY AREA

3. FIELD PROCEDURES AND METHODS

3.1 Bacteriological Sampling and Analyses

All marine water samples for bacteriological analyses were collected in sterile wide-mouth glass bottles, approximately 15-30 cm below the water surface. The water depth at collection points over shellfish beds did not usually exceed 1.5 m. Samples were stored in coolers at temperatures not exceeding 10°C until processed. All analyses were conducted on site in the EPS mobile microbiology laboratory, generally within five hours of collection.

The fecal coliform MPN per 100 ml was determined using the multiple tube fermentation technique (three decimal dilutions of five tubes each) as described in Part 908 of the 15th edition of Standard Methods for the Examination of Water and Wastewater (3). The culture medium used was the A-1 medium as described by Andrews and Presnell (4) and further evaluated by Kay (5). A-1 medium was prepared in this laboratory.

All freshwater samples were collected in sterile wide mouth glass bottles and were tested for fecal coliform and fecal streptococci using the membrane filtration method described in Part 909 and 910 of the 15th edition of Standard Methods. Media used were mFC and KF Streptococcus Agars obtained from Difco laboratories, Detroit, for the fecal coliform and fecal streptococci tests respectively. The membrane filters used were Millipore HC, obtained from Millipore Limited, Mississauga, Ontario.

Biochemical confirmation of fecal coliform isolates obtained from the MPN procedure was performed on a percentage of all samples collected. These results are presented in Appendix VI.

3.2 Physical Testing Analyses and Equipment

Salinity measurements were made on all marine samples using an American Optical Refractometer (Catalogue No. 10413) which has a resolution to the nearest 0.5 ppt. Salinity data and tide information are presented in Appendix I.

4. RESULTS AND DISCUSSION

The daily data record for marine sample stations, which includes salinity, fecal coliform MPN/100 mL, time of collection and state of tide is presented in Appendix I. Bacteriological results for marine and freshwater stations are summarized in Appendices II and V, respectively. Freshwater sample station descriptions are given in Appendix III and daily freshwater bacteriological data is given in Appendix IV.

Canadian bivalve molluscan shellfish growing waters are classified according to the following bacteriological criteria:

> In order that an area be considered bacteriologically safe for the harvesting of shellfish, the fecal coliform median MPN of the water must not exceed 14 per 100 mL, and not more than 10% of the samples ordinarily exceed an MPN of 43 per 100 mL, in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.*

Based on these criteria, 26 of the 103 sample stations did not meet the approved growing water standard during some or all of the sampling periods. This data is presented in both Table 1 and Figure 5 and is discussed in detail in subsequent sections.

Shellfish growing areas can also be closed on the basis of known or potential pollution sources which may or may not be reflected in the bacteriological water quality results. All major freshwater inputs to the study areas were therefore sampled and both fecal coliform and fecal streptococci measurements were performed on these samples. The fecal coliform:fecal streptococci ratio (FC:FS) of each input was calculated where both mean values exceeded 100/100 mL in an attempt to determine the origin of fecal contamination observed. Geldreich and Kenner (6) have reported higher FS than FC levels in all warm-blooded animal feces except for humans. The FC:FS ratio in humans was 4.4 whereas in other warm-blooded animals the ratio was less than 0.7. Care must be taken in the interpretation of FC:FS data and in this report it is presented as supporting data for sanitary investigations. The calculated FC:FS ratios are presented in Appendix V.

*This report expresses the 10% limit in terms of a 90 percentile which must not exceed 43/100 mL.

TABLE 1 SAMPLE STATION GROWING WATER STATUS ACCORDING TO SAMPLING PERIOD

SAMPLE STATION	SAMPLE LOCATION	JUNE/JULY 1982	AUGUST 1982	COMBINED SUMMER	FEBRUARY 1983	ALL DATA 1982 & 1983
1	Degnen Bay	X	X	X	X	X
2	"				X	X
3	"	X			X	X
4	"		X		X	X
5	"	X		X	X	X
6	"				X	X
7	"	X			X	X
8	"				X	
10	"				X	
13	"				X	X
21	False Narrows		X			
23	"		X			
30	Boat Harbour	X				X
35	Pirates Cove		X	X	n.s.	X
36	"		X	X	n.s.	X
44	North Cove				X	
46	"				X	
52	Pioneer Pacific		X	X	n.s.	X
63	Dayman Island		X	X	n.s.	X
71	Telegraph Harbour		X		n.s.	
74	"	X		X	n.s.	X
81	Tent Island		X	X	n.s.	X
90	Clam Bay - lease				X	X
92	" "	X			X	
101	" N. side		X	X	X	X
102	" "		X	X	X	X

'X' denotes approved shellfish growing water standard is exceeded.
n.s. - not sampled

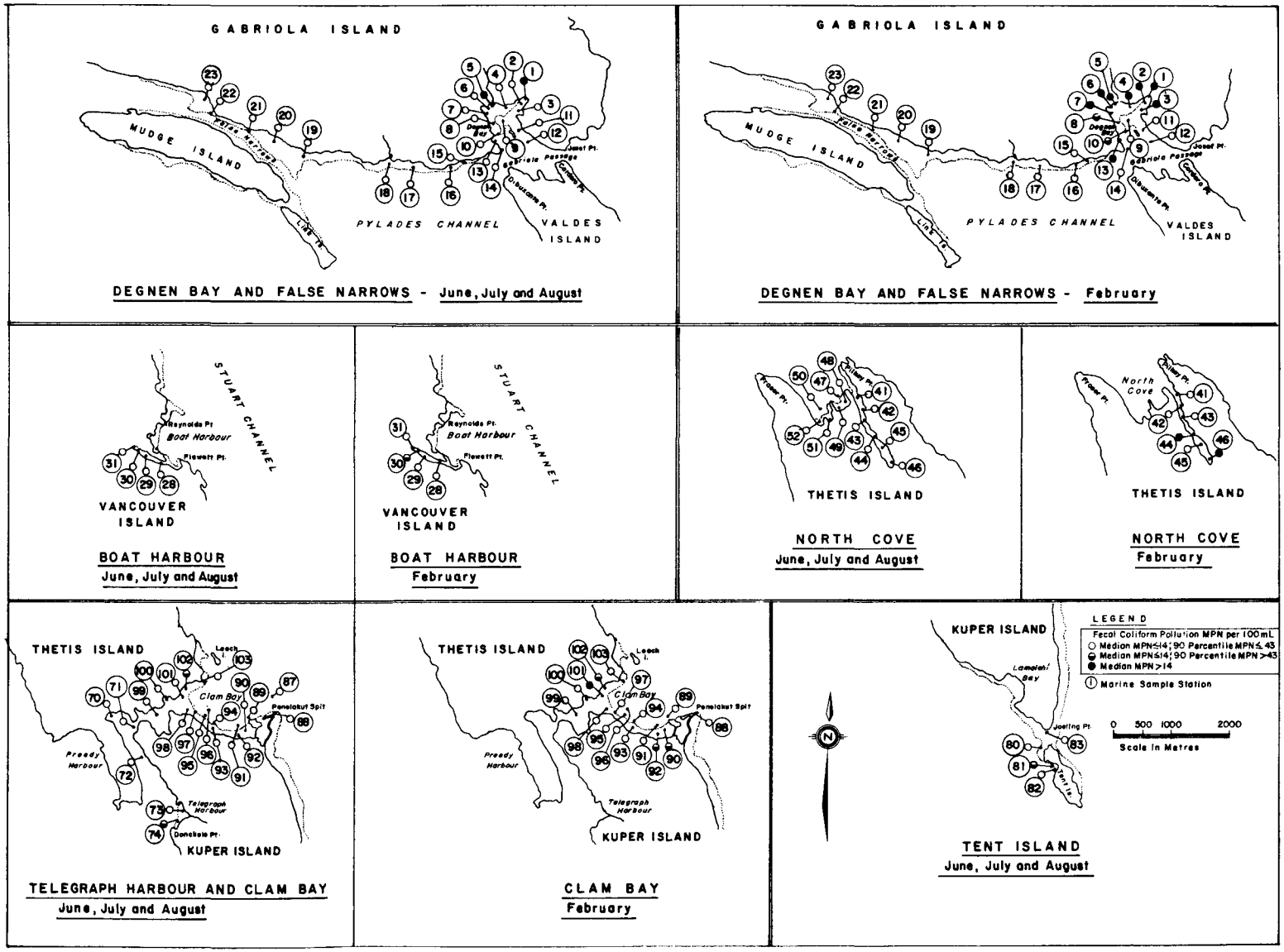

FIGURE 5 CONTAMINATED AREA MARINE SAMPLE STATION DATA BY SURVEY PERIOD

Rainfall had a significant effect on water quality in some portions of the study area, particularly during February. Data provided by the Atmospheric Environment Service for their stations on Gabriola Island and at Nanaimo Airport is presented in Table 2 and is discussed in detail in subsequent sections.

4.1 Gabriola Island - Degnen Bay (Marine stations 1-14)

Previous sampling conducted in Degnen Bay during the 1975 EPS survey (2) concluded that discharges from moored vessels and landwash during heavy rains resulted in fecal coliform levels exceeding the approved standard at the head of the bay. During the 1982 and 1983 surveys, sampling was conducted at 14 marine and 7 freshwater stations to assess the water quality of three registered oyster leases (L.352, L.359 and UF7). In the summer, sporadic contamination was noted at stations 1, 3, 4, 5 and 7, however during February extensive contamination was noted throughout Degnen Bay with stations 1-8, 10 and 13 all exceeding the approved standard. This extensive contamination was due, in part, to the extraordinarily heavy rainfall recorded in February. According to Atmospheric Environment Service records, 255.6 mm of rain fell in February compared with an average monthly rainfall of 87.1 mm for Gabriola Island. Combined MPN data for stations overlying the oyster leases is presented in Table 3 and shows that all leases met the growing water standard during the summer but exceeded it during the winter. Only stations 8 and 10 individually met the standard for all data.

TABLE 3 COMBINED MPN DATA FOR SELECTED STATIONS IN DEGNEN BAY

STATIONS	COMBINED SUMMER DATA	COMBINED WINTER DATA	ALL DATA
6,7 (L.352)	20[a]/<2-13[b]/5[c]/13[d]	10/<2-540/47.5/240	30/<2-540/6/130
8,10,13 (L.359,UF7)	30/<2-49/5/13	15/<2-350/13/120	45/<2-350/5/49

[a]no. of samples
[b]MPN/100 mL range
[c]median fecal coliform MPN/100 mL
[d]90th percentile fecal coliform MPN/100 mL

TABLE 2 PRECIPITATION DATA FOR SURVEY PERIODS (mm)

DATE	JUNE 1982		JULY 1982		AUGUST 1982		FEBRUARY 1983	
	Nanaimo A.	Gabriola I.	Nanaimo A.	Gabriola I.	Nanaimo A.	Gabriola I.	Nanaimo A.	Gabriola I.
1	-	4.2	* TR	No Data	TR	-	-	-
2	5.0	0.8	1.0	10.4	1.5	3.0	-	-
3	-	-	21.9	7.4	-	0.4	-	-
4	TR	-	-	1.6	-	-	-	-
5	1.0	TR	0.8	-	1.4	1.4	TR	3.0
6	-	-	-	1.4	-	-	4.0	1.6
7	-	-	-	-	-	-	-	-
8	-	-	-	-	TR	-	22.0	14.2
9	-	-	-	-	1.0	1.6	* 9.9	3.8
10	-	-	-	-	2.0	1.6	* 66.5	61.0
11	-	-	-	-	TR	-	36.0	18.0
12	-	-	-	-	TR	0.6	14.4	10.6
13	-	-	7.2	6.0	5.3	4.8	1.2	3.2
14	-	-	6.4	7.0	-	-	* 3.8	1.2
15	-	-	3.3	1.0	-	-	* 17.0	14.0
16	-	-	TR	-	* -	-	31.4	31.8
17	-	-	0.8	-	-	-	* 14.7	9.6
18	-	-	1.6	-	* -	-	* 0.4	-
19	-	-	-	-	* -	-	55.2	37.8
20	-	-	-	-	* -	-	-	-
21	-	-	-	-	* -	-	* 19.6	15.6
22	* -	-	-	-	* -	-	* 20.6	16.4
23	* -	-	-	-	* -	-	* 2.2	2.8
24	* -	-	-	-	* -	-	1.1	1.0
25	* TR	5.6	-	-	* -	-	3.4	8.8
26	* 24.3	26.2	-	-	* -	-	1.8	1.2
27	* 22.5	11.0	-	-	-	-	-	-
28	* 3.2	0.4	-	-	-	-	0.4	-
29	* 0.2	-	-	-	TR	0.4		
30	* 0.4	-	-	-	2.8	-		
31	* -	-	0.2	-	0.2	-		
TOTALS	56.6	48.2	43.2	34.8	14.2	13.8	325.6	255.6

*denotes sampling day

Salinity values for stations 6, 7, 8, 10 and 13 did not differ significantly from control station 11 during the summer as shown in Table 4. However, stations 6, 7 and 13 had much lower salinities in the winter than did the control, with stations 8 and 10 showing a limited freshwater influence.

TABLE 4 SALINITY COMPARISON FOR SELECTED STATIONS IN DEGNEN BAY

STATION	JUNE	AUGUST	COMBINED SUMMER	FEBRUARY
6	21.5 (n=5)	24.5 (n=5)	23 (n=10)	13.6 (n=5)
7	21.6	24.8	23.2	13.7
8	21.3	25.0	23.2	23
10	21.6	23.7	22.7	25.9
13	21.5	23.7	22.6	18.0
11 (Control)	22.3	23.2	22.8	25.8

Regression analysis was attempted on groups of stations to determine if any correlations could be found between the fecal coliform MPN, sampling day rainfall, 24 hour antecedent rainfall and salinity. The most significant correlation (R= -0.87) was seen between salinity and MPN for combined winter data for stations 6 and 7. Although other significant correlations were not seen, graphical data analysis demonstrated a general trend of higher MPN's occurring with greater rainfall and reduced salinities.

The correlation between MPN and salinity noted at stations 6 and 7 during February is consistent with the pollution sources identified during the sanitary survey. L.352 is influenced by 3 streams: S2, S3, and S4 which flow into the lease area. The mean fecal coliform levels in these streams were ranked S4(2.3×10^4/100 mL)>S3(1.7×10^3/100 mL)>S2(67/100 mL) which reflects the presence of upstream contamination sources. Both S3 and S4 drain sheep grazing areas where animals were observed to have direct access to the creek just above the beach. During the summer the sheep range in the uplands while in the winter they move closer to the

beach. The Gray Farm, which is drained by S4, was grazing approximately 200 sheep during this survey. Drainage from S2 was not highly contaminated and was not influenced by the pastureland runoff. This creek drains a small residential area serviced by on-site disposal systems. No malfunctions have been reported or were observed. FC:FS ratios for S2 and S3 were indicative of animal pollution however the value of 16.9 for S4, which indicates human sewage, was not supported by the sanitary survey.

The contamination noted at marine stations 5-7 during June was also likely due to these streams. Reduced fecal coliform levels in these stations was noted in August in the absence of any flows from S2-S4.

Oyster lease L.359 is situated between freshwater inputs S2-S4, and S5, which enters at marine station 13, immediately south of lease UF7. Contamination in S5 was not significant ($\bar{x}$ FC = 56/100 mL), nor was the flow. Nevertheless, the elevated fecal coliform levels and reduced salinities at station 13 suggest S5 to be responsible for contamination at Station 13 in February. Station 10, located north of S5 may also have been influenced by this stream, although average salinity values were very near control levels. This stream drains a swamp area and some animals were observed upstream.

The head of Degnen Bay, which is presently under Schedule I closure, is influenced by streams and vessel discharges. The major freshwater input (S1 $\bar{x}$ FC/100 mL = 2.6×10^3; FC:FS = 0.76) enters at the head of the bay and drains the MacDonald Farm. This farm has a maximum cattle population of 45. Highest FC levels were recorded in June, with the creek being dry in August. Lower FC levels occurred in February although the flow was considerably greater. Two other streams (S6 and S7) did not significantly influence water quality although S6 was contaminated ($\bar{x}$ FC/100 mL = 213/100 mL) by a few domestic animals.

Sewage discharged from moored and anchored pleasure vessels was the likely source of contaminated noted at stations 1-5 during August since no streams were flowing and no rainfall was recorded.

Vessel counts are shown below.

TABLE 5 VESSEL COUNTS - DEGNEN BAY

DATE	NO. OF VESSELS
26.06.82	10
18.08.82	14
21.08.82	16 anchored, 18 docked
22.08.82	11 anchored, 11 docked
25.08.82	25 (total anchored & docked)

Vessel sewage discharges have been responsible for a number of shellfish closures in B.C. and are a recognized source of sewage pollution to shellfish growing areas (7).

Shellstock were collected at various locations during the surveys and the data indicates fecal coliform levels in shellfish tissue can exceed the approved market standard of 230 MPN/100 g (Table 6).

TABLE 6 SHELLFISH TISSUE BACTERIOLOGICAL RESULTS - DEGEN BAY

COLLECTION DATE	LOCATION	MPN/100 g	SPECIES
23.06.82	vic. L.352 & L.359	220 (EPS)	oyster
25.06.82	"	2400 (EPS)	oyster
17.08.82	"	80 (EPS)	oyster
01.03.83	L.359	20 (DFO)	oyster

4.2 False Narrows (Marine stations 15-23)

Previous sampling (2) of False Narrows indicated water quality met the approved shellfish standard however the increasing incidence of contaminated shellstock reportedly harvested from the False Narrows-Mudge Island-Gabriola Bar area prompted reassessment of this area. In addiiton, water quality of a registered oyster lease (UF7) and a proposed recreational shellfish reserve was undertaken.

All marine stations were of approved water quality during both the summer (combined June and August data) and February surveys, although significant contamination was noted at stations 21 and 23 during August. The high fecal counts occurred only once at each station on different days and were not related to any identified onshore sources. Log-probability analysis of the data indicates constant water quality is observed at these location (i.e. the MPNs are normally distributed) and it appears the two high FC values were aberrant events.

Three freshwater inputs were sampled in this area (S8, S9 and S10) with S8 having extremely high FC levels (S8: $\bar{x}$ FC/100 mL = 8.8×10^4; FC:FS = 8.12) during June. This stream drains pastureland where horses and cows (up to 12) were noted, and enters the foreshore at station 18. The culvert is equipped with a backflow valve and therefore no discharges occurs during high tide and consequently no fecal contamination was noted at station 18. There was no flow during August and the area was not sampled in February.

Freshwater S9 ($\bar{x}$ FC/100 mL = 275/100 mL) enters False Narrows near Station 15 and drains the uplands area. Freshwater S10($\bar{x}$ FC/100 mL = 48) enters False Narrows at Station 23 and was only observed to be flowing in February, although flows were considered significant. This creek drains the uplands residential area and the Brookswood Poultry Farm. Creek water is impounded by the farm and chicken manure is applied twice per year to the fields. Seven cattle also graze on the fields. Neither of these two streams were observed to have any impact on water quality in

False Narrows during February, likely due to the considerable amount of dilution and dispersion afforded by the rapid tidal currents.

Shellstock collected in False Narrows during the surveys were not significantly contaminated with fecal coliforms and corroborate the water quality data (Table 7).

TABLE 7 SHELLFISH TISSUE BACTERIOLOGICAL RESULTS - FALSE NARROWS

COLLECTION DATE	LOCATION	MPN/100 g	SPECIES
23.06.82	False Narrows	20 (EPS)	littleneck
17.08.82	False Narrows	20 (EPS)	littleneck
01.03.83	Gabriola Bar	50 (EPS)	oyster shellstock

4.3 Boat Harbour (Marine stations 24-31)

Fecal contamination in Boat Harbour was sporadic and was confined to the lagoon area (Stations 28-31). Station 30 was the most contaminated and exceeded the approved growing water standard for combined winter and summer data.

No sources of fecal contamination were positively identified during the sanitary investigation. A swamp area at the head of the lagoon is uninhabited but may receive drainage from the upland area where farms are present. A private dock located at the entrance to the lagoon is a potential sewage source although only three live aboards were noted at the dock during the summer. Any sewage discharged at or around the dock would rapidly enter the lagoon on a flood tide, as evidenced by a dye release.

Shellstock collected during the survey were intermittently contaminated as noted in Table 8.

TABLE 8 SHELLFISH TISSUE BACTERIOLOGICAL RESULTS - BOAT HARBOUR

COLLECTION DATE	LOCATION	MPN/100 g	SPECIES
23.06.82	lagoon	130;80 (EPS)	littleneck
25.06.82	lagoon	9200 (EPS)	littleneck
17.08.82	lagoon (entrance)	20 (EPS)	littleneck

4.4 Decourcy Island, Pylades Island (Marine stations 34-40)

Samples collected in Pirates Cove, DeCourcy Island, during the previous EPS (2) survey showed water quality exceeded the shellfish standard and identified sewage discharges from anchored vessels as the pollution source. The area was subsequently closed to shellfish harvesting. Contamination was also observed in August 1982, coincident with vessel anchorage. Combined August MPN data for stations 35-37 gave a median MPN of 13/100 mL and a 90 percentile of 79/100 mL. Approved growing water quality was observed during June in the absence of significant anchorage activity. Pirates Cove is a popular provincial marine park and is used intensively in the summer. The most recent data from the Ministry of Lands, Parks and Housing shows 3799 vessels anchored in this marine park during 1975 and based on data from other marine parks, there has likely been an increase in usage since then of between 50-100%.

Commercial oyster leases L.342 (DeCourcy I.) and L.274 (Pylades I.) were of approved growing water quality and no sewage sources were identified, although a single shellstock result of 170/100 g was noted at the DeCourcy lease.

4.5 Thetis Island

Sampling around Thetis Island was confined to the commercial oyster lease and clam harvesting areas. Previous EPS survey data (1) from Thetis Island identified the Telegraph Harbour area as being subject to localized bacterial pollution from moored boats. However it was felt that the 125 m wharf closure was adequate and no additional closure action was warranted at that time.

4.5.1 North Cove (Marine stations 41-52). Three commercial oyster leases located in the North Cove lagoon, locally known as Cufra Canal, had shown evidence of being polluted as a result of consistent contamination of commercial shellstock reportedly harvested from this location. Sampling of the canal was undertaken at Stations 41-46 during June, August

and February and all stations were of approved water quality with the exception of stations 44 and 46, which exceeded the standard during February. These stations were located at the head of the lagoon and were influenced by runoff during the heavy February rainfall. A small creek (S11 $\bar{x}$ FC/100 mL = 117) which entered at the head and drained uninhabited area was the likely fecal coliform source. A second creek (S12 $\bar{x}$ FC/100 mL = 61) entering on the west side near the head was not a significant source. During the summer survey, no freshwater inputs were observed and it was felt that both S11 and S12 would only flow during exceptionally heavy and continuous rainfall, similar to that recorded in February.

Considerable shellstock sampling was undertaken in Cufra Canal and some samples showed evidence of fecal contamination, although none exceeded the 230/100 g market standard as shown below.

TABLE 9 SHELLFISH TISSUE RESULTS - CUFRA CANAL (NORTH COVE)

COLLECTION DATE	LOCATION	MPN/100 g	SPECIES
23.06.82	lagoon (near pier)	220/20 (EPS)	mixed clams
25.06.82	" (near head)	220 (EPS)	mixed clams
17.08.82	" (s. of pier)	<20 (EPS)	oyster
17.08.82	" (head)	100 (EPS)	littleneck
01.03.83	" (mouth of creek)	<20 (DFO)	littleneck
01.03.83	" (100 yd S of float)	20 (DFO)	manila
01.03.83	" (500 yd N of float)	50 (DFO)	mixed littleneck

The remainder of North Cove was sampled only during the summer and was of approved water quality. Station 52 exceeded the shellfish standard during August, likely being influence by S13 (single result FC/100 mL = 110). This creek drains part of Pioneer Pacific Camp, which was in full operation during August but not June, suggesting a malfunctioning onsite disposal system to be the cause. Station 52 lies inside the 125 m wharf closure around the Pioneer Pacific dock.

4.5.2 Stuart Channel, Dayman Island, Scott Island and Preedy Harbour (Marine stations 53-69). Several commercial oyster leases are located in this portion of the study area (Figure 3) and all had approved growing water quality. Station 63, located just outside the eastern boundary of L.562 on Dayman Island showed unacceptable contamination during August, attributed to domestic animals onshore having access to the beach. No other sewage sources were identified. This area was not sampled during February 1983.

4.5.3 Telegraph Harbour (Marine stations 70-74). Telegraph Harbour is a popular summer moorage and anchorage location, having two marinas with combined moorage capacity for approximately 150 vessels. Station 71 exceeded the shellfish standard in August and station 74 exceeded the standard for combined summer data. Freshwater S15 ($\bar{x}$ FC/100 mL = 141) was the only observed fecal coliform source in the vicinty of station 74. No upstream sewage sources were identified.

Sewage discharges from anchored and/or moored vessels was likely the cause of contamination noted at Station 71. On August 18, 1982 a surface addition of Rhodamine WT dye to Telegraph Harbour at locations opposite Telegraph Harbour marina and north of Thetis Island marine inside the dolphins showed very little movement of surface water on a flood tide. None of the dye was observed entering the Boat Channel between Thetis and Kuper Island. Previous samples collected during the 1973 EPS survey (1) showed that water quality at one station in the vicintiy of the Telegraph Harbour marina exceeded the shellfish standard. Vessel sewage discharges were identified as the pollution source at this time.

A Schedule I closure is presently in effect around the Kuper Island ferry dock due to a marine sewage outfall serving the Indian Mission School. This school has now been abandoned which the exception of some of the newer buildings, which are now being used by the Clam Bay Shellfish Company. This facility would generate relatively small volumes of effluent. This area was not sampled during February 1983.

4.6 Kuper Island

Sampling around Kuper Island was confined to the Lamalchi Bay-Josling Point area and Clam Bay/Boat Channel between Thetis and Kuper Island. Commercial oyster leases and clam harvesting occur in these areas.

4.6.1 Lamalchi Bay - Josling Point (Marine stations 75-79,83). All marine stations in this area met the approved shellfish growing water standard. The uplands portion of Lamalchi Bay is used for grazing some cattle, however the minimal use would not appear to constitute a pollution threat at this time. These areas were not sampled in February 1983.

4.6.2 Clam Bay (Marine stations 87-103). Previous sampling by EPS (1) in Clam Bay found the area to be free of fecal contamination. However, during the 1982 and 1983 surveys, contamination was noted in the vicinity of oyster lease UNS0353952 (stations 89-93) and along the northern shoreline of Clam Bay (stations 101 and 102).

Station 92 exceeded the standard in both June and February and water quality was borderline for combined summer and combined summer and winter data. Station 90 exceeded the standard in February. Combined data calculations for Stations 89-93 (UNS0353952) are presented below.

TREATMENT	NO. OF SAMPLES	RANGE	MEDIAN	90 PERCENTILE
cumulative summer (89-93)	50	< 2-49	5	33
cumulative winter	25	< 2-540	< 2	76.5

The data shows that overall water quality for stations 89-93 is of approved status, during the summer, while during winter the 90 percentile limit is exceeded. The winter data is biased by the high

counts at stations 90 and 92. A similar analysis was performed on data from stations 101 and 102 and showed these stations were contaminated during all sampling periods:

TREATMENT	NO. OF SAMPLES	RANGE	MEDIAN	90 PERCENTILE
cumulative summer	14	2-240	9	67
cumulative winter	10	< 2-79	12	49
summer and winter	24	< 2-240	9	67

Regression analysis did not indicate any significant correlations. Combined salinity data for Stations 89-93 showed higher mean salinities in winter (26.1 ppt) than in the summer (23.8 ppt) despite the heavy rainfall. This may be a function of the Fraser River freshet which could have influenced salinities during June.

No freshwater inputs were noted or collected during the summer. The contamination source at stations 90 and 92 was not identified but may have been septic tank seepage from the Indian Village.

Freshwater samples were collected along the north side of Clam Bay (S16 and S17) S16 drains a field which grazes cattle and FC counts ranged from 60-100/100 mL. No contamination was evident in S17.

Freshwater inputs S18 and S19 enter the Boat Channel and had fecal counts ranging from 10-115/100 mL. These streams were dry during summer.

Sewage discharges from vessels anchored in Clam Bay may have been responsible for some of the summer contamination since no streams were flowing. Higher FC counts were observed at Stations 90, 91, 92, and 93, coincident with substantial boat counts, as noted below:

TABLE 10 VESSEL COUNTS - CLAM BAY

DATE	FC MPN RANGE (STATION 90-93)	NO. OF VESSELS
27.06.83	< 2 - 5	3
19.08.82	5 - 8 (collected on 20/08/82)	16
22.08.82	21 - 33	13
24.08.82	< 2 - 11	5

The shellfish tissue bacteriological data indicates contamination of shellstock in the bay can occur in the summer.

TABLE 11 SHELLFISH TISSUE BACTERIOLOGICAL RESULTS - CLAM BAY

COLLECTION DATE	LOCATION	FECAL MPN/100 g	SPECIES
24.06.82	Clam Bay-east of Clam Bay Rd.	110	littleneck
25.06.82	Clam Bay Channel	1300	littleneck
28.06.82	Clam Bay raft culture	< 20	oyster
17.08.82	Clam Bay Creek	490	oyster
17.08.82	Clam Bay Anchorage	40	clams
17.08.82	Clam Bay Channel	330	clams
01.03.83	Penelakut Spit	20	oyster
01.03.83	Kuper Island	<20, <20	littleneck/ butter clam

4.7 Tent Island (Marine stations 80-82)

The portion of Tent Island surveyed is a provincial marine park and is a popular summer anchorage location. During a survey conducted by EPS in 1973 (1), unacceptable fecal contamination was noted in the vicinity of the anchored boats. This same result was recorded during August 1982 at Station 81. No contamination was observed in the absence of boats during June 1982.

4.8 Porlier Pass (Marine stations 84-86)

Surface samples were collected in Porlier Pass and Trincomali Channel during June 1982 to determine if fecal contamination noted in Clam Bay and previously reported at Josling Point was attributable to contaminated runoff from the Fraser River freshet. Salinity levels were variable at these stations although low levels of 19.0 ppt and 20.0 ppt were recorded. These values were less than others noted in Clam Bay suggesting cause of the reduced salinities to be the Fraser River. There was no evidence of fecal contamination in any of these samples.

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APPENDIX I

DAILY DATA RECORD FOR MARINE STATIONS

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Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK001	49 08.30	123 42.55	82/06/22	0550	EBB	8	22.0
			82/06/23	0840	EBB	13	22.5
			82/06/24	0850	EBB	14	21.0
			82/06/25	1010	EBB	33	20.0
			82/06/26	1045	EBB	70	19.5
			82/08/18	0850	EBB	5	23.0
			82/08/19	0830	EBB	17	21.5
			82/08/21	0835	EBB	49	22.0
			82/08/23	0910	HIGH SLACK	170	24.0
			82/08/25	1115	HIGH SLACK	8	24.0
			83/02/09	1145	HIGH SLACK	33	26.0
			83/02/15	1225	LOW SLACK	49	26.0
			83/02/17	1145	EBB	540	16.0
			83/02/18	1040	EBB	63	21.5
			83/02/22	1145	EBB	11	22.0
TK002	49 08.22	123 42.60	82/06/22	0555	EBB	2	22.0
			82/06/23	0840	EBB	11	23.0
			82/06/24	0850	EBB	17	22.0
			82/06/25	1010	EBB	23	19.0
			82/06/26	1045	EBB	4	20.5
			82/08/18	0850	EBB	7	23.0
			82/08/19	0825	EBB	5	21.5
			82/08/21	0835	EBB	33	22.5
			82/08/23	0910	HIGH SLACK	13	24.0
			82/08/25	1115	HIGH SLACK	11	24.0
			83/02/09	1140	HIGH SLACK	79	25.0
			83/02/15	1225	LOW SLACK	70	22.5
			83/02/17	1145	EBB	33	22.0
			83/02/18	1040	EBB	33	22.0
			83/02/22	1140	EBB	11	24.0
TK003	49 08.12	123 42.69	82/06/22	0600	EBB	33	22.0
			82/06/23	0840	EBB	17	22.5
			82/06/24	0845	EBB	14	22.5
			82/06/25	1005	EBB	17	18.0
			82/06/26	1045	EBB	23	20.0
			82/08/18	0845	EBB	2	23.5
			82/08/19	0825	EBB	2	22.0
			82/08/21	0830	EBB	13	22.5
			82/08/23	0905	HIGH SLACK	11	25.0
			82/08/25	1115	HIGH SLACK	<2	24.0
			83/02/09	1140	HIGH SLACK	70	26.0
			83/02/15	1220	LOW SLACK	4	26.0
			83/02/17	1140	EBB	350	15.0
			83/02/18	1035	EBB	33	24.5
			83/02/22	1140	EBB	23	20.5

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK004	49 08.21	123 42.81	82/06/22	0600	EBB	23	22.0
			82/06/23	0835	EBB	7	23.0
			82/06/24	0845	EBB	13	21.5
			82/06/25	1005	EBB	8	20.0
			82/06/26	1040	EBB	<2	20.0
			82/08/18	0845	EBB	<2	22.5
			82/08/19	0820	EBB	4	21.0
			82/08/21	0830	EBB	8	23.5
			82/08/23	0905	HIGH SLACK	170	24.0
			82/08/25	1110	HIGH SLACK	11	25.0
			83/02/09	1140	HIGH SLACK	2	25.5
			83/02/15	1220	LOW SLACK	14	22.5
			83/02/17	1140	EBB	79	20.0
			83/02/18	1035	EBB	33	23.5
			83/02/22	1135	EBB	33	25.0
TK005	49 08.21	123 42.99	82/06/22	0600	EBB	49	22.0
			82/06/23	0835	EBB	23	23.0
			82/06/24	0840	EBB	23	22.0
			82/06/25	1000	EBB	23	20.0
			82/06/26	1040	EBB	11	20.0
			82/08/18	0840	EBB	<2	22.5
			82/08/19	0820	EBB	<2	26.0
			82/08/21	0825	EBB	2	24.0
			82/08/23	0905	HIGH SLACK	13	25.0
			82/08/25	1110	HIGH SLACK	70	25.0
			83/02/09	1135	HIGH SLACK	70	26.0
			83/02/15	1215	LOW SLACK	27	18.5
			83/02/17	1140	EBB	170	6.0
			83/02/18	1035	EBB	2	26.0
			83/02/22	1135	EBB	46	23.5
TK006	49 08.21	123 43.10	82/06/22	0605	EBB	23	22.5
			82/06/23	0830	EBB	2	23.0
			82/06/24	0840	EBB	4	22.0
			82/06/25	1000	EBB	5	20.0
			82/06/26	1040	EBB	13	20.0
			82/08/18	0840	EBB	9	23.5
			82/08/19	0815	EBB	<2	26.0
			82/08/21	0820	EBB	8	24.0
			82/08/23	0900	HIGH SLACK	5	25.0
			82/08/25	1110	HIGH SLACK	<2	24.0
			83/02/09	1130	HIGH SLACK	240	12.5
			83/02/15	1215	LOW SLACK	13	21.0
			83/02/17	1135	EBB	130	2.0
			83/02/18	1030	EBB	<2	25.0
			83/02/22	1130	EBB	79	7.5

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK007	49 08.15	123 43.15	82/06/22	0610	EBB	130	22.0
			82/06/23	0830	EBB	2	24.0
			82/06/24	0840	EBB	13	22.0
			82/06/25	0955	EBB	7	20.0
			82/06/26	1035	EBB	2	20.0
			82/08/18	0835	EBB	2	25.0
			82/08/19	0810	EBB	2	26.0
			82/08/21	0820	EBB	5	24.0
			82/08/23	0900	HIGH SLACK	5	25.0
			82/08/25	1105	HIGH SLACK	<2	24.0
			83/02/09	1130	HIGH SLACK	46	13.0
			83/02/15	1215	LOW SLACK	17	22.0
			83/02/17	1135	EBB	540	3.0
			83/02/18	1030	EBB	5	24.0
			83/02/22	1130	EBB	49	6.5
TK008	49 08.04	123 43.04	82/06/22	0610	EBB	13	22.0
			82/06/23	0820	EBB	2	23.5
			82/06/24	0835	EBB	8	22.0
			82/06/25	0955	EBB	17	18.0
			82/06/26	1030	EBB	7	21.0
			82/08/18	0835	EBB	2	25.5
			82/08/19	0805	EBB	5	26.5
			82/08/21	0815	EBB	13	24.0
			82/08/23	0900	HIGH SLACK	4	25.0
			82/08/25	1100	HIGH SLACK	8	24.0
			83/02/09	1125	HIGH SLACK	13	27.0
			83/02/15	1210	LOW SLACK	2	25.5
			83/02/17	1130	EBB	49	15.5
			83/02/18	1030	EBB	2	25.0
			83/02/22	1130	EBB	110	22.0
TK009	49 08.04	123 42.88	82/06/22	0620	EBB	2	22.0
			82/06/23	0815	EBB	13	23.5
			82/06/24	0825	EBB	2	23.5
			82/06/25	0950	EBB	6	21.0
			82/06/26	1030	EBB	7	21.5
			82/08/18	0830	EBB	<2	23.0
			82/08/19	0805	EBB	5	22.0
			82/08/21	0815	EBB	<2	24.0
			82/08/23	0900	HIGH SLACK	8	25.0
			82/08/25	1100	HIGH SLACK	2	25.0
			83/02/09	1120	HIGH SLACK	<2	27.5
			83/02/15	1205	EBB	<2	26.0
			83/02/17	1125	EBB	46	24.5
			83/02/18	1025	EBB	5	25.5
			83/02/22	1125	EBB	17	22.5

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK010	49 07.99	123 42.91	82/06/22	0625	EBB	2	22.0
			82/06/23	0820	EBB	2	23.5
			82/06/24	0830	EBB	4	22.0
			82/06/25	0950	EBB	8	20.0
			82/06/26	1025	EBB	7	20.5
			82/08/18	0830	EBB	5	23.5
			82/08/19	0805	EBB	5	22.0
			82/08/21	0815	EBB	5	24.0
			82/08/23	0855	HIGH SLACK	<2	25.0
			82/08/25	1100	HIGH SLACK	5	24.0
			83/02/09	1125	HIGH SLACK	2	27.5
			83/02/15	1205	EBB	<2	26.0
			83/02/17	1130	EBB	13	26.5
			83/02/18	1025	EBB	130	24.5
			83/02/22	1125	EBB	33	25.0
TK011	49 08.00	123 42.70	82/06/22	0630	EBB	2	22.0
			82/06/23	0815	EBB	<2	23.5
			82/06/24	0825	EBB	2	22.0
			82/06/25	0945	EBB	11	20.0
			82/06/26	1025	EBB	2	24.0
			82/08/18	0830	EBB	<2	22.5
			82/08/19	0800	EBB	<2	20.5
			82/08/21	0810	EBB	2	24.0
			82/08/23	0855	HIGH SLACK	4	25.0
			82/08/25	1055	HIGH SLACK	2	24.0
			83/02/09	1120	HIGH SLACK	2	27.5
			83/02/15	1205	EBB	<2	26.0
			83/02/17	1125	EBB	8	26.0
			83/02/18	1025	EBB	13	24.5
			83/02/22	1125	EBB	22	25.0
TK012	49 07.88	123 42.55	82/06/22	0630	EBB	<2	22.0
			82/06/23	0810	EBB	2	23.5
			82/06/24	0825	EBB	2	23.0
			82/06/25	0945	EBB	11	20.0
			82/06/26	1020	EBB	2	20.5
			82/08/18	0825	EBB	<2	22.5
			82/08/19	0800	EBB	5	20.5
			82/08/21	0810	EBB	7	24.0
			82/08/23	0850	HIGH SLACK	17	25.0
			82/08/25	1055	HIGH SLACK	2	24.0
			83/02/09	1115	HIGH SLACK	<2	27.5
			83/02/15	1205	EBB	5	27.0
			83/02/17	1120	EBB	14	27.5
			83/02/18	1025	EBB	8	26.0
			83/02/22	1125	EBB	5	27.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK013	49 07.90	123 42.98	82/06/22	0635	EBB	<2	22.0
			82/06/23	0810	EBB	2	24.0
			82/06/24	0830	EBB	5	22.0
			82/06/25	0940	EBB	49	19.0
			82/06/26	1020	EBB	2	20.5
			82/08/18	0825	EBB	<2	24.5
			82/08/19	0755	EBB	5	22.0
			82/08/21	0810	EBB	2	24.0
			82/08/23	0850	HIGH SLACK	23	24.0
			82/08/25	1055	HIGH SLACK	2	24.0
			83/02/09	1115	HIGH SLACK	79	13.0
			83/02/15	1200	EBB	5	26.0
			83/02/17	1110	EBB	350	14.0
			83/02/18	1020	EBB	<2	25.5
			83/02/22	1120	EBB	49	11.5
TK014	49 07.89	123 42.89	82/06/22	0640	EBB	2	22.5
			82/06/23	0805	EBB	2	24.0
			82/06/24	0820	EBB	5	23.0
			82/06/25	0940	EBB	8	20.0
			82/06/26	1015	EBB	17	20.5
			82/08/18	0820	EBB	<2	23.0
			82/08/19	0755	EBB	2	22.0
			82/08/21	0805	EBB	2	24.0
			82/08/23	0845	HIGH SLACK	5	25.0
			82/08/25	1050	HIGH SLACK	5	25.0
			83/02/09	1110	HIGH SLACK	<2	27.0
			83/02/15	1155	EBB	4	29.5
			83/02/17	1105	EBB	<2	28.0
			83/02/18	1020	EBB	<2	28.0
			83/02/22	1115	EBB	5	28.0
TK015	49 07.70	123 43.41	82/06/22	0645	EBB	<2	22.5
			82/06/23	0800	EBB	<2	23.5
			82/06/24	0820	EBB	<2	22.0
			82/06/25	0935	EBB	5	20.0
			82/06/26	1005	EBB	5	20.5
			82/08/18	0820	EBB	<2	23.0
			82/08/19	0750	EBB	2	22.0
			82/08/21	0805	EBB	<2	25.0
			82/08/23	0845	HIGH SLACK	2	25.0
			82/08/25	1050	HIGH SLACK	<2	24.5
			83/02/09	1105	HIGH SLACK	<2	27.5
			83/02/15	1150	EBB	<2	26.5
			83/02/17	1100	EBB	2	28.0
			83/02/18	1015	EBB	5	27.5
TK016	49 07.69	123 43.59	82/06/22	0645	EBB	<2	23.5
			82/06/23	0800	EBB	<2	24.0
			82/06/24	0815	EBB	2	22.0

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TK016	continued...		82/06/25	0930	EBB	8	20.0
			82/06/26	1005	EBB	13	20.5
			82/08/18	0815	EBB	<2	23.0
			82/08/19	0750	EBB	2	22.0
			82/08/21	0805	EBB	<2	24.0
			82/08/23	0845	HIGH SLACK	4	25.0
			82/08/25	1045	HIGH SLACK	<2	25.0
			83/02/09	1105	HIGH SLACK	<2	28.0
			83/02/15	1150	EBB	<2	26.0
			83/02/17	1100	EBB	2	27.5
			83/02/18	1015	EBB	<2	28.0
TK017	49 07.68	123 44.10	82/06/22	0650	EBB	13	23.0
			82/06/23	0755	EBB	13	23.5
			82/06/24	0815	EBB	7	22.0
			82/06/25	0930	EBB	23	22.0
			82/06/26	1000	EBB	<2	23.0
			82/08/18	0815	EBB	5	24.0
			82/08/19	0745	EBB	5	22.0
			82/08/21	0800	EBB	2	24.0
			82/08/23	0840	HIGH SLACK	8	24.0
			82/08/25	1045	HIGH SLACK	2	24.0
			83/02/09	1100	HIGH SLACK	<2	28.0
			83/02/15	1145	EBB	<2	26.5
			83/02/17	1055	EBB	5	26.0
			83/02/18	1010	EBB	5	27.5
TK018	49 07.68	123 44.50	82/06/22	0700	EBB	5	22.5
			82/06/23	0750	EBB	<2	23.0
			82/06/24	0810	EBB	4	22.0
			82/06/25	0920	EBB	8	22.0
			82/06/26	1000	EBB	11	22.5
			82/08/18	0810	EBB	<2	23.0
			82/08/19	0745	EBB	5	22.0
			82/08/21	0755	EBB	<2	23.0
			82/08/23	0840	HIGH SLACK	<2	25.0
			82/08/25	1040	HIGH SLACK	5	24.0
			83/02/09	1055	HIGH SLACK	2	26.0
			83/02/15	1130	EBB	2	26.5
			83/02/17	1050	EBB	33	25.0
			83/02/18	1010	EBB	<2	28.0
TK019	49 07.78	123 45.71	82/06/22	0710	EBB	7	22.0
			82/06/23	0745	EBB	8	23.5
			82/06/24	0805	EBB	2	24.0
			82/06/25	0920	EBB	4	22.0
			82/06/26	0955	EBB	<2	23.0
			82/08/18	0805	EBB	7	20.0
			82/08/19	0740	EBB	17	18.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK019	continued...		82/08/21	0745	EBB	5	22.0
			82/08/23	0835	HIGH SLACK	<2	25.0
			82/08/25	1035	HIGH SLACK	<2	24.0
			83/02/09	1050	HIGH SLACK	5	27.0
			83/02/15	1125	EBB	<2	27.5
			83/02/17	1040	EBB	8	27.5
			83/02/18	1005	EBB	5	27.0
TK020	49 07.90	123 46.69	82/06/22	0715	EBB	2	21.0
			82/06/23	0745	EBB	<2	21.5
			82/06/24	0800	EBB	5	24.0
			82/06/25	0915	EBB	<2	25.0
			82/06/26	0950	EBB	8	23.5
			82/08/18	0800	EBB	<2	20.0
			82/08/19	0735	EBB	22	18.0
			82/08/21	0745	EBB	13	20.5
			82/08/23	0835	HIGH SLACK	2	24.0
			82/08/25	1035	HIGH SLACK	<2	24.0
			83/02/09	1040	HIGH SLACK	<2	28.0
			83/02/15	1120	EBB	2	29.5
			83/02/17	1035	EBB	2	28.0
			83/02/18	1005	EBB	4	28.0
TK021	49 08.05	123 46.55	82/06/22	0725	EBB	<2	22.0
			82/06/23	0740	EBB	2	22.5
			82/06/24	0755	EBB	5	24.0
			82/06/25	0915	EBB	2	24.5
			82/06/26	0950	EBB	<2	25.5
			82/08/18	0755	EBB	5	20.0
			82/08/19	0730	EBB	8	18.0
			82/08/21	0745	EBB	7	20.0
			82/08/23	0835	HIGH SLACK	1600	23.0
			82/08/25	1030	FLOOD	2	24.0
			83/02/09	1020	HIGH SLACK	<2	28.0
			83/02/15	1115	EBB	<2	28.0
			83/02/17	1030	EBB	5	28.0
			83/02/18	1000	EBB	2	28.5
TK022	49 08.20	123 47.05	82/06/22	0725	EBB	<2	21.0
			82/06/23	0735	EBB	2	23.5
			82/06/24	0750	EBB	17	24.0
			82/06/25	0910	EBB	13	24.0
			82/06/26	0945	EBB	8	26.0
			82/08/18	0755	EBB	11	20.0
			82/08/19	0725	EBB	5	18.0
			82/08/21	0740	EBB	13	20.0
			82/08/23	0830	HIGH SLACK	5	23.0
			82/08/25	1030	FLOOD	4	24.5
			83/02/09	1030	HIGH SLACK	2	28.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK022	continued...		83/02/15	1115	EBB	<2	28.0
			83/02/17	1030	EBB	13	27.5
			83/02/18	1000	EBB	5	28.5
TK023	49 08.30	123 47.16	82/06/22	0730	EBB	2	21.0
			82/06/23	0730	EBB	5	23.0
			82/06/24	0750	EBB	13	24.0
			82/06/25	0910	EBB	4	23.5
			82/06/26	0945	EBB	<2	23.5
			82/08/18	0750	EBB	<2	20.0
			82/08/19	0725	EBB	130	18.0
			82/08/21	0740	EBB	14	20.0
			82/08/23	0825	HIGH SLACK	2	23.0
			82/08/25	1025	FLOOD	<2	24.0
			83/02/09	1025	HIGH SLACK	8	28.0
			83/02/15	1110	EBB	7	28.0
			83/02/17	1025	EBB	11	28.0
			83/02/18	1000	EBB	2	27.5
TK024	49 05.90	123 48.00	82/06/22	0820	EBB	5	24.0
			82/06/23	0715	EBB	2	24.0
			82/06/24	0720	EBB	2	24.5
			82/06/25	0855	EBB	5	24.0
			82/06/26	0925	EBB	21	24.0
			82/08/18	0735	EBB	4	26.0
			82/08/19	0705	EBB	2	26.0
			82/08/21	0725	EBB	2	22.0
			82/08/23	0810	HIGH SLACK	<2	26.0
			82/08/25	1010	FLOOD	<2	25.0
TK025	49 05.80	123 48.10	82/06/22	0825	EBB	5	24.0
			82/06/23	0710	EBB	<2	24.0
			82/06/24	0725	EBB	<2	24.0
			82/06/25	0850	EBB	2	24.0
			82/06/26	0920	EBB	17	24.0
			82/08/18	0730	EBB	<2	26.5
			82/08/19	0705	EBB	2	24.0
			82/08/21	0720	HIGH SLACK	<2	24.0
			82/08/23	0810	HIGH SLACK	<2	26.0
			82/08/25	1005	FLOOD	<2	25.0
TK026	49 05.70	123 48.21	82/06/22	0830	EBB	<2	24.0
			82/06/23	0705	EBB	11	24.5
			82/06/24	0725	EBB	2	24.0
			82/06/25	0845	EBB	2	24.0
			82/06/26	0920	EBB	23	20.5
			82/08/18	0730	EBB	<2	26.5
			82/08/19	0700	EBB	<2	26.0
			82/08/21	0720	HIGH SLACK	<2	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK026	continued...		82/08/23	0805	HIGH SLACK	<2	26.0
			82/08/25	1005	FLOOD	2	25.0
TK027	49 05.60	123 48.15	82/06/22	0830	EBB	<2	24.0
			82/06/23	0705	EBB	2	24.5
			82/06/24	0730	EBB	<2	24.0
			82/06/25	0845	EBB	<2	24.0
			82/06/26	0915	EBB	17	24.5
			82/08/18	0725	EBB	<2	26.5
			82/08/19	0700	EBB	2	26.0
			82/08/21	0715	HIGH SLACK	<2	24.0
			82/08/23	0805	HIGH SLACK	<2	25.0
			82/08/25	1005	FLOOD	<2	25.0
TK028	49 05.49	123 48.09	82/06/22	0845	EBB	7	24.0
			82/06/23	0650	EBB	17	24.0
			82/06/24	0710	EBB	11	24.0
			82/06/25	0830	EBB	9	24.0
			82/06/26	0900	EBB	5	24.5
			82/08/18	0720	EBB	<2	26.5
			82/08/19	0740	EBB	2	26.0
			82/08/21	0705	HIGH SLACK	<2	24.0
			82/08/23	0800	HIGH SLACK	2	25.0
			82/08/25	0955	FLOOD	5	25.0
			83/02/10	1305	HIGH SLACK	<2	28.0
			83/02/14	1440	FLOOD	<2	26.5
			83/02/21	1130	EBB	2	26.0
			83/02/23	1240	EBB	5	25.5
TK029	49 05.55	123 48.29	82/06/23	0655	EBB	5	24.0
			82/06/24	0710	EBB	17	24.0
			82/06/25	0835	EBB	33	24.0
			82/06/26	0905	EBB	8	23.5
			82/08/18	0725	EBB	8	26.5
			82/08/19	0750	EBB	5	27.0
			82/08/21	0705	HIGH SLACK	14	24.0
			82/08/23	0800	HIGH SLACK	11	25.0
			82/08/25	0955	FLOOD	2	25.0
			83/02/10	1310	HIGH SLACK	<2	28.0
			83/02/14	1445	FLOOD	31	26.5
			83/02/21	1130	EBB	<2	27.0
			83/02/23	1240	EBB	23	22.0
TK030	49 05.60	123 48.40	82/06/23	0700	EBB	7	24.0
			82/06/24	0715	EBB	23	24.0
			82/06/25	0840	EBB	79	24.0
			82/06/26	0910	EBB	33	24.0
			82/08/19	0740	EBB	5	26.0
			82/08/21	0710	HIGH SLACK	13	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK030	continued...		82/08/23	0800	HIGH SLACK	2	25.0
			82/08/25	1000	FLOOD	2	25.0
			83/02/10	1310	HIGH SLACK	<2	25.0
			83/02/14	1450	FLOOD	79	21.0
			83/02/21	1135	EBB	2	25.0
			83/02/23	1245	EBB	8	15.0
TK031	49 06.25	123 44.40	82/08/19	0740	EBB	4	26.0
			82/08/21	0710	HIGH SLACK	4	24.0
			82/08/23	0800	HIGH SLACK	2	25.0
			83/02/10	1310	HIGH SLACK	<2	21.5
			83/02/14	1450	FLOOD	23	11.0
			83/02/21	1140	EBB	4	24.5
			83/02/23	1245	EBB	2	26.5
TK032	49 06.42	123 44.50	82/06/22	0910	EBB	<2	22.0
			82/06/23	0935	EBB	5	23.0
			82/06/24	0940	EBB	2	24.0
			82/06/25	1050	EBB	8	22.0
			82/06/26	1200	EBB	2	23.0
			82/08/18	0910	EBB	8	23.0
			82/08/19	0850	EBB	2	27.0
			82/08/21	0900	EBB	33	24.0
			82/08/23	0945	EBB	<2	24.0
			82/08/25	1145	HIGH SLACK	2	24.0
TK033	49 06.40	123 44.78	82/06/23	0925	EBB	<2	23.0
			82/06/24	0935	EBB	<2	23.0
			82/06/25	1040	EBB	5	22.0
			82/06/26	1150	EBB	2	23.0
			82/08/18	0910	EBB	<2	23.5
			82/08/19	0855	EBB	5	22.0
			82/08/21	0905	EBB	14	22.0
			82/08/23	0945	EBB	2	24.0
			82/08/25	1145	HIGH SLACK	<2	24.0
TK034	49 05.65	123 41.59	82/06/22	0920	EBB	<2	22.0
			82/06/23	0920	EBB	<2	23.5
			82/06/24	0935	EBB	5	22.0
			82/06/25	1040	EBB	2	22.0
			82/06/26	1150	EBB	2	23.0
			82/08/18	0915	EBB	<2	25.0
			82/08/19	0850	EBB	2	22.0
			82/08/21	0905	EBB	4	22.0
			82/08/23	0950	EBB	2	24.0
			82/08/25	1145	HIGH SLACK	2	25.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK035	49 05.65	123 41.40	82/08/21	0910	EBB	23	24.0
			82/08/23	0955	EBB	79	24.0
			82/08/25	1200	HIGH SLACK	2	24.0
TK036	49 05.61	123 41.20	82/08/21	0915	EBB	79	25.6
			82/08/23	0955	EBB	13	24.0
			82/08/25	1155	HIGH SLACK	2	25.0
TK037	49 00.90	123 41.15	82/08/21	0920	EBB	23	25.0
			82/08/23	0950	EBB	8	24.0
			82/08/25	1150	HIGH SLACK	2	25.0
TK038	49 00.80	123 41.02	82/06/22	0945	EBB	5	22.0
			82/06/23	0955	EBB	<2	24.0
			82/06/24	1000	EBB	<2	24.0
			82/06/25	1105	EBB	<2	24.0
			82/06/26	1220	EBB	8	22.5
			82/08/18	0930	EBB	<2	25.5
			82/08/19	0920	EBB	2	24.0
TK039	49 00.70	123 41.00	82/06/22	0945	EBB	<2	22.0
			82/06/23	0955	EBB	<2	24.0
			82/06/24	1000	EBB	<2	24.0
			82/06/25	1105	EBB	<2	24.0
			82/06/26	1220	EBB	8	23.0
			82/08/18	0930	EBB	2	25.5
			82/08/19	0920	EBB	<2	23.0
TK040	49 00.75	123 40.90	82/06/22	0950	HIGH SLACK	<2	22.0
			82/06/23	0955	HIGH SLACK	2	24.0
			82/06/24	1005	HIGH SLACK	<2	24.0
			82/06/25	1105	HIGH SLACK	<2	24.0
			82/06/26	1225	HIGH SLACK	<2	23.5
			82/08/18	0935	EBB	<2	25.5
			82/08/19	0925	EBB	2	22.0
TK041	49 00.50	123 40.78	82/06/22	1005	EBB	<2	24.0
			82/06/23	0600	EBB	<2	24.0
			82/06/24	0630	HIGH SLACK	2	24.0
			82/06/25	0755	HIGH SLACK	13	24.0
			82/06/26	0820	HIGH SLACK	2	24.5
			82/08/18	0630	EBB	8	25.5
			82/08/19	0935	EBB	<2	28.0
			82/08/21	0615	HIGH SLACK	13	22.5
			82/08/23	0710	FLOOD	<2	24.0
			82/08/25	0920	FLOOD	7	24.0
			83/02/09	1230	HIGH SLACK	2	28.0
			83/02/15	1020	EBB	<2	24.5
			83/02/17	0935	EBB	13	25.0
			83/02/18	0915	HIGH SLACK	8	25.5

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK041	continued...		83/02/22	0935	HIGH SLACK	4	24.0
			83/02/23	1200	HIGH SLACK	8	23.0
TK042	49 00.32	123 40.62	82/06/22	1005	EBB	<2	24.0
			82/06/23	0605	EBB	<2	24.0
			82/06/24	0635	HIGH SLACK	<2	24.5
			82/06/25	0800	EBB	4	24.0
			82/06/26	0820	HIGH SLACK	7	24.5
			82/08/18	0630	EBB	8	25.5
			82/08/19	0935	EBB	2	26.0
			82/08/21	0615	HIGH SLACK	8	24.0
			82/08/23	0710	FLOOD	5	24.0
			82/08/25	0920	FLOOD	5	24.0
			83/02/09	1230	HIGH SLACK	4	28.0
			83/02/15	1020	EBB	5	24.0
			83/02/17	0935	EBB	13	24.5
			83/02/18	0915	HIGH SLACK	14	23.5
			83/02/22	0935	HIGH SLACK	5	22.0
			83/02/23	1200	HIGH SLACK	5	25.0
TK043	49 00.99	123 41.38	82/06/23	0605	EBB	<2	24.0
			82/06/24	0635	HIGH SLACK	2	24.0
			82/06/25	0800	EBB	5	24.0
			82/06/26	0820	HIGH SLACK	2	24.0
			82/08/18	0635	EBB	2	25.5
			82/08/19	0940	EBB	5	26.0
			82/08/21	0615	HIGH SLACK	5	22.0
			82/08/23	0710	FLOOD	2	24.0
			82/08/25	0920	FLOOD	2	25.0
			83/02/09	1235	HIGH SLACK	7	26.5
			83/02/15	1025	EBB	8	25.0
			83/02/17	0935	EBB	21	21.5
			83/02/18	0915	HIGH SLACK	8	24.0
			83/02/22	0940	HIGH SLACK	8	24.0
			83/02/23	1205	HIGH SLACK	49	21.5
TK044	49 00.89	123 41.25	82/06/23	0610	EBB	7	24.0
			82/06/24	0640	HIGH SLACK	2	24.0
			82/06/25	0800	EBB	13	24.0
			82/06/26	0825	HIGH SLACK	2	24.0
			82/08/18	0640	EBB	2	26.0
			82/08/21	0615	HIGH SLACK	13	24.0
			82/08/23	0715	FLOOD	4	24.0
			82/08/25	0920	FLOOD	5	24.5
			83/02/09	1235	HIGH SLACK	5	28.0
			83/02/15	1025	EBB	13	19.5
			83/02/17	0940	EBB	17	25.0
			83/02/18	0915	HIGH SLACK	23	22.0
			83/02/22	0940	HIGH SLACK	33	20.0
			83/02/23	1205	HIGH SLACK	8	22.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK045	49 00.82	123 41.40	82/06/23	0615	EBB	2	23.5
			82/06/24	0640	HIGH SLACK	2	24.0
			82/06/25	0805	EBB	5	24.0
			82/06/26	0830	HIGH SLACK	4	24.5
			82/08/18	0640	EBB	<2	26.0
			82/08/21	0620	HIGH SLACK	33	24.0
			82/08/23	0715	FLOOD	11	24.0
			82/08/25	0925	FLOOD	<2	24.0
			83/02/09	1235	HIGH SLACK	8	28.0
			83/02/15	1030	EBB	23	20.5
			83/02/17	0940	EBB	2	26.0
			83/02/18	0920	HIGH SLACK	23	23.5
			83/02/22	0945	HIGH SLACK	13	25.0
			83/02/23	1210	EBB	15	22.5
TK046	49 00.81	123 41.65	82/06/23	0620	EBB	<2	23.5
			82/06/24	0645	HIGH SLACK	5	24.0
			82/06/25	0810	EBB	5	24.0
			82/06/26	0830	HIGH SLACK	<2	25.5
			82/08/18	0645	EBB	8	26.0
			82/08/21	0625	HIGH SLACK	14	24.0
			82/08/23	0715	FLOOD	33	24.0
			82/08/25	0925	FLOOD	11	24.0
			83/02/09	1240	HIGH SLACK	79	27.0
			83/02/15	1030	EBB	170	19.5
			83/02/17	0940	EBB	130	17.0
			83/02/18	0920	HIGH SLACK	70	25.0
			83/02/22	0945	HIGH SLACK	8	22.0
			83/02/23	0945	EBB	33	22.0
TK047	49 00.78	123 41.50	82/06/22	1010	EBB	<2	24.0
			82/06/23	1010	EBB	<2	24.0
			82/06/24	1015	EBB	<2	24.0
			82/06/25	0755	HIGH SLACK	<2	24.0
			82/08/18	0650	EBB	<2	26.0
			82/08/19	0945	EBB	<2	23.0
			82/08/21	0635	HIGH SLACK	5	24.0
			82/08/23	0720	FLOOD	7	24.0
			82/08/25	0930	FLOOD	5	24.0
TK048	49 00.70	123 41.65	82/06/22	1010	EBB	<2	24.0
			82/06/24	1020	EBB	2	24.0
			82/06/25	0750	HIGH SLACK	<2	24.0
			82/08/18	0650	EBB	<2	26.0
			82/08/19	0950	EBB	2	24.0
			82/08/21	0630	HIGH SLACK	5	24.0
			82/08/23	0720	FLOOD	7	24.0
			82/08/25	0930	FLOOD	<2	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK049	48 59.49	123 41.70	82/06/22	1015	EBB	<2	24.0
			82/06/23	1015	EBB	<2	24.0
			82/06/24	1020	EBB	<2	24.0
			82/06/25	0750	HIGH SLACK	<2	24.0
			82/08/18	0655	EBB	5	26.0
			82/08/19	0955	EBB	<2	24.0
			82/08/21	0635	HIGH SLACK	5	24.0
			82/08/23	0720	FLOOD	49	24.0
			82/08/25	0930	FLOOD	<2	24.0
TK050	48 59.42	123 41.69	82/06/22	1015	EBB	<2	24.0
			82/06/23	1015	EBB	<2	24.0
			82/06/24	1025	EBB	<2	24.0
			82/08/18	0655	EBB	<2	26.0
			82/08/19	0955	EBB	2	24.0
			82/08/21	0635	HIGH SLACK	8	24.0
			82/08/23	0725	FLOOD	5	24.0
			82/08/25	0935	FLOOD	7	24.0
TK051	48 58.83	123 41.10	82/06/22	1020	EBB	<2	24.0
			82/06/23	1020	EBB	2	24.0
			82/06/24	1025	EBB		24.0
			82/08/18	0655	EBB	2	26.0
			82/08/19	1000	EBB	<2	24.0
			82/08/21	0635	HIGH SLACK	8	24.0
			82/08/23	0725	FLOOD	17	24.0
			82/08/25	0935	FLOOD	33	24.0
TK052	48 58.88	123 40.95	82/06/22	1020	EBB	<2	23.0
			82/06/23	1020	EBB	4	23.5
			82/06/24	1025	EBB	2	24.0
			82/08/18	0700	EBB	7	26.0
			82/08/19	1000	EBB	2	22.0
			82/08/21	0640	HIGH SLACK	33	22.5
			82/08/23	0725	FLOOD	920	24.0
			82/08/25	0935	FLOOD	5	24.0
TK053	48 59.00	123 40.80	82/06/27	0850	HIGH SLACK	13	23.5
			82/06/28	0845	FLOOD	5	23.5
			82/06/29	0815	LOW SLACK	<2	23.5
			82/06/30	0855	LOW SLACK	<2	24.0
			82/07/01	0740	EBB	4	24.0
			82/08/16	1600	FLOOD	<2	25.5
			82/08/20	0630	EBB	2	24.0
			82/08/22	0705	HIGH SLACK	7	25.0
			82/08/24	0840	FLOOD	<2	24.0
			82/08/26	0755	FLOOD	<2	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK054	48 58.32	123 40.38	82/06/27	0855	HIGH SLACK	5	23.5
			82/06/28	0845	FLOOD	23	23.5
			82/06/29	0815	LOW SLACK	<2	24.0
			82/06/30	0855	LOW SLACK	2	24.0
			82/07/01	0740	EBB	<2	24.0
			82/08/16	1605	FLOOD	<2	25.5
			82/08/20	0630	EBB	<2	24.0
			82/08/22	0705	HIGH SLACK	2	24.0
			82/08/24	0840	FLOOD	<2	25.0
			82/08/26	0800	FLOOD	<2	24.0
TK055	48 58.30	123 40.38	82/06/27	0900	HIGH SLACK	2	23.5
			82/06/28	0850	FLOOD	6	23.5
			82/06/29	0825	LOW SLACK	2	24.0
			82/06/30	0900	LOW SLACK	<2	24.0
			82/07/01	0745	EBB	<2	24.0
			82/08/16	1605	FLOOD	<2	25.5
			82/08/20	0635	EBB	2	25.0
			82/08/22	0710	HIGH SLACK	<2	25.0
			82/08/24	0845	FLOOD	<2	25.0
			82/08/26	0800	FLOOD	<2	25.0
TK056	48 58.04	123 41.30	82/06/27	0910	HIGH SLACK	<2	23.5
			82/06/28	0855	FLOOD	<2	23.5
			82/06/29	0830	LOW SLACK	<2	24.0
			82/06/30	0900	LOW SLACK	<2	24.0
			82/07/01	0745	EBB	<2	24.0
			82/08/16	1610	FLOOD	<2	25.5
			82/08/20	0635	EBB	2	25.0
			82/08/22	0710	HIGH SLACK	5	25.0
			82/08/24	0850	FLOOD	<2	24.0
			82/08/26	0800	FLOOD	<2	25.0
TK057	48 58.50	123 41.20	82/06/27	0915	HIGH SLACK	<2	24.0
			82/06/28	0900	FLOOD	2	23.5
			82/06/29	0830	LOW SLACK	2	24.0
			82/06/30	0900	LOW SLACK	<2	24.0
			82/07/01	0750	EBB	<2	24.0
			82/08/16	1610	FLOOD	<2	25.5
			82/08/20	0640	EBB	<2	24.0
			82/08/22	0715	HIGH SLACK	5	24.0
			82/08/24	0850	FLOOD	2	24.0
			82/08/26	0805	FLOOD	2	25.0
TK058	48 58.40	123 41.09	82/06/27	0920	HIGH SLACK	2	24.0
			82/06/28	0900	FLOOD	17	23.5
			82/06/29	0840	LOW SLACK	<2	24.0
			82/06/30	0905	LOW SLACK	<2	24.0
			82/07/01	0805	LOW SLACK	<2	24.0
			82/08/16	1615	FLOOD	5	25.5

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK058	continued...		82/08/20	0640	EBB	5	23.0
			82/08/22	0715	HIGH SLACK	13	24.0
			82/08/24	0855	FLOOD	<2	24.5
			82/08/26	0805	FLOOD	11	24.5
TK059	48 58.38	123 41.15	82/06/27	0930	HIGH SLACK	8	24.0
			82/06/28	0905	FLOOD	14	23.5
			82/06/29	0840	LOW SLACK	2	24.0
			82/06/30	0905	LOW SLACK	<2	24.0
			82/07/01	0805	LOW SLACK	<2	24.0
			82/08/16	1615	FLOOD	4	25.5
			82/08/20	0645	EBB	<2	22.0
			82/08/22	0715	HIGH SLACK	70	24.0
			82/08/24	0855	FLOOD	2	25.0
			82/08/26	0805	FLOOD	5	24.0
TK060	48 58.28	123 41.28	82/06/27	0935	HIGH SLACK	2	24.0
			82/06/28	0910	FLOOD	5	23.5
			82/06/29	0850	LOW SLACK	<2	24.0
			82/06/30	0910	LOW SLACK	2	24.0
			82/07/01	0750	EBB	<2	24.0
			82/08/16	1620	FLOOD	<2	25.5
			82/08/20	0645	EBB	<2	23.0
			82/08/22	0720	HIGH SLACK	<2	24.0
			82/08/24	0900	HIGH SLACK	<2	24.5
			82/08/26	0815	FLOOD	2	24.0
TK061	48 58.32	123 41.48	82/06/27	0940	HIGH SLACK	5	23.5
			82/06/28	0910	FLOOD	<2	24.0
			82/06/29	0850	LOW SLACK	<2	24.0
			82/06/30	0910	LOW SLACK	4	24.0
			82/07/01	0750	EBB	2	23.5
			82/08/16	1620	FLOOD	5	25.5
			82/08/20	0650	EBB	<2	22.0
			82/08/22	0720	HIGH SLACK	2	24.0
			82/08/24	0700	HIGH SLACK	<2	24.0
			82/08/26	0815	FLOOD	2	25.0
TK062	48 58.41	123 41.48	82/06/27	0945	HIGH SLACK	13	23.5
			82/06/28	0915	FLOOD	2	24.0
			82/06/29	0850	LOW SLACK	<2	24.0
			82/06/30	0910	LOW SLACK	<2	24.0
			82/07/01	0755	EBB	5	23.5
			82/08/16	1620	FLOOD	<2	25.5
			82/08/20	0650	EBB	13	24.0
			82/08/22	0720	HIGH SLACK	23	24.0
			82/08/24	0905	HIGH SLACK	17	24.0
			82/08/26	0820	FLOOD	5	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK063	48 58.30	123 41.68	82/06/27	0950	HIGH SLACK	22	23.0
			82/06/28	0915	FLOOD	2	24.0
			82/06/29	0855	FLOOD	5	24.0
			82/06/30	0910	LOW SLACK	5	23.5
			82/07/01	0755	EBB	2	23.5
			82/08/16	1625	FLOOD	8	25.5
			82/08/20	0650	EBB	70	25.0
			82/08/22	0725	HIGH SLACK	79	24.0
			82/08/24	0915	HIGH SLACK	<2	24.0
			82/08/26	0820	FLOOD	2	24.0
TK064	48 58.48	123 41.60	82/06/27	0955	HIGH SLACK	13	23.0
			82/06/28	0920	FLOOD	<2	24.5
			82/06/29	0855	FLOOD	<2	24.5
			82/06/30	0915	LOW SLACK	<2	24.0
			82/07/01	0755	EBB	<2	23.5
			82/08/16	1625	FLOOD	5	25.5
			82/08/20	0655	EBB	79	25.0
			82/08/22	0725	HIGH SLACK	<2	25.0
			82/08/24	0915	HIGH SLACK	<2	24.0
			82/08/26	0820	FLOOD	<2	25.0
TK065	48 58.53	123 41.48	82/06/27	0955	HIGH SLACK	5	23.5
			82/06/28	0920	FLOOD	<2	24.0
			82/06/29	0900	FLOOD	<2	24.0
			82/06/30	0915	LOW SLACK	5	24.0
			82/07/01	0755	EBB	4	23.5
			82/08/16	1630	FLOOD	2	25.5
			82/08/20	0655	EBB	<2	24.0
			82/08/22	0725	HIGH SLACK	<2	25.0
			82/08/24	0920	HIGH SLACK	2	24.0
			82/08/26	0825	FLOOD	<2	24.0
TK066	48 59.02	123 39.35	82/06/27	1000	HIGH SLACK	<2	23.0
			82/06/28	0925	FLOOD	<2	24.0
			82/06/29	0900	FLOOD	<2	24.0
			82/06/30	0915	LOW SLACK	2	24.0
			82/07/01	0800	EBB	<2	24.0
			82/08/16	1630	FLOOD	<2	25.5
			82/08/20	0700	EBB	<2	22.0
			82/08/22	0725	HIGH SLACK	<2	24.0
			82/08/24	0920	HIGH SLACK	4	24.0
			82/08/26	0825	FLOOD	2	24.0
TK067	48 58.95	123 40.05	82/06/27	1005	HIGH SLACK	<2	23.5
			82/06/28	0925	FLOOD	13	24.0
			82/06/29	0905	FLOOD	<2	24.0
			82/06/30	0920	LOW SLACK	<2	24.0
			82/07/01	0800	EBB	<2	23.5
			82/08/16	1630	FLOOD	<2	25.5

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK067	continued...		82/08/20	0705	EBB	2	24.0
			82/08/22	0730	HIGH SLACK	2	24.0
			82/08/24	0920	HIGH SLACK	5	24.0
			82/08/26	0825	FLOOD	<2	24.0
TK068	48 58.65	123 40.00	82/06/27	1010	HIGH SLACK	5	23.5
			82/06/28	0930	FLOOD	<2	24.0
			82/06/29	0910	FLOOD	<2	24.0
			82/06/30	0920	LOW SLACK	<2	24.0
			82/07/01	0800	EBB	<2	23.5
			82/08/16	1635	FLOOD	<2	25.5
			82/08/20	0705	EBB	<2	22.0
			82/08/22	0730	HIGH SLACK	<2	24.0
			82/08/24	0920	HIGH SLACK	<2	24.5
			82/08/26	0825	FLOOD	<2	24.0
TK069	48 58.12	123 39.42	82/06/27	1015	HIGH SLACK	<2	24.0
			82/06/28	0930	FLOOD	<2	24.0
			82/06/29	0915	FLOOD	<2	24.0
			82/06/30	0920	LOW SLACK	<2	24.0
			82/07/01	0805	LOW SLACK	<2	24.0
			82/08/16	1635	FLOOD	<2	25.5
			82/08/20	0705	EBB	<2	23.0
			82/08/22	0735	HIGH SLACK	<2	24.0
			82/08/24	0925	HIGH SLACK	<2	24.5
			82/08/26	0830	FLOOD	2	24.0
TK070	48 58.02	123 39.50	82/06/28	1135	HIGH SLACK	4	24.0
			82/06/29	1135	HIGH SLACK	<2	24.0
			82/06/30	1040	FLOOD	11	24.0
			82/07/01	0820	LOW SLACK	8	24.0
			82/08/16	1805	HIGH SLACK	8	25.5
			82/08/20	0845	EBB	13	24.0
			82/08/22	0850	EBB	11	24.0
			82/08/24	1050	HIGH SLACK	33	25.0
			82/08/26	0950	FLOOD	2	25.0
TK071	48 56.50	123 48.45	82/06/27	1230	EBB	4	23.5
			82/06/28	1130	HIGH SLACK	<2	24.0
			82/06/29	1130	HIGH SLACK	2	23.0
			82/06/30	1040	FLOOD	2	24.0
			82/07/01	0835	LOW SLACK	4	23.5
			82/08/16	1800	HIGH SLACK	13	25.5
			82/08/20	0840	EBB	8	24.0
			82/08/22	0855	EBB	14	24.0
			82/08/24	1045	HIGH SLACK	79	24.5
			82/08/26	0950	FLOOD	8	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK072	48 56.53	123 38.35	82/06/27	1235	EBB	2	23.5
			82/06/28	1140	HIGH SLACK	<2	24.0
			82/06/29	1140	HIGH SLACK	2	24.0
			82/06/30	1045	FLOOD	49	24.0
			82/07/01	0815	LOW SLACK	5	23.5
			82/08/16	1805	HIGH SLACK	33	25.5
			82/08/20	0845	EBB	4	24.0
			82/08/22	0855	EBB	<2	25.0
			82/08/24	1050	HIGH SLACK	13	24.0
			82/08/26	0955	FLOOD	4	25.0
TK073	48 56.45	123 38.11	82/06/28	1145	HIGH SLACK	49	23.0
			82/06/29	1135	HIGH SLACK	5	24.0
			82/06/30	1050	FLOOD	2	24.0
			82/07/01	0815	LOW SLACK	5	24.0
			82/08/16	1810	HIGH SLACK	7	25.5
			82/08/20	0855	EBB	13	25.0
			82/08/22	0900	EBB	2	25.0
			82/08/24	1100	HIGH SLACK	<2	24.0
			82/08/26	1000	FLOOD	5	24.0
TK074	48 56.73	123 38.29	82/06/28	1145	HIGH SLACK	46	23.0
			82/06/29	1135	HIGH SLACK	11	24.0
			82/06/30	1100	FLOOD	2	24.0
			82/07/01	0815	LOW SLACK	49	24.0
			82/08/16	1810	HIGH SLACK	49	25.5
			82/08/20	0855	EBB	13	25.0
			82/08/22	0900	EBB	2	24.0
			82/08/24	1100	HIGH SLACK	<2	24.5
			82/08/26	1000	FLOOD	7	24.0
TK075	48 56.11	123 38.02	82/06/27	1030	HIGH SLACK	5	24.0
			82/06/28	0950	FLOOD	5	24.5
			82/06/29	0925	FLOOD	2	23.5
			82/06/30	0930	LOW SLACK	27	24.0
			82/07/01	1010	FLOOD	4	23.5
			82/08/16	1645	HIGH SLACK	<2	25.5
			82/08/20	0715	EBB	<2	24.0
			82/08/22	0745	HIGH SLACK	2	24.0
			82/08/24	0935	HIGH SLACK	<2	24.5
			82/08/26	0845	FLOOD	<2	24.0
TK076	48 55.75	123 38.00	82/06/27	1030	HIGH SLACK	13	24.0
			82/06/28	0950	FLOOD	13	24.5
			82/06/29	0930	FLOOD	2	23.5
			82/06/30	0935	LOW SLACK	8	24.0
			82/07/01	1015	FLOOD	<2	23.5
			82/08/16	1640	HIGH SLACK	<2	25.5
			82/08/20	0720	EBB	<2	25.0
			82/08/22	0745	HIGH SLACK	<2	24.0

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Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK076	continued...		82/08/24	0935	HIGH SLACK	<2	24.0
			82/08/26	0845	FLOOD	2	24.0
TK077	48 55.82	123 37.80	82/06/27	1035	EBB	2	24.0
			82/06/28	0955	FLOOD	11	24.5
			82/06/29	0930	FLOOD	5	23.5
			82/06/30	0935	LOW SLACK	<2	24.0
			82/07/01	1015	FLOOD	<2	23.5
			82/08/16	1650	HIGH SLACK	<2	25.5
			82/08/20	0720	EBB	<2	24.0
			82/08/22	0745	HIGH SLACK	<2	24.0
			82/08/24	0935	HIGH SLACK	<2	24.0
			82/08/26	0850	FLOOD	<2	24.0
TK078	48 55.68	123 37.72	82/06/27	1040	EBB	8	24.5
			82/06/28	1000	FLOOD	5	24.5
			82/06/29	0935	FLOOD	5	23.5
			82/06/30	0935	LOW SLACK	<2	24.0
			82/07/01	1015	FLOOD	2	23.5
			82/08/16	1655	HIGH SLACK	14	25.5
			82/08/20	0720	EBB	<2	24.0
			82/08/22	0745	HIGH SLACK	<2	24.0
			82/08/24	0935	HIGH SLACK	<2	24.0
			82/08/26	0850	FLOOD	<2	25.0
TK079	48 56.00	123 37.89	82/06/27	1045	EBB	<2	24.5
			82/06/28	1000	FLOOD	<2	24.5
			82/06/29	0935	FLOOD	2	23.0
			82/06/30	0940	FLOOD	<2	24.0
			82/07/01	0940	LOW SLACK	<2	23.5
			82/08/16	1655	HIGH SLACK	2	25.5
			82/08/20	0725	EBB	<2	24.0
			82/08/22	0750	HIGH SLACK	4	24.0
			82/08/24	0940	HIGH SLACK	<2	24.0
			82/08/26	0900	FLOOD	<2	24.0
TK080	49 00.30	123 35.90	82/06/27	1050	EBB	<2	24.5
			82/06/28	1005	FLOOD	<2	25.0
			82/06/29	0940	FLOOD	2	23.0
			82/06/30	0940	FLOOD	<2	24.0
			82/07/01	0935	LOW SLACK	5	23.5
			82/08/16	1700	HIGH SLACK	2	25.5
			82/08/20	0725	EBB	2	24.0
			82/08/22	0750	HIGH SLACK	<2	24.0
			82/08/24	0940	HIGH SLACK	2	24.0
			82/08/26	0900	FLOOD	<2	24.0

APPENDIX I

Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK081	48 59.80	123 36.15	82/06/27	1055	EBB	2	24.5
			82/06/28	1005	FLOOD	2	25.0
			82/06/29	0945	FLOOD	<2	24.0
			82/06/30	0940	FLOOD	<2	24.0
			82/07/01	0940	LOW SLACK	<2	23.5
			82/08/16	1700	HIGH SLACK	49	25.5
			82/08/20	0730	EBB	11	24.5
			82/08/22	0755	HIGH SLACK	46	24.0
			82/08/24	0945	HIGH SLACK	2	24.0
			82/08/26	0905	FLOOD	110	24.0
TK082	48 59.28	123 36.50	82/06/29	0945	FLOOD	11	24.0
			82/06/30	0945	FLOOD	<2	24.0
			82/07/01	0940	LOW SLACK	<2	23.0
			82/07/27	1055	EBB	2	24.0
			82/07/28	1010	FLOOD	23	25.0
			82/08/16	1700	HIGH SLACK	2	25.5
			82/08/20	0730	EBB	<2	24.0
			82/08/22	0755	HIGH SLACK	<2	24.0
			82/08/24	0945	HIGH SLACK	5	24.0
			82/08/26	0905	FLOOD	8	24.0
TK083	48 59.18	123 38.10	82/06/27	1110	EBB	<2	24.5
			82/06/28	1020	FLOOD	<2	25.0
			82/06/29	0955	FLOOD	<2	22.5
			82/06/30	0950	FLOOD	<2	24.0
			82/07/01	0935	LOW SLACK	<2	23.0
			82/08/16	1705	HIGH SLACK	<2	25.5
			82/08/20	0740	EBB	<2	24.0
			82/08/22	0800	HIGH SLACK	<2	24.0
			82/08/24	0950	HIGH SLACK	<2	24.0
			82/08/26	0910	FLOOD	<2	24.0
TK084	48 58.99	123 38.10	82/06/27	1120	EBB	2	20.0
			82/06/28	1035	HIGH SLACK	<2	23.5
			82/06/29	1025	FLOOD	<2	23.5
			82/06/30	1000	FLOOD	<2	24.0
			82/07/01	0855	LOW SLACK	<2	23.0
			82/08/16	1720	HIGH SLACK	<2	27.0
TK085	48 58.95	123 38.42	82/06/27	1125	EBB	<2	19.5
			82/06/28	1040	HIGH SLACK	2	24.0
			82/06/29	1030	FLOOD	<2	20.5
			82/06/30	1005	FLOOD	<2	20.0
			82/07/01	0850	LOW SLACK	2	23.5
			82/08/16	1720	HIGH SLACK	<2	25.0
TK086	48 58.39	123 38.45	82/06/27	1130	EBB	<2	24.0
			82/06/28	1040	HIGH SLACK	5	22.5
			82/06/29	1030	FLOOD	<2	22.5

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Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK086	continued...		82/06/30	1005	FLOOD	2	20.5
			82/07/01	0850	LOW SLACK	2	23.0
			82/08/16	1725	HIGH SLACK	<2	25.5
TK087	48 58.90	123 38.55	82/06/27	1140	EBB	<2	24.0
			82/06/28	1045	HIGH SLACK	<2	23.5
			82/06/29	1035	FLOOD	2	22.5
			82/06/30	1010	FLOOD	2	24.0
			82/07/01	0845	LOW SLACK	<2	23.5
			82/08/16	1730	HIGH SLACK	<2	25.5
			82/08/20	0750	EBB	2	22.0
			82/08/22	0815	HIGH SLACK	2	23.0
			82/08/24	1000	HIGH SLACK	<2	24.5
			82/08/26	0920	FLOOD	<2	25.0
			83/02/09	1335	HIGH SLACK	2	28.0
			83/02/15	1345	LOW SLACK	<2	26.0
			83/02/17	1235	EBB	5	24.0
			83/02/18	1105	EBB	<2	27.5
			83/02/22	1005	HIGH SLACK	<2	26.0
TK088	48 58.80	123 38.55	82/06/27	1145	EBB	2	24.0
			82/06/28	1050	HIGH SLACK	<2	23.5
			82/06/29	1035	FLOOD	<2	22.0
			82/06/30	1015	FLOOD	<2	24.0
			82/07/01	0845	LOW SLACK	2	23.5
			82/08/16	1730	HIGH SLACK	49	25.5
			82/08/20	0755	EBB	4	23.0
			82/08/22	0815	HIGH SLACK	<2	23.0
			82/08/24	1000	HIGH SLACK	<2	24.0
			82/08/26	0920	FLOOD	2	24.0
			83/02/09	1335	HIGH SLACK	<2	28.0
			83/02/15	1350	LOW SLACK	<2	26.5
			83/02/17	1235	EBB	<2	24.0
			83/02/18	1110	EBB	<2	28.0
			83/02/22	1005	HIGH SLACK	2	28.0
TK089	48 58.90	123 38.92	82/06/27	1145	EBB	11	24.0
			82/06/28	1055	HIGH SLACK	5	23.5
			82/06/29	1040	FLOOD	<2	22.0
			82/06/30	1015	FLOOD	<2	22.5
			82/07/01	0845	LOW SLACK	5	23.5
			82/08/16	1735	HIGH SLACK	49	25.5
			82/08/20	0755	EBB	5	23.0
			82/08/22	0815	HIGH SLACK	2	24.0
			82/08/24	1005	HIGH SLACK	<2	24.0
			82/08/26	0925	FLOOD	<2	25.0
			83/02/09	1340	HIGH SLACK	<2	28.0
			83/02/15	1355	LOW SLACK	<2	26.5
			83/02/17	1240	EBB	<2	24.0

APPENDIX I

Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK089	continued...		83/02/18	1110	EBB	<2	29.0
			83/02/22	1010	HIGH SLACK	<2	27.5
TK090	48 58.95	123 38.91	82/06/27	1150	EBB	2	23.5
			82/06/28	1055	HIGH SLACK	5	24.0
			82/06/29	1045	FLOOD	5	22.0
			82/06/30	1015	FLOOD	33	23.5
			82/07/01	0845	LOW SLACK	7	24.0
			82/08/16	1735	HIGH SLACK	2	25.5
			82/08/20	0800	EBB	8	22.0
			82/08/22	0820	HIGH SLACK	21	24.0
			82/08/24	1005	HIGH SLACK	8	24.5
			82/08/26	0925	FLOOD	13	25.0
			83/02/09	1340	HIGH SLACK	<2	27.0
			83/02/15	1400	LOW SLACK	<2	26.5
			83/02/17	1240	EBB	540	24.0
			83/02/18	1115	EBB	540	28.0
			83/02/22	1010	HIGH SLACK	2	27.0
TK091	48 59.00	123 39.12	82/06/27	1150	EBB	<2	24.0
			82/06/28	1100	HIGH SLACK	<2	24.0
			82/06/29	1045	FLOOD	<2	22.0
			82/06/30	1020	FLOOD	<2	24.0
			82/07/01	0840	LOW SLACK	5	23.5
			82/08/16	1735	HIGH SLACK	2	25.5
			82/08/20	0800	EBB	5	22.5
			82/08/22	0820	HIGH SLACK	33	24.0
			82/08/24	1010	HIGH SLACK	4	24.5
			82/08/26	0930	FLOOD	8	25.0
			83/02/09	1345	HIGH SLACK	<2	27.5
			83/02/15	1400	LOW SLACK	<2	27.0
			83/02/17	1245	EBB	5	24.0
			83/02/18	1115	EBB	<2	27.5
			83/02/22	1010	HIGH SLACK	5	26.0
TK092	48 58.98	123 39.02	82/06/27	1155	EBB	2	23.5
			82/06/28	1100	HIGH SLACK	2	24.0
			82/06/29	1050	FLOOD	23	22.0
			82/06/30	1020	FLOOD	33	22.5
			82/07/01	0840	LOW SLACK	49	24.0
			82/08/16	1740	HIGH SLACK	23	25.5
			82/08/20	0805	EBB	5	23.0
			82/08/22	0820	HIGH SLACK	33	24.0
			82/08/24	1010	HIGH SLACK	<2	24.0
			82/08/26	0930	FLOOD	2	25.0
			83/02/09	1345	HIGH SLACK	2	27.5
			83/02/15	1400	LOW SLACK	<2	26.5
			83/02/17	1245	EBB	130	23.0
			83/02/18	1115	EBB	2	27.0
			83/02/22	1015	HIGH SLACK	23	25.5

APPENDIX I

Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK093	48 59.05	123 39.32	82/06/27	1200	EBB	5	24.0
			82/06/28	1105	HIGH SLACK	7	23.5
			82/06/29	1050	FLOOD	8	22.0
			82/06/30	1020	FLOOD	8	22.0
			82/07/01	0840	LOW SLACK	5	23.0
			82/08/16	1745	HIGH SLACK	<2	25.5
			82/08/20	0805	EBB	5	23.0
			82/08/22	0825	HIGH SLACK	22	24.0
			82/08/24	1010	HIGH SLACK	11	24.5
			82/08/26	0930	FLOOD	2	25.0
			83/02/09	1350	HIGH SLACK	2	27.5
			83/02/15	1405	LOW SLACK	<2	26.5
			83/02/17	1250	EBB	5	21.5
			83/02/18	1120	EBB	<2	28.0
			83/02/22	1015	HIGH SLACK	8	24.5
TK094	48 59.05	123 39.69	82/06/27	1200	EBB	2	24.0
			82/06/28	1105	HIGH SLACK	<2	23.5
			82/06/29	1050	FLOOD	2	22.0
			82/06/30	1020	FLOOD	33	22.5
			82/07/01	0835	LOW SLACK	5	23.5
			82/08/16	1745	HIGH SLACK	<2	25.5
			82/08/20	0810	EBB	2	22.0
			82/08/22	0825	HIGH SLACK	4	24.0
			82/08/24	1015	HIGH SLACK	8	24.0
			82/08/26	0930	FLOOD	23	25.0
			83/02/09	1350	HIGH SLACK	<2	27.5
			83/02/15	1405	LOW SLACK	<2	27.0
			83/02/17	1250	EBB	2	26.0
			83/02/18	1120	EBB	2	28.0
			83/02/22	1020	HIGH SLACK	7	25.0
TK095	48 59.15	123 39.31	82/06/27	1205	EBB	4	23.5
			82/06/28	1105	HIGH SLACK	2	24.0
			82/06/29	1100	FLOOD	4	22.5
			82/06/30	1025	FLOOD	23	22.0
			82/07/01	0835	LOW SLACK	7	23.5
			82/08/16	1745	HIGH SLACK	<2	25.5
			82/08/20	0810	EBB	2	22.0
			82/08/22	0825	EBB	<2	24.0
			82/08/24	1015	HIGH SLACK	<2	24.0
			82/08/26	0935	FLOOD	13	25.0
			83/02/09	1350	HIGH SLACK	<2	27.5
			83/02/15	1405	LOW SLACK	2	26.0
			83/02/17	1250	EBB	2	25.0
			83/02/18	1120	EBB	<2	27.0
			83/02/22	1020	HIGH SLACK	5	23.5

APPENDIX I

Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK096	48 59.30	123 39.00	82/06/27	1210	EBB	<2	24.0
			82/06/28	1110	HIGH SLACK	<2	24.0
			82/06/29	1100	FLOOD	13	22.5
			82/06/30	1025	FLOOD	13	22.0
			82/07/01	0835	LOW SLACK	2	24.0
			82/08/16	1750	HIGH SLACK	<2	25.5
			82/08/20	0815	EBB	4	22.0
			82/08/22	0830	HIGH SLACK	7	24.0
			82/08/24	1020	HIGH SLACK	2	25.0
			82/08/26	0935	FLOOD	<2	25.0
			83/02/09	1355	HIGH SLACK	<2	27.5
			83/02/15	1410	LOW SLACK	2	27.0
			83/02/17	1255	EBB	2	25.0
			83/02/18	1120	EBB	<2	28.0
			83/02/22	1020	HIGH SLACK	8	25.0
TK097	49 59.05	123 39.32	82/06/27	1210	EBB	5	23.5
			82/06/28	1110	HIGH SLACK	17	24.0
			82/06/29	1105	FLOOD	11	22.0
			82/06/30	1025	FLOOD	11	22.5
			82/07/01	0830	LOW SLACK	17	24.0
			82/08/16	1750	HIGH SLACK	2	25.5
			82/08/20	0820	EBB	17	22.0
			82/08/22	0830	HIGH SLACK	8	24.5
			82/08/24	1020	HIGH SLACK	5	24.5
			82/08/26	0940	FLOOD	13	25.0
			83/02/09	1355	HIGH SLACK	<2	27.5
			83/02/15	1410	LOW SLACK	2	28.0
			83/02/17	1255	EBB	13	24.5
			83/02/18	1120	EBB	5	26.0
			83/02/22	1025	HIGH SLACK	17	22.5
TK098	49 59.00	123 39.35	82/08/20	0835	EBB	8	24.0
			82/08/22	0845	EBB	2	24.0
			82/08/24	1040	HIGH SLACK	23	24.5
			82/08/26	0950	FLOOD	2	25.0
			83/02/09	1410	EBB	2	28.0
			83/02/15	1420	FLOOD	2	25.0
			83/02/17	1315	EBB	2	23.5
			83/02/18	1130	EBB	<2	26.0
			83/02/22	1025	HIGH SLACK	17	22.5
TK099	49 59.05	123 39.69	82/06/28	1125	HIGH SLACK	8	24.0
			82/06/29	1130	HIGH SLACK	49	24.0
			82/06/30	1040	FLOOD	2	24.0
			82/07/01	0825	LOW SLACK	2	24.0
			82/08/16	1755	HIGH SLACK	33	25.5
			82/08/20	0840	EBB	11	23.0
			82/08/22	0845	EBB	8	24.0
			82/08/24	1040	HIGH SLACK	5	24.5

APPENDIX I

Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK099	continued...		82/08/26	0950	FLOOD	13	24.5
			83/02/09	1415	EBB	2	28.0
			83/02/15	1430	FLOOD	17	16.0
			83/02/17	1310	EBB	49	19.5
			83/02/18	1130	EBB	9	23.5
			83/02/22	1030	HIGH SLACK	14	19.0
TK100	49 59.29	123 39.60	82/08/20	0835	EBB	2	24.0
			82/08/22	0835	EBB	4	24.0
			82/08/24	1035	HIGH SLACK	<2	24.5
			82/08/26	0945	FLOOD	2	25.0
			83/02/09	1415	EBB	2	27.0
			83/02/15	1425	FLOOD	2	24.0
			83/02/17	1305	EBB	17	21.5
			83/02/18	1130	EBB	5	25.0
			83/02/22	1035	HIGH SLACK	7	20.0
TK101	49 59.20	123 39.43	82/08/20	0830	EBB	5	24.0
			82/08/22	0835	EBB	79	24.0
			82/08/24	1030	HIGH SLACK	11	24.5
			82/08/26	0945	FLOOD	2	25.0
			83/02/09	1405	EBB	5	26.0
			83/02/15	1410	LOW SLACK	21	17.5
			83/02/17	1305	EBB	17	24.0
			83/02/18	1125	EBB	2	27.0
			83/02/22	1040	HIGH SLACK	79	21.5
TK102	49 59.15	123 39.31	82/06/27	1215	EBB	2	23.0
			82/06/28	1115	HIGH SLACK	4	23.5
			82/06/29	1105	FLOOD	2	22.0
			82/06/30	1030	FLOOD	7	22.0
			82/07/01	0830	LOW SLACK	13	23.5
			82/08/16	1755	HIGH SLACK	240	25.5
			82/08/20	0820	EBB	49	24.0
			82/08/22	0840	EBB	31	25.0
			82/08/24	1030	HIGH SLACK	31	25.0
			82/08/26	0940	FLOOD	2	25.0
			83/02/09	1405	EBB	49	24.0
			83/02/15	1410	LOW SLACK	<2	26.0
			83/02/17	1300	EBB	7	19.0
			83/02/18	1125	EBB	<2	26.5
			83/02/22	1040	HIGH SLACK	49	23.0
TK103	49 59.30	123 39.00	82/06/27	1220	EBB	14	23.5
			82/06/28	1120	HIGH SLACK	23	23.5
			82/06/29	1120	FLOOD	4	22.0
			82/06/30	1035	FLOOD	8	22.5
			82/07/01	0830	LOW SLACK	2	23.5
			82/08/16	1755	HIGH SLACK	49	25.5

APPENDIX I

Daily Data Record for Marine Sample Stations

Station	Latitude	Longitude	Date	Time	Tide	Fec.Colif.	Salinity
TK103	continued...		82/08/20	0825	EBB	8	23.0
			82/08/22	0845	EBB	2	24.0
			82/08/24	1025	HIGH SLACK	2	24.0
			82/08/26	0940	FLOOD	2	24.0
			83/02/09	1400	EBB	7	28.0
			83/02/15	1415	FLOOD	<2	27.5
			83/02/17	1255	EBB	8	25.5
			83/02/18	1125	EBB	<2	27.5
			83/02/22	1045	HIGH SLACK	11	26.0

APPENDIX II

SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL		
	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %
001	5	8-70	14	51.5	5	5-170	17	109.5	10	5-170	15.5	70	5	11-540	49	301.5	15	5-540	33	120
2	5	2-23	11	20	5	5-33	11	23	10	2-33	11	23	5	11-79	33	74.5	15	2-79	13	51.5
3	5	14-33	17	28	5	< 2-13	2	7	10	< 2-33	5	23	5	4-350	33	210	15	< 2-350	17	51.5
4	5	< 2-33	8	18	5	< 2-170	8	90.5	10	< 2-170	8	23	5	2-79	33	56	15	< 2-170	11	56
5	5	11-49	23	36	5	< 2-70	2	41.5	10	< 2-70	18	49	5	< 2-170	46	120	15	< 2-170	23	70
6	5	2-23	4	14	5	< 2-9	5	8.5	10	< 2-23	4.5	9	5	< 2-240	79	185	15	< 2-240	8	104.5
7	5	2-130	7	71.5	5	< 2-5	2	5	10	< 2-130	2.5	7	5	5-540	46	294.5	15	< 2-540	5	89.5
8	5	2-17	8	15	5	2-13	5	10.5	10	2-17	6	13	5	2-110	13	79.5	15	< 2-110	8	33
9	5	2-13	6	10	5	2-8	2	6.5	10	< 2-13	3.5	8	5	< 2-46	5	31.5	15	< 2-46	5	15
10	5	2-8	4	7.5	5	< 2-5	5	5	10	< 2-8	5	7	5	< 2-130	13	81.5	15	< 2-130	5	23
11	5	< 2-11	2	6.5	5	< 2-4	2	3	10	< 2-11	2	4	5	< 2-22	8	17.5	15	< 2-22	2	12
12	5	< 2-11	2	6.5	5	< 2-17	5	12	10	< 2-17	2	11	5	< 2-14	5	11	15	< 2-17	5	12.5
13	5	< 2-49	2	27	5	< 2-23	2	14	10	< 2-49	2	23	5	< 2-350	49	214.5	15	< 2-350	5	64
14	5	2-17	5	12.5	5	< 2-5	2	5	10	< 2-17	3.5	8	5	< 2-5	< 2	4.5	15	< 2-17	2	6.5
15	5	< 2-5	< 2	5	5	< 2-2	< 2	2	10	< 2-5	< 2	5	4	< 2-5	-	-	14	< 2-5	< 2	5

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %
16	5	< 2-13	2	10.5	5	< 2-4	< 2	3	10	< 2-13	2	4	4	< 2-2	-	-	14	< 2-13	< 2	6.4
17	5	< 2-23	13	18	5	2-8	5	6.5	10	< 2-23	5	13	4	< 2-5	-	-	14	< 2-23	5	13
18	5	< 2-11	5	9.5	5	< 2-5	< 2	5	10	< 2-11	4.5	8	4	< 2-33	-	-	14	< 2-33	3	9.8
19	5	< 2-8	2	6.5	5	< 2-17	5	12	10	< 2-17	4.5	8	4	< 2-8	-	-	14	< 2-17	5	8.0
20	5	< 2-8	< 2	3.8	5	< 2-22	2	12.5	10	< 2-22	2	13	4	< 2-4	-	-	14	< 2-22	2	11
21	5	< 2-5	2	3.5	5	2->1600	7	804	10	< 2->1600	3.5	8	4	< 2-5	-	-	14	< 2- 1600	2	7.6
22	5	< 2-17	8	15	5	4-13	5	12	10	< 2-17	6.5	13	4	< 2-13	-	-	14	< 2-17	5	13.0
23	5	< 2-13	4	9	5	< 2-130	2	67	10	< 2-130	2.5	5	4	2-11	-	-	14	< 2-130	4.5	13.6
24	5	2-21	5	13	5	< 2-4	2	3	10	< 2-21	2	5	——— NOT SAMPLED ———							
25	5	< 2-17	2	11	5	< 2-2	< 2	< 2	10	< 2-17	< 2	5	"							
26	5	< 2-23	2	14	5	< 2-2	< 2	< 2	10	< 2-23	< 2	11	"							
27	5	< 2-17	< 2	9.5	5	< 2-2	< 2	< 2	10	< 2-17	< 2	2	"							
28	5	5-17	9	14	5	< 2-5	2	3.5	10	< 2-17	5	11	4	< 2-5	-	-	14	< 2-17	3.5	10.2
29	4	5-33	-	-	5	2-14	5	9.5	9	2-33	8	18.6	4	< 2-31	-	-	13	< 2-33	8	28.6
30	4	7-79	-	-	4	2-13	-	-	8	2-79	10	42.2	4	< 2-79	-	-	12	< 2-79	7.5	69.8

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL		
	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %
31	——— NOT SAMPLED ———				3	2-4			3	2-4			4	< 2-23			7	< 2-23	4	9.7
32	5	< 2-8	2	6.5	5	< 2-33	2	20.5	10	< 2-33	2	8	——— NOT SAMPLED ———							
33	4	< 2-5			5	< 2-14	2	9.5	9	< 2-14	2	5	"							
34	5	< 2-5	2	3.5	5	< 2-4	2	3	10	< 2-5	2	4	"							
35	——— NOT SAMPLED ———				3	2-79			3	2-79			"							
36	"				3	2-79			3	2-79			"							
37	"				3	2-23			3	2-23			"							
38	5	< 2-8	< 2	6.5	2	< 2-2			7	< 2-8	< 2	5.9	"							
39	5	< 2-8	< 2	4	2	< 2-2			7	< 2-8	< 2	3.8	"							
40	5	< 2-2	< 2	2	2	< 2-2			7	< 2-2	< 2	2	"							
41	5	< 2-13	2	2.5	5	< 2-13	7	10.5	10	< 2-13	2	13	6	< 2-13	6	10	16	< 2-13	3	13
42	5	< 2-7	< 2	5.5	5	2-8	5	8	10	< 2-8	4.5	8	6	4-14	5	13.4	16	< 2-14	5	10
43	4	< 2-5			5	2-5	2	5	9	< 2-5	2	5	6	7-49	8	32.2	15	< 2-49	5	35
44	4	2-13			4	2-13			8	2-13	3.5	8.2	6	5-33	15	27.0	14	< 2-33	7	20.6
45	5	2-5	3	4.6	4	< 2-33			8	< 2-33	2	10.6	6	2-23	14	23.0	14	< 2-33	6.5	23

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL		
	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %
046	4	< 2-5			4	8-33			8	< 2-33	5	15.4	6	8-170	74.5	146	14	< 2-170	12.5	109.6
47	4	< 2			5	< 2-7	5	6	10	< 2-7	< 2	5	——— NOT SAMPLED ———							
48	4	< 2-2			5	< 2-7	2	6	9	< 2-7	2	5.2	"							
49	4	< 2			5	< 2-49	5	27	10	< 2-49	< 2	5	"							
50	3	< 2			5	< 2-8	5	7.5	8	< 2-8	< 2	7.2	"							
51	3	< 2-2			5	< 2-33	8	25	8	< 2-33	2	20.2	"							
52	3	< 2-4			5	2-920	7	476.5	8	< 2-920	4.5	210.4	"							
53	5	< 2-13	4	9	5	< 2-7	< 2	4.2	10	< 2-13	< 2	7	"							
54	5	< 2-23	2	14	5	< 2-2	< 2	< 2	10	< 2-23	< 2	5	"							
55	5	< 2-6	2	4	5	< 2-2	< 2	< 2	10	< 2-6	< 2	2	"							
56	5	< 2-	< 2	< 2	5	< 2-5	< 2	3.5	10	< 2-5	< 2	2	"							
57	5	< 2-2	< 2	< 2	5	< 2-5	2	3.5	10	< 2-5	< 2	2	"							
58	5	< 2-17	< 2	9.5	5	< 2-13	5	8	10	< 2-17	3.5	13	"							
59	5	< 2-14	2	11	5	< 2-70	4	37.5	10	< 2-70	3	8	"							
060	5	< 2-5	2	3.5	5	< 2-2	< 2	< 2	10	< 2-5	< 2	2	"							

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL		
	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %
61	5	< 2-5	2	4.5	5	< 2-5	2	3.5	10	< 2-5	2	5	-------- NOT SAMPLED --------							
62	5	< 2-13	2	9	5	< 2-23	13	20	10	< 2-23	5	17	"							
63	5	2-22	5	13.5	5	< 2-79	8	74.5	10	< 2-79	5	70	"							
64	5	< 2-13	< 2	6.5	5	< 2-79	< 2	42	10	< 2-79	< 2	13	"							
65	5	< 2-5	4	5	5	< 2-2	< 2	2	10	< 2-5	< 2	5	"							
66	5	< 2-2	< 2	< 2	5	< 2-4	< 2	3	10	< 2-4	< 2	2	"							
67	5	< 2-13	< 2	6.5	5	< 2-5	2	3.5	10	< 2-13	< 2	5	"							
68	5	< 2-5	< 2	2.5	5	< 2	< 2	< 2	10	< 2-5	< 2	< 2	"							
69	5	< 2	< 2	< 2	5	< 2-2	< 2	< 2	10	< 2-2	< 2	< 2	"							
70	4	< 2-11			5	2-33	11	23	9	< 2-33	8	11.2	"							
71	5	< 2-4	2	4	5	8-79	13	46.5	10	< 2-79	6	14	"							
72	5	< 2-49	2	27	5	< 2-33	4	23	10	< 2-49	4	33	"							
73	4	2-49			5	< 2-13	5	10	9	< 2-49	5	16.6	"							
74	4	2-49			5	< 2-49	7	31	9	< 2-49	11	49	"							
075	5	2-27	5	16	5	< 2-2	< 2	< 2	10	< 2-27	2	5	"							

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %	No. of Samples	MPN per 100 mL Range	Median	90 %
76	5	< 2-13	8	13	5	< 2-2	< 2	< 2	10	< 2-13	< 2	13	——— NOT SAMPLED ———							
77	5	< 2-11	2	8	5	< 2	< 2	< 2	10	< 2-11	< 2	5	"							
78	5	< 2-8	5	6.5	5	< 2-14	< 2	7	10	< 2-14	< 2	8	"							
79	5	< 2-2	< 2	< 2	5	< 2-4	< 2	3	10	< 2-4	< 2	2	"							
80	5	< 2-5	< 2	2.5	5	< 2-2	2	2	10	< 2-5	< 2	2	"							
81	5	< 2-2	< 2	< 2	5	2-110	46	79.5	10	< 2-110	2	49	"							
82	5	< 2-23	2	17	5	< 2-8	2	6.5	10	< 2-23	2	11	"							
83	5	< 2-2	< 2	< 2	5	< 2	< 2	< 2	10	< 2-2	< 2	2	"							
84	5	< 2-2	< 2	< 2	1	< 2			6	< 2-2	< 2	2	"							
85	5	< 2-2	< 2	< 2	1	< 2			6	< 2-2	< 2	2	"							
86	5	< 2-5	2	3.5	1	< 2			6	< 2-5	< 2	3.2	"							
87	5	< 2-2	< 2	< 2	5	< 2-2	< 2	2	10	< 2-2	< 2	2	5	< 2-5	< 2	3.5	15	< 2-5	< 2	2
88	5	< 2-2	< 2	< 2	5	< 2-49	2	26.5	10	< 2-49	3	11	5	< 2-2	< 2	< 2	15	< 2-49	< 2	3
89	5	< 2-11	5	8	5	< 2-49	2	27	10	< 2-49	3.5	11	5	< 2	< 2	< 2	15	< 2-49	< 2	14
90	5	5-33	5	20	5	2-21	8	17	10	2-33	7.5	21	5	< 2-540	2	540	15	< 2-540	7	286.5

APPENDIX II SUMMARY OF FECAL COLIFORM MPN DATA FOR MARINE SAMPLE STATIONS

STATION	JUNE & JULY 1982				AUGUST 1982				JUNE, JULY & AUGUST				FEBRUARY 1983				JUNE, JULY, AUGUST, FEBRUARY			
	No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL			No. of	MPN per 100 mL		
	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %	Samples	Range	Median	90 %
91	5	< 2-5	< 2	2.5	5	2-33	5	20.5	10	< 2-33	3	8	5	< 2-5	< 2	5	15	< 2-33	2	6.5
92	5	2-49	23	41	5	< 2-33	5	28	10	< 2-49	14	33	5	< 2-130	2	76.5	15	< 2-130	5	41
93	5	5-8	7	8	5	< 2-22	5	16.5	10	< 2-22	6	11	5	< 2-8	2	6.5	15	< 2-22	5	9.5
94	5	< 2-33	2	19	5	2-23	4	15.5	10	< 2-33	3	23	5	< 2-7	2	4.5	15	< 2-33	2	15.5
95	5	2-23	4	15	5	< 2-13	2	7.5	10	< 2-23	2.5	4	5	< 2-5	2	3.5	15	< 2-23	2	10
96	5	< 2-13	2	13	5	< 2-7	2	5.5	10	< 2-13	2	13	5	< 2-8	< 2	5	15	< 2-13	2	10.5
97	5	5-17	11	17	5	2-17	8	15	10	2-17	11	17	5	< 2-17	5	15	15	< 2-17	11	17
98	——— NOT SAMPLED ———				4	2-23			4	2-23			5	< 2-17	2	9.5	9	< 2-23	2	17.6
99	4	2-49	-	-	5	5-33	11	23	9	2-49	8	34.6	5	2-49	14	33	14	2-49	9	42.6
100	——— NOT SAMPLED ———				4	< 2-4			4	2-4			5	2-17	5	12	9	< 2-17	2	8
101	"				4	2-79			4	2-79			5	2-79	17	50	9	2-79	11	79
102	5	2-13	4	10	5	2-240	31	144.5	10	2-240	10	49	5	< 2-49	7	49	15	< 2-240	7	49
103	5	2-23	8	18.5	5	2-49	2	28.5	10	2-49	6	23	5	< 2-11	7	9.5	15	< 2-49	7	18.5

APPENDIX III

FRESHWATER SAMPLE STATION LOCATION DESCRIPTIONS

APPENDIX III FRESHWATER SAMPLE STATION LOCATION DESCRIPTIONS

STATION	DESCRIPTION	RECEIVING WATER
S1	Stream entering at head of Degnen Bay	Degnen Bay
S1A	Upstream S2 above MacDonald Farm	" "
S2	Culvert west of government wharf	" "
S3	Stream northeast of Gray residence at beach	" "
S4	Stream northwest of Gray residence at beach	" "
S5	Stream on southwest shore draining marsh area	" "
S6	Head of small bay on SE side; private dock	" "
S7	Drainage culvert on east side	" "
S8	Drainage culvert on Gabriola I. south shore, mid-way between Gabriola Passage and False Narrows	False Narrows
S9	Drainage culvert at east entrance to False Narrows	" "
S10	24" culvert at west entrance to False Narrows	" "
S11	Creek at head of Cufra Canal	Cufra Canal (North Cove)
S12	Creek on south shore near head of Cufra Canal	" "
S13	Creek draining Pioneer Pacific camp at beach near dock	North Cove
S14	Upstream S13 below reservoir	" "
S15	Kuper I. - SE of ferry slip, E. of boom area	Telegraph Harbour
S16	Thetis I. - small creek on Pardee property - W side	Clam Bay
S17	Thetis I. - small creek on Pardee property - E side	" "
S18	Thetis I. - drainage near garbage receptable site	" "
S19	Thetis I. - slough drainage on Pilkey Point Rd just east of Marina Drive	" "

APPENDIX IV

DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS

APPENDIX IV DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS

SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.	SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.
S1	June 27/82	12,000	15,000	S6	Feb 15/83	110	-
	28/82	2,900	4,000		16/83	50	-
	Feb 15/83	60	-		17/83	610	-
	16/83	110	-		18/83	80	90
	17/83	710	-				
	18/83	60	< 10	S7	Feb 15/83	< 10	-
					16/83	< 10	-
S1A	Feb 16/83	60	-		17/83	10	-
	17/83	130	-		18/83	< 10	-
	18/83	40	-				
				S8	June 27/82	170,000	23,000
S2	June 28/82	110	510		28/82	5,700	7,100
	Feb 15/83	40	-				
	16/83	20	-	S9	Feb 15/83	140	-
	17/83	120	-		16/83	270	-
	18/83	60	-		17/83	540	-
					18/83	150	< 10
S3	June 26/82	3,300	8,200				
	27/82	6,600	6,200	S10	Feb 15/83	< 10	-
	Feb 15/83	110	-		16/83	10	-
	16/83	< 10	-		17/83	160	-
	17/83	250	-		18/83	10	-
	18/83	20	< 10				
				S11	Feb 17/83	150	-
S4	June 26/82	160,000	14,000		21/83	80	-
	27/82	1,100	1,200		22/83	120	-
	28/82	440	150				
	Feb 15/83	20	-	S12	Feb 17/83	60	-
	16/83	540	-		21/83	10	-
	17/83	250	-		22/83	51	-
	18/83	30	< 10				
				S13	June 28/83	110	510
S5	Feb 15/83	90	-				
	16/83	40	-	S14	June 28/83	24	7
	17/83	90	-				
	18/83	10	-				

APPENDIX IV DAILY BACTERIOLOGICAL MF DATA FOR FRESHWATER SAMPLE STATIONS
(Continued)

SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.	SAMPLE STATION	COLLECTION DATE	COUNT/100 mL F.C.	COUNT/100 mL F.S.
S15	June 29/82	61	95	S18	Feb 17/83	80	-
	30/82	220	480		21/83	10	-
					22/83	25	-
S16	Feb 17/83	60	-	S19	Feb 17/83	30	-
	21/83	100	-		21/83	40	-
	22/83	70	20		22/83	115	-
S17	Feb 17/83	< 10	-				
	21/83	< 10	-				
	22/83	< 10	-				

APPENDIX V

SUMMARY OF BACTERIOLOGICAL RESULTS FOR FRESHWATER SAMPLE STATIONS

APPENDIX V SUMMARY OF BACTERIOLOGICAL RESULTS FOR FRESHWATER SAMPLE STATIONS

SAMPLE	FECAL COLIFORM/100 mL			FECAL STREPTOCOCCI/100 mL			FC:FS[a]
STATION	No. of Samples	Range	Mean	No. of Samples	Range	Mean	RATIO
S1	6	60-12,000	2640	3	< 10[b]-15,000	6340	0.76
S1A	3	40-130	115	-	-	-	-
S2	5	20-120	67	1		510	0.2
S3	6	< 10-6,600	1720	3	< 10-8,200	4800	0.73
S4	7	20-160,000	23,200	4	< 10-14,000	3840	16.9
S5	4	10-90	56	-	-	-	-
S6	4	50-610	213	1	-	90	-
S7	4	< 10-10	10	-	-	-	-
S8	2	5,700-170,000	87,850	2	7,100-23,000	15,100	8.2
S9	4	140-540	275	1	-	< 10	-
S10	4	< 10-160	48	-	-	-	-
S11	3	80-150	117	-	-	-	-
S12	3	10-60	61	-	-	-	-
S13	1	-	23	1	-	7	-
S14	1	-	110	1	-	510	-
S15	2	61-220	141	2	95-480	288	0.46
S16	3	60-100	77	1	-	20	-
S17	3	< 10-< 10	< 10	-	-	-	-
S18	3	10-80	58	-	-	-	-
S19	3	30-115	62	-	-	-	-

[a]FC:FS ratios are calculated as the mean of daily FC:FS ratios. Ratios are not usually calculated unless both FC and FS values exceed 100/100 mL

[b]A value of 10/100 mL is used in the calculations of the mean.

APPENDIX VI

BIOCHEMICAL CONFIRMATION RESULTS

1 INTRODUCTION

The accuracy of the MPN test procedure in recovering fecal coliforms (specifically Escherichia coli) from the marine environment is routinely tested as part of the microbiology laboratory quality control procedure.

During shellfish surveys, a minimum of 10% of all positive (growth + gas) A-1 media tubes are subjected to biochemical identification to confirm the presence of E. coli in the sample. Positive tubes are generally picked randomly unless anomolous results are observed at individual samples stations.

2 MATERIALS AND METHODS

Inocula from positive A-1 tubes are streaked on Levine's EMB agar to obtain isolated colonies. After 24 hours incubation on Levine's EMB, typical coliform colonies are picked for further biochemical identification. If no typical coliform colonies are present, atypical colonies are selected for biochemical screening.

All isolates are subjected to biochemical screening using the API20E system (Analytab Products, New York).

3 RESULTS AND DISCUSSION

The percentage recovery of E. coli was 96% (122/127) for the June 1982 survey and 94.5% for the February 1983 survey.