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CHARACTERISTICS OF FISH PLANT WASTES IN NOVA SCOTIA AND THEIR EFFECTS ON COASTAL BAYS

II: WASTE WATER CHARACTERIZATION

Environmental Impact and Assessment

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Atlantic Region

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CHARACTERISTICS OF FISH PLANT WASTES IN NOVA SCOTIA AND THEIR EFFECTS ON COASTAL BAYS II: WASTE WATER CHARACTERIZATION

A. R. KUMBHARE

FOOD & TEXTILES SECTION

TECHNICAL SERVICES BRANCH

ENVIRONMENTAL PROTECTION SERVICE

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FOREWORD

This report is the second of a five part series entitled "Characteristics of Fish Plant Wastes in Nova Scotia and Their Effects on Coastal Bays". Other reports in the series are:

Vol. I Summary and General Conclusions. EPS-8-AR-75-2.
Vol. III Toxicity Studies. EPS-8-AR-75-4.
Vol. IV Bacteriological Characteristics. EPS-8-AR-75-5.
Vol. V Nearshore Effects. EPS-8-AR-75-6.

Avant-propos

Ce rapport est la seconde d'une série en cinq parties intitulé "Les caractéristiques des effluents des usines de traitement de poisson en Nouvelle-Ecosse et leurs influences sur les eaux côtières".

Vol. I Sommaire et conclusions générales. EPS-8-AR-75-2.
Vol. III Etude sur la toxicité. EPS-8-AR-75-4.
Vol. IV Les caractéristiques bactériologiques. EPS-8-AR-75-5.
Vol. V Les effets sur la zone littorale. EPS-8-AR-75-6.

ABSTRACT

Relevant physical and chemical data on fish plants to estimate the total pollutional load contributed by them to the bays has been collected and estimates of daily pollutional loads have been made. Important parameters observed are BOD_5, COD, SS, Grease, nutrients and wastewater flows. The information collected is concurrent to and co-ordinated with the environmental data collected in the bays.

Despite many limitations in the collection of information, it is felt that the estimates made in this study are reasonably accurate and also compare well with the results of other studies on similar wastes.

Résumé

Des données physiques et chimiques ont été recueillies les usines de traitment de poisson pour estimer le chargement total de pollution déchargé par eux. Une approximation a aussi été faite pour le chargement quotidien de pollution. Les paramètres observés sont le DOB_5, DOC, SS, graisse, les nutrients et l'écoulement des effluents. Ces données ont été recueillies concurremment avec les données environmentales dans les eaux cotières.

Malgré les limitations de l'information, on considère que les approximations faites durant cet étude sont raisonablement exactes. Elles comparent aussi favorablement avec les résultats d'autres études sur des effluents semblables.

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CONCLUSIONS

As a result of this study, the following conclusions can be drawn:

1. The values of important wastewater parameters observed for the fish and fish meal plants are tabulated. It will be noticed that the values compare well with the observations made by other investigators.

2. Collection of samples for Oil and Grease has to be done more carefully as outlines in the report to prevent it from adhering to the sides of the container, and thereby giving unreliable observational values.

3. Identification of all sources of pollution from any plant is important. This study indicates that the vacuum unloading facility of the type with water seal and water conveyance can make a substantial contribution to the total pollution of the bay.

4. The plants surveyed are representative of general ground fish processing operations in the Atlantic Region. The results of this study compare well with the results of studies conducted by other investigators at various other locations in the region. It can, therefore, be safely concluded that the wastewater characteristics from these plants are typical of the groundfish processing operations in the region.

5. The wastes discharged from the groundfish processing and fish meal plants are of low order of magnitude compared to other industries of comparable size. The recently developed federal guidelines (Fish Processing Operations Liquid Effluent Guidelines, EPS Report No. EPS-1-WP-75-1) for controlling pollution from these operations appear to be adequate. However, in areas which are environmentally more sensitive, more advanced effluent treatment than that stipulated in the Guidelines may be required.

SUMMARY OF RESULTS

Plant Name	Water Consumption (Gal/1000 lbs.)	BOD_5 (lbs/1000 lbs.)	COD (lbs/1000 lbs.)	SS (lbs/1000 lbs.)	Grease (lbs/1000 lbs.)	TS (lbs/1000 lbs.)	TVS (lbs/1000 lbs.)	Total Inorganic Phos. (PO_4) (lbs/1000 lbs.)
N.S.P. Louisbourg (Fish Plant)	4,300 (4) 246 to 1724 (1) 504 (5) 16,500	5.65 (4) 1.2 to 2.8 (1) 15	9.65	2.52 (4) 8.3 to 22.5 (1) 20 (5) 7	1.49 (1) 13	51.66	12.36	0.53
N.S.P. Louisbourg (Fish Unloading facilities)	0.060 MGD	381 (lbs/day)	633 (lbs/day)	94 (lbs/day)	81 (lbs/day)	415 (lbs/day)	290 (lbs/day)	14 (lbs/day)
Hopkins Plant Louisbourg	9,500 gal/day	36.5	56.5	10.45	-	33.6	21.98	2.12
N.S.P. Lockeport (Fish Pl.)	2,534	6.63	9.38	1.87	0.607	-	-	0.78
Swim Bros. Lockeport	7,676	24.42	31.45	6.89	13.095	2278*	228	1.87
N.S.P. Louisbourg ** Meal Plant	0.304 MGD	0.24	0.52	118.7	55	8985*	1105	5.64

(Cont'd...)

SUMMARY OF RESULTS (CONT'D...)

Plant Name	VSS (lbs/1000 lbs.)	Organic PO_4 (lbs/1000 lbs.)	NO_3-N (lbs/1000 lbs.)	NO_2-N (lbs/1000 lbs.)
N.S.P. Louisbourg (Fish Plant)	-	-	-	-
N.S.P. Louisbourg (Fish Unloading facilities)	79 (lbs/day)	1.75 (lbs/day)	0.045 (lbs/day)	0.003 (lbs/day)
Hopkins Plant Louisbourg	10.42	0.115	0.006	-
N.S.P. Lockeport (Fish Pl.)	115.7	0.144	-	-
Swim Bros. Lockeport	-	0.59	0.006	-
N.S.P. Louisbourg ** Meal Plant	123.5	1.23	0.018	0.002

Note: (1) The underlined values represent the observations of this study.
(2) Observations reported by others are given against their references; e.g., (4) 246 to 1724 means that Nutt has reported values ranging between 246 and 1724. The references are listed on page .
(3) Unless otherwise specified, values reported are per 1000 lbs. of round fish processed.

* Salt water used.

6. Accurate determination of the total pollutional load depends on the accurate determination of the wastewater flows. The determination of the latter in turn depends on the physical layout of the sewers and the ease with which they can be accessed for flow measurement. Older plants generally present greater difficulty in this regard.

RECOMMENDATIONS

1. The federal "Fish Processing Operations Liquid Effluent Guidelines" should be applied generally to all fish processing and fish meal plants.

2. Sampling and analytical procedures for Oil and Grease need improvement.

ACKNOWLEDGEMENTS

I am grateful to the National Sea Products Ltd. for the excellent co-operation extended during the course of this study, both on my behalf as well as on behalf of the Environmental Protection Service. Gratefulness is also expressed for similar co-operation received from Hopkin's Plant at Louisbourg and Swim Brothers Plant at Lockeport.

I am grateful to Mr. George Lindsay for his guidance during all phases of this study.

Mr. Dave Scott and Mr. Kevin Roche deserve appreciation for their help, initiative and interest in collecting the samples.

The staff of the chemistry laboratory are worthy of appreciation for conducting the analyses of such a large number of samples.

Miss Pamela Elaine Tracey and Mrs. Gail Scott are worthy of appreciation for their patience and understanding in typing this report.

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1 INTRODUCTION

The objectives of this study were:

1. To identify the sources of pollution entering the marine environments under consideration;

2. To design and carry out a sampling program to determine the wastewater characteristics of each source;

3. To gather information on the total flow of wastewater from each source to determine the total pollution contributed;

4. To gather information on the plant production during the period of survey to relate the waste characteristics to the products processed.

This information will complement the biological observations. Water quality data and measurement of certain biological parameters will indicate the effects of pollution created by the fish processing industry on the marine environment.

The collection of this information was difficult. The smaller and older plants particularly in the Lockeport area do not have adequate facilities to gain access to accurate information on wastewater flows. Thus, an effort has been made to make the best estimates of the wastewater flows and other factors involved, in the estimation of total pollutional load.

II DESCRIPTION OF WATER SUPPLY AND WASTEWATER SYSTEMS OF THE PLANTS SURVEYED.

II.1 Louisbourg

II.1.1 National Sea Products Plant

The plant has two sources of water supply. The Town of Louisbourg, which supplies the fresh water and the harbour which supplies salt water. The fresh water, pumped in and metered, is used in the filleting plant and the fish unloading facilities. The salt water is drawn in to supply the demands of the condensers in the meal plant.

The filleting plant consumes most of the fresh water. It is used in fluming the fish and generally for washing and cleaning purposes. The fish offal is flumed out through the main sewer which conveys it to the meal plant for the manufacture of fish meal. The offal flume water is passed through a trommel screen which allows only coarser solids (>1/4" diameter) to enter the meal plant. A screw conveyor conveys the offal collected by the trommel screen in to the meal plant (to offal hoppers). The offal flume water, containing the solids and dissolved organics, after screening is drained to the bay through a 24" diameter concrete pipe.

The meal plant does not require much fresh water to operate. A small quantity of water is used in this plant for cleaning the offal hoppers and by the evaporators. After use, it is collected and drained out to a manhole where it meets the large flow of salt water from the condensers. The condensers require a large quantity of water which is supplied from the harbour. A 24" diameter sewer conveys the total flow to the bay.

The two 24" diameter sewers described here - one from the filleting plant and another from the meal plant - constitute the main outlets of wastewater from the NSP Louisbourg operation and are located close to one another (Refer Fig. 1).

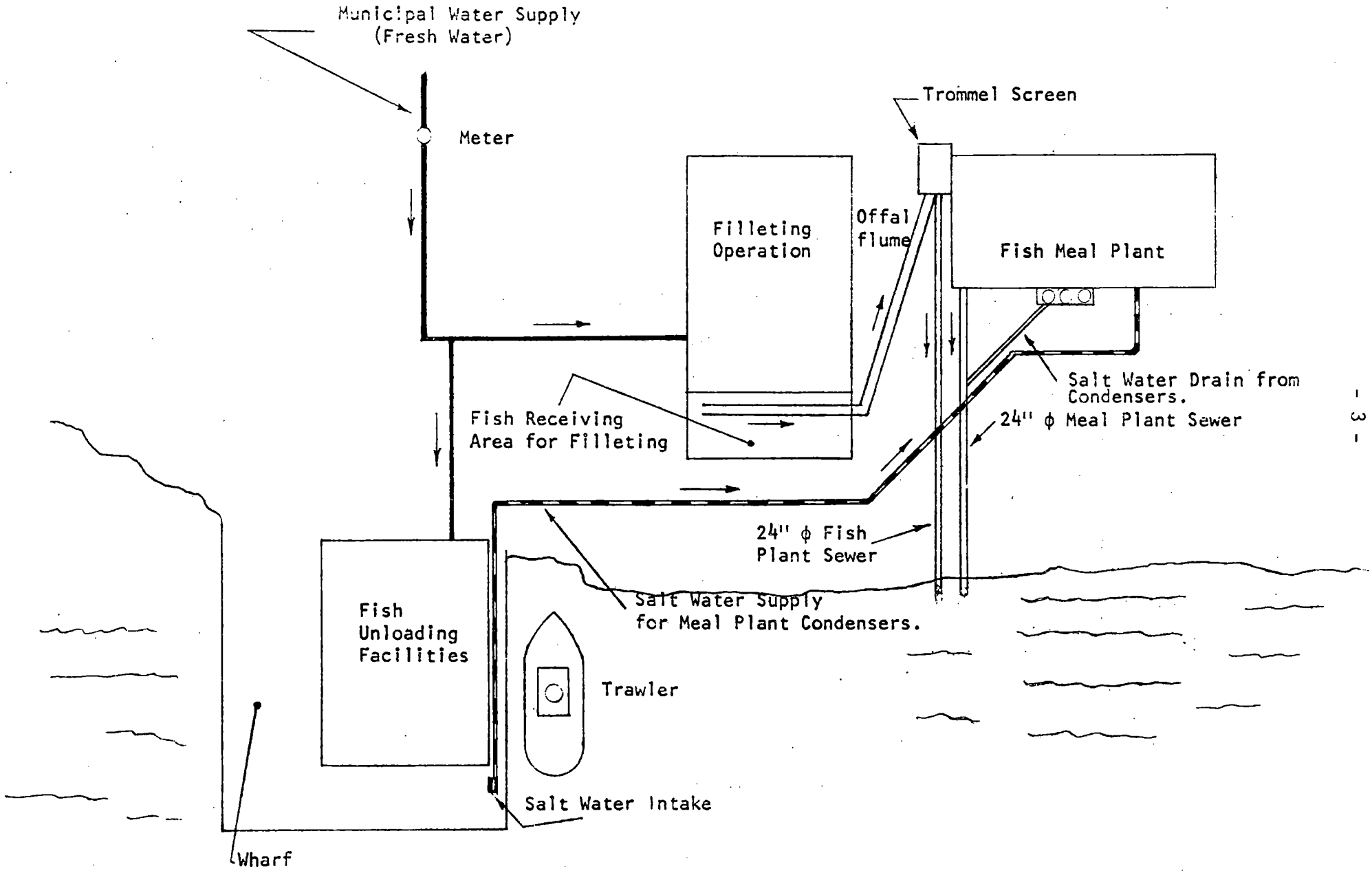

FIGURE 1.

Schematic diagram showing the water supply and sewerage of NSP plant at Louisbourg, N. S.

II.1.2 Hopkins Plant

This is a small filleting plant compared to the NSP plant and operates only intermittently. The water supply is from the town of Louisbourg and is metered. Unfortunately, the meter was not working during the sampling period.

One drain collects all the process wastewater from the plant and discharges into the bay. Most of the offal and solids are collected manually and are trucked to the nearby NSP meal plant for manufacture of fish meal.

This plant is not automated to the same degree as the NSP Louisbourg plant and most of the processing is done manually. The fish is supplied by inshore fishermen and are unloaded, weighed and processed. Very little storage capacity is provided and generally the fish is processed soon after it is landed.

Fig. 2 schematically shows the water supply and wastewater system of this plant.

II.2 Lockeport

II.2.1 NSP Lockeport Plant

This is an old plant, mostly built on the wharfs. The two main operating sections of the plant are filleting and fish meal production.

This conventional filleting plant has a metered salt water supply. The offal is conveyed from the filleting lines through above-floor metal flumes. These flumes are connected to a stainless steel lateral which in turn takes the offal out of the plant. At this stage, the material is dumped on to an inclined conveyor which loads the offal into trucks for transportation to

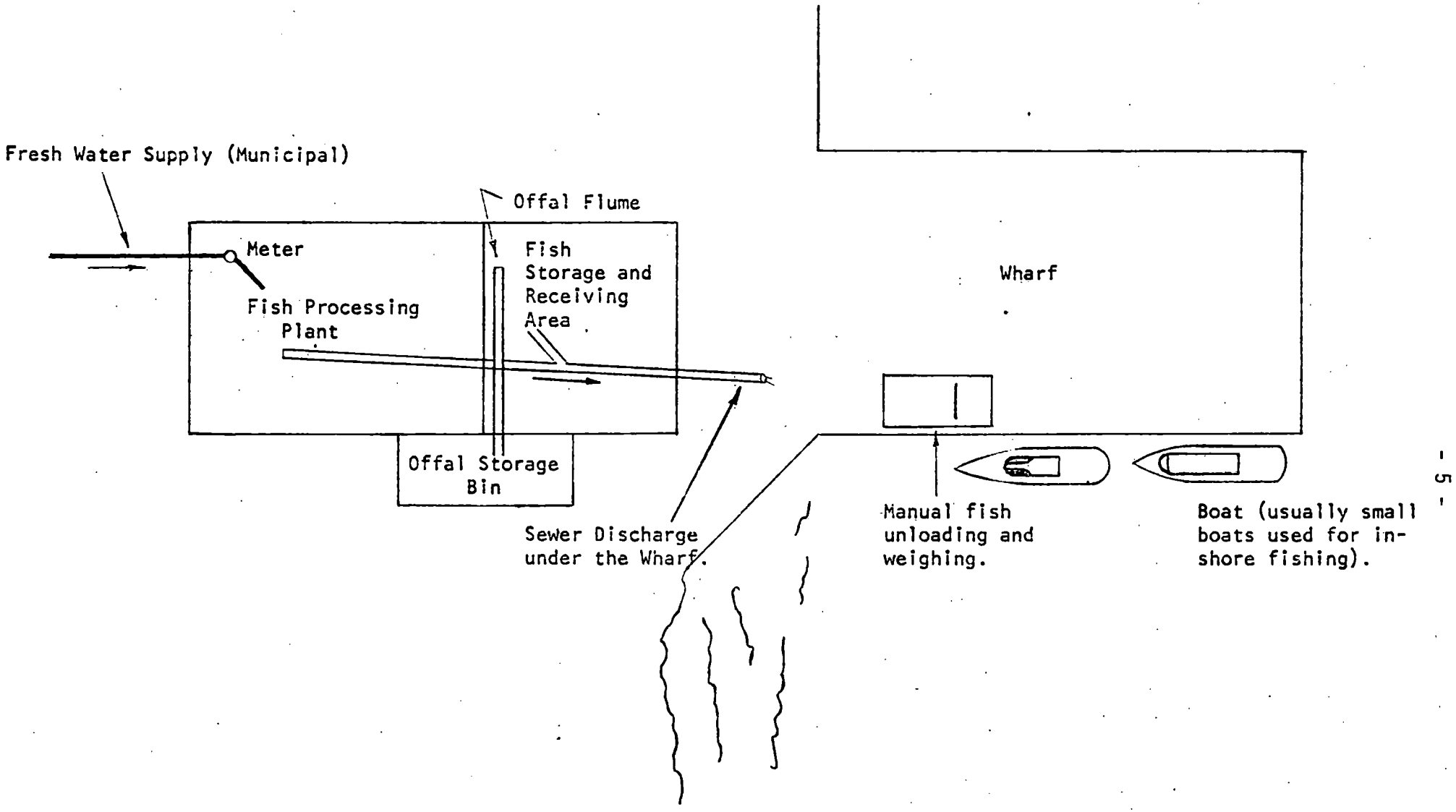

FIGURE 2

Schematic Diagram showing the water supply and sewerage of Hopkins Plant at Louisbourg, N. S.

the meal plant for the manufacture of fish meal. The inclined conveyor is a drag-flyte conveyor which separates the coarse offal from the flume water. In turn, the flume water drops onto a flat coarse mesh screen and is discharged to the harbour. From what has been observed, the performance of this screen is poor.

A small pipe conveys wastewater from the skinning operation and discharges at the same location as the lateral from the filleting plant.

Wastewater is generated in the meal plant, mostly at the offal hoppers and at the condensers. All the water from this plant is collected and discharged to the harbour through one sewer. Salt water is used in plant, but is not metered. The sewer is submerged during the high tide and the sampling time available is, therefore, restricted. In addition, there is no other location inside the meal plant where sampling can be carried out. Fig. 3 schematically shows the water supply and wastewater system of this plant.

II.2.2 Swim Brothers

This filleting plant is smaller than the NSP Lockeport plant and uses salt water, which is metered. The offal is transported to nearby fish meal plants, primarily the neighbouring NSP plant, for the manufacture of fish meal.

All the effluent is collected in a single sewer which drains the waste material into the harbour. This sewer is located below the high tide level and is, therefore, only available for a limited time period for sampling. Fish scales, some rejected fish, other miscellaneous solid wastes and a lot of greasy material accumulates close to the outfall and create unsightly conditions.

Fig. 4 shows schematically the water supply and wastewater system of this Plant.

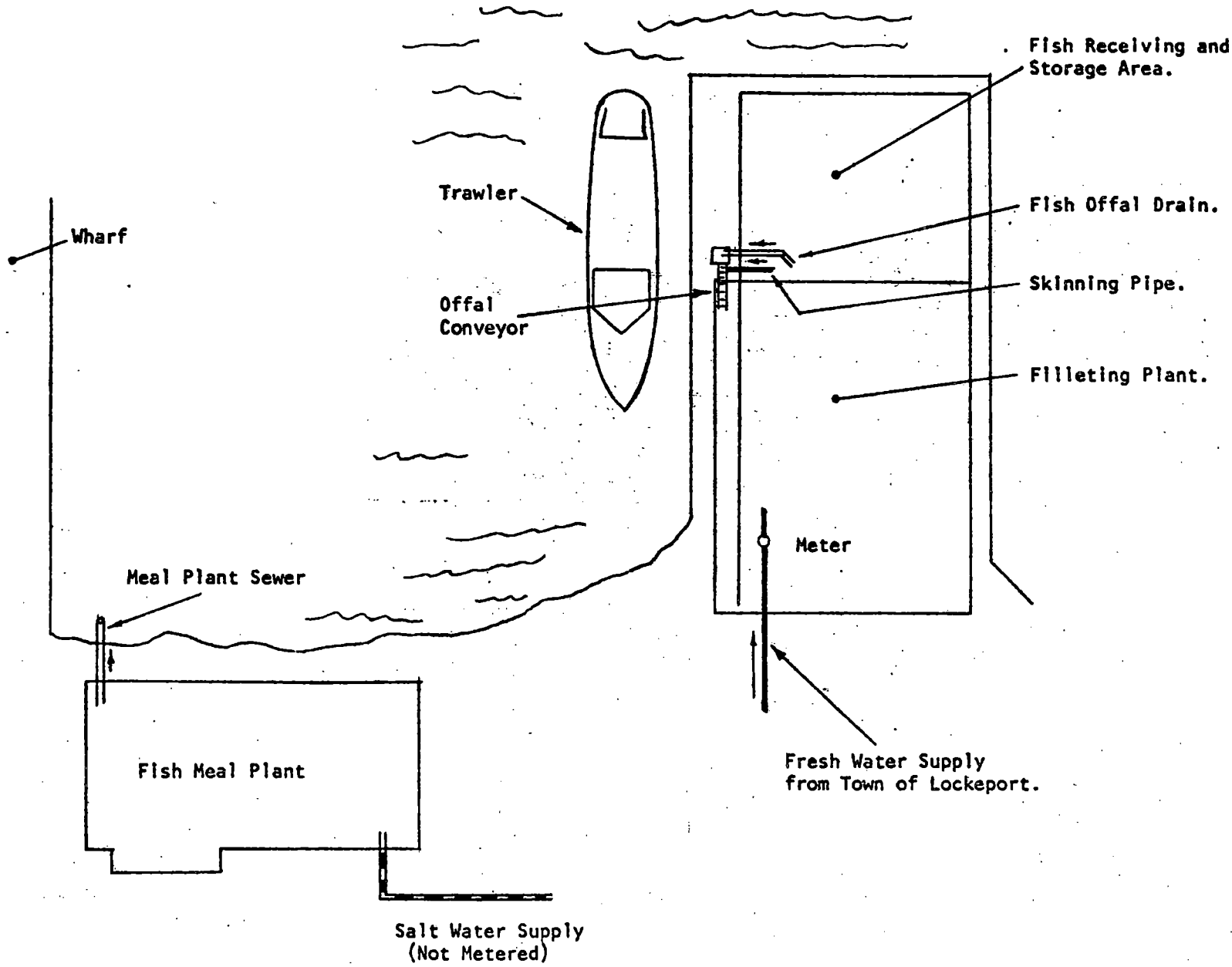

FIGURE 3

Schematic Diagram showing the water supply and sewerage of NSP Plant at Lockeport, N.S.

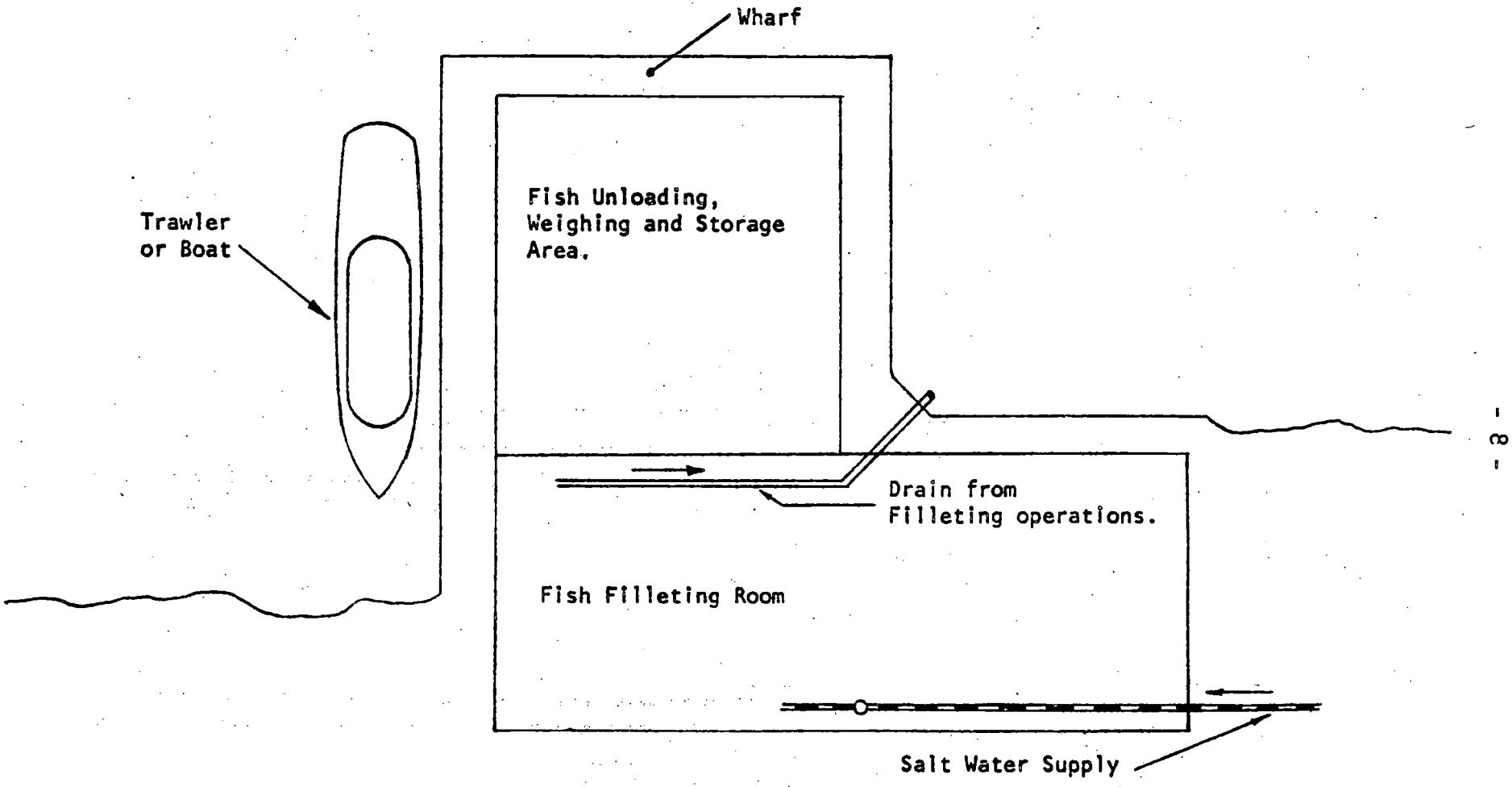

FIGURE 4.

Schematic Diagram showing the water supply and sewerage of Swim Brothers Plant at Lockeport, N. S.

III DETAILS OF WASTEWATER CHARACTERIZATION

Characterization of wastewater has been assumed to include the following:

(i) Measurement of the concentration of the physical and chemical parameters of the wastewater; and
(ii) Measurement of the quantity of wastewater to estimate the total amount of pollution.

III.1 Selection of Physical and Chemical Parameters

The selection of physical and chemical parameters generally depends on the type of wastewater. Little work has been done in observing and defining the physical and chemical characteristics of fish plant wastes. Also, defining the characteristics of wastewater in this particular industry is difficult because of a number of factors involved. Some of these factors are:

(1) the type of fish processed;
(2) the type of fish processing done;
(3) the type of water used;
(4) The age of the plant which includes factors such as the amount of mechanization in processing, the type of materials used in processing equipment, the degree of control over the use of water, the plant layout, and the layout of the wastewater conveyance system which influences the ease of sampling.

From our experience of fish plant wastes and from the past studies (Ref. 1, 2, 3), it was decided that the following parameters should be observed:

1. Temperature
2. pH
3. BOD_5
4. COD
5. SS
6. TS
7. TVS
8. VSS

9. Total Inorganic Phosphorus as PO_4
10. Organic Phosphorus as PO_4
11. Oil and Grease
12. Ammonia - N
13. Nitrate (NO_3)-N
14. Nitrite (NO_2)-N

III.2 Analytical Procedures

For analyses of samples, the WPCF Standard Methods (1971) (Ref. 4) has been used. In certain cases the sample water was saline and suitable precautions were taken in the analyses to allow for the salinity effect.

III.3 Field Sampling Techniques

Samples for each parameter were collected at one-half hourly intervals in constant volumes and were generally composited over a two hour period as well as for the day (during the production period). Sample volumes were not collected proportional to the volume of the wastewater as it was not possible to do so.

Tables 1, 2, 3 and 4 give the liquid effluent characteristics of the NSP Louisbourg Fish Plant, Meal Plant, Fish Unloading Facilities and the Hopkins Plant respectively.

Tables 5, 6, 7 and 8 give the liquid effluent characteristics of plants in Lockeport. Table 5, 6 and 7 give the characteristics for the effluent from the NSP Lockeport fish plant, the skinning machine effluent and the fish meal plant respectively. Table 8 gives the liquid effluent characteristics for the Swim Brothers Plant.

III.4 Measurement of Wastewater Flows

III.4.1 Louisbourg

III.4.1.1 NSP Louisbourg Plant

Three sources of effluent discharge were identified and sampled from this plant. These are:

1. The fish meal plant sewer (24" ϕ)
2. The filleting plant sewer (24" ϕ)
3. The unloading facilities.

The fish meal plant water supply is not metered. The estimation of flow from this plant was made using the Hazen-Williams formula. The following form of the formula was used to give daily flow:

$$Q = 405.C.d^{2.63}s^{0.54}$$

where:

Q = the total flow in gallons per day (gpd);
C = the Hazen-William constant for the type of pipe surface; in this case it was assumed to be 130.
d = the internal diameter of the pipe in inches.
s = the slope of the pipe.

Since the pipe was usually not flowing full, the flow for the actual depth of flow was obtained by the proportionality relationships:

$$\frac{\phi}{2} = \cos^{-1}\left(1 - \frac{2y}{d_o}\right);$$

and $$\frac{Q}{Q_f} = \frac{(\phi - \sin\phi)^{5/3} \cdot \phi^{2/3}}{921946.7445}$$

where:

ϕ = the angle subtended by the water surface line at the centre;
y = the depth of water flowing through the pipe in inches;
d_o = the inside diameter of the pipe, applicable for flowing full conditions;
Q = the flow for depth y; ($y < d_o$)
Q_f = the flow for pipe flowing full (depth d_o)

After Q was obtained for a 24 hr. period, the flow for the period during which sampling was carried out was obtained by simple proportional reduction.

The estimated flows for the meal plant sewer for the period of survey are tabulated in Table 9.

The value of d_o for both the meal plant and the filleting plant sewers is 24". The slopes of these sewers were measured by using a levelling instrument and a levelling rod. The length of the meal plant sewer was measured by a steel tape which was passed through the sewer. One end of the tape was held at the manhole and the other was read off at the end of the sewer where wastewater was being discharged into the bay.

For the flow of water from the filleting plant, it was more convenient to measure the depth of flow in the U-shaped channel. This U-shaped channel carried the wastewater from the filleting plant to the trommel screen. The circular bottom of this channel is 30" diameter and the depth of flow was always very small (3-4"); thus, for the purpose of flow estimation this could be treated as a circular pipe of 30" diameter.

The depth of flow measurement for both the meal plant sewer as well as the filleting plant was done by a thin steel graduated rule held parallel to the direction of flow. Precautions were taken to see that the flow pattern was not disturbed and the rule registered the correct depth.

The flows estimated for the fish meal plant using the Hazen-William formula have been tabulated in Table 10.

The total fresh water supply to the NSP facility is consumed in three main areas:

1. the filleting plant (this is the main consumer);
2. the fish unloading facilities;
3. the sanitary facilities.

The main meter registers the total flow to the plant. This meter was read during the survey period both at the beginning and end of each sampling day. Since the flow to the unloading facilities is not metered, it was assumed that the flow estimated for the filleting plant would give an estimate of water consumption for the unloading facilities. This was the basis for estimation of flow for the fish unloading facilities.

On the basis of all these considerations and the available data, it was estimated that the fish unloading facilities consumed approximately 10,000 gal/hr. The water consumption by the fish unloading facilities has been tabulated in Table 10.

It was also possible to compare the flow estimates for the filleting plant as done by the Hazen-William formula against the meter readings. Table 11 shows this comparison.

III.4.1.2 Hopkins Plant

Estimation of flows for this plant was difficult for two reasons:

(1) The meter registering water supply to the plant had broken down, and
(2) The sewer was inaccessible for flow measurement.

The only method available for flow estimates was to examine the water consumption data for the plant for the corresponding periods in the past and assume the same water consumption for the period of survey. The flow data based on this assumption is tabulated in Table 12.

III.4.2 Lockeport

III.4.2.1 NSP Louisbourg Plant

Three main sources of water consumption were identified in this plant. These are:

1. The fish plant
2. The skinning outfall
3. The fish meal plant

The water supply to the fish plant is metered and the daily meter readings were used to estimate the total pollutional load from this plant. This data is tabulated in Table 13.

The water supply to the fish meal plant is not metered and, as already indicated earlier, it was not possible to measure the flow of water through the main outfall. The estimates are, therefore, based on the pumping rates. This gives a flow of 1350 gpm to the plant. Some of this water is expected to be lost in evaporation but this is difficult to estimate. The flow coming out of the meal plant sewer has been assumed to be 1350 gpm.

The water discharged through the skinning machine outfall is almost constant. The discharge takes place through a 4" ϕ pipe sloping at the rate of 0.12 ft. in 1000 ft. and flows 3/4 full. The estimated rate of flow from this pipe by using the Hazen-William formula with a value of C = 130, is 0.015 mgd flowing full and 0.01438 mgd flowing 3/4 full. The flow for 9 hr. working shift is 0.0054 mg.

III.4.2.2 Swim Brothers Plant

The water supply to this plant is metered and meter records were kept during the period of survey to estimate the total pollutional load. The flow figures are tabulated in Table 14.

IV ESTIMATION OF POLLUTIONAL LOADS

The estimation of total daily pollution load for each source of wastewater has been done by considering the average concentration of the pollution parameter for the day and the corresponding flow. The information has been presented in tabular form for both Louisbourg and Lockeport locations. Ref. Tables 15 to 21.

Tables 15 through 21 also relate the polluting parameters to the production.

The tables exhibiting the wastewater concentrations (Tables 1 through 13) present two values for the same parameter; one obtained by analyzing the daily composite sample and another by averaging the two hourly composites over the same period. Judgement has been exercised in using a suitable value for calculating the total daily pollutional loads.

V DISCUSSION OF RESULTS

The purpose of this segment of the study was to estimate the amount of waste discharged to the bays from the fish plants. The estimation of the total wastes is done by measuring the concentration of the pollutant and the total quantity of wastewater flow. Precautions were taken to ensure that all sources of wastewater were identified and included in the estimate of pollutional loads.

Accurate measurement of both the concentration of the pollutant and the wastewater flow is important. Estimates of pollutant concentrations are based on the sampling and analytical techniques already described. Thus, it has been assumed that the estimates of concentration are reliable. However, discrepancies have been observed in the values of the parameters obtained from the daily composite samples compared to the ones obtained over 2-hr. periods for the day. This discrepancy is within reasonable limits in most cases but is large in other cases. One of the explanations is the hourly variation in the fish processing operations. These hourly variations may be due to start-up, coffee and lunch breaks, variations in water flows and process changes to other species within the sampling period. However, in most cases, there is reasonable agreement between the average of the 2 hr. composite samples and the daily composite samples. In cases where the discrepancy is large, no satisfactory explanation can be provided. In most cases, the hourly averaged values have been considered more reliable than the daily composited ones for this study.

With regard to the estimation of the wastewater flows, an effort was made to measure them as accurately as possible. Generally, if the water supply to the plant was metered, records of the meter readings during the processing periods provided the best estimates of wastewater flows in the absence of any other applicable method. In some cases it was possible to make estimates by the application of the Hazen-William formula. The details for this have already been described. However, it is to be understood that there are a number of factors affecting the accuracy of flow estimates by this technique. The two most important ones are - the roughness coefficient, C, and the depth of flow. C has been assumed based on the age and construction material of the conduit. The depth of flow has been observed

in the field taking adequate precautions that the measurement caused only the least possible disturbance to the existing flow pattern in the conduit.

The sampling carried out for the wastewater characterization in the plant was concurrent with the sampling carried out for the determination of water quality of the receiving water. This was done to facilitate correlation between the two types of information during the period of sampling. The estimation of daily pollutional load for each source of wastewater has been done by considering the average concentration of the pollutional parameter for the day and the corresponding flow. The results discussed here refer only to the average values of the parameters over the period of the survey. Also, the summary is limited to important parameters, such as flow, BOD_5, COD, SS and Grease.

The average flow from the NSP Louisbourg offal flume was 0.325 million gallons/day which is approximately 4300 gals/1000 lbs. of round fish processed. This result is in the lower range of that cited by other investigators. Nutt (5) has observed between 246 to 1724; Brodersen (1) 504 and Claggett et al (6) have assumed a value of 16,500 gals/1000 lbs. of round fish.

The values of other parameters observed from this plant are BOD_5, 5.65; COD, 9.65 and SS, 2.52, all expressed in terms of lbs/1000 lbs. of round fish. The value of BOD_5 observed is higher than cited by Nutt (4) which ranges between 1.2 to 2.8 and lower than that observed by Brodersen (1) which is 15 lbs/1000 lbs.

The value of 2.52 observed for SS is much lower than those observed by Nutt (5) which was found to range from 8.3 to 22.5. The value observed is also lower than that reported by Brodersen (1) and Claggett et al (6), which are 20 and 7 respectively.

The average oil and grease observed from this plant is 149 lbs/1000 lbs. and is much lower than 13 observed by Brodersen (1).

The average values of BOD_5, COD, SS and Grease observed for NSP Lockeport offal flume water expressed in lbs/1000 lbs. of round fish are: 6.63, 9.38, 1.87 and 0.607 respectively. The corresponding observations for Swim Brothers Plant in Lockeport are: 24.42, 31.45, 6.89 and 13.095 respectively, whereas the observations for the NSP Lockeport offal flume water are comparable to those for the NSP Louisbourg operation, the observations for the Swim Brothers Plant are particularly high, compared to other observations in this study. The value of 24.42 for BOD_5 is higher than other reported values; 6.89 for SS falls within the range of values reported and the value of 13.095 for Grease compares very well with that of 13 reported by Brodersen (1).

The average meal plant wastewater characteristics are:

Flow = 0.304 million gals.
BOD_5 = 923 mg/l
COD = 1384 mg/l
SS = 593 mg/l
Oil & Grease = 399 mg/l

for NSP Louisbourg Plant. The corresponding values of BOD_5, COD, SS for the NSP Lockeport Plant are 155, 271 and 54 mg/l respectively.

N.S.P. LOUISBOURG

TABLE 1

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

FISH PLANT

	29.5.74		30.5.74		11.6.74		12.6.74		13.6.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values
pH	-	7.3	-	7.41	-	7	7.1	7.08	-	7.28
Temp.	-	7.8	-	9.5	-	14.25	9.0	12.0	-	13.75
BOD	136	126.75	107.0	114.5	144.0	120.25	207	218	156	142
COD	294.0	287.75	231.0	230.25	236.0	173.5	312	260	213*	194
SS	81.0	76.0	105	57.5	70.5	67.34	110.0	101.8	60	76.5
TS	1921.0	1828	1528.0	1447.0	1488	2054	2056	2109	1944	1897
TVS	396.0	404.0	324	321.0	360.0	448.0	528	497	300	303
VSS	-	-	-	-	-	-	-	-	-	-
Total Inorganic Phos. (PO_4)	14.80	17.47	15.50	14.61	11.25	-	17.85	-	14.85	-
Organic Phos. PO_4	3.05	2.275	2.25	2.05	-	-	.005	-	.005	-
Oil and Grease	38.7	-	21.6	-	23.6	-	12.8	-	14.1	-
Ammonia N	-	-	-	-	-	-	-	-	-	-
NO_3-N	-	-	-	-	-	-	-	-	-	0.706
NO_2-N	-	-	-	-	-	-	-	-	-	-

..../2

Table 1 cont'd...

N.S.P. LOUISBOURG

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

FISH PLANT

	6.8.74 Daily Composite Values	Average Values	7.8.74 Daily Composite Values	Average Values
pH		7.0		6.67
Temp.		21.25		21.2
BOD	326	324	332	348
COD	450*	450	517	448
SS	90	104	99	107
TS	1530	1463	1336	1336
TVS	380	331	428	390
VSS	85*	85	99	107
Total Inorganic Phos. (PO_4)	21.2	-	16.6	-
Organic Phos. PO_4	3.95	-	0.8	-
Oil and Grease	90	-	-	-
Ammonia N				
NO_3-N	0.145	-	0.082	-
NO_2-N	0.005	-	-	-

* Value adopted from the average value.

N.S.P. LOUISBOURG

Table 2

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

MEAL PLANT

	11.6.74		12.6.74		13.6.74		6.8.74		7.8.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values
pH	-	8.17	8.1	9.05	-	8.69	-	8.23	-	7.5
Temp.	-	9.37	14.0	10.41	-	14.2	-	22.16	-	23.6
BOD	400**	333**	280**	297**	230*	236	1326	1550	1270	1104
COD	640	532	448	475	304	315	1800	2130	2120	2454
SS	228	187	272	185	131	136	888	1050	660	757
TS	32967	32950	30620	29848	31381	31027	31730	33407	32650	31337
TVS	4528	4427.5	3172	3621	3378	3802	3950	5275	5210	4620
VSS	-	-	-	-	-	-	872	1032	632	739
Total Inorganic Phos. (PO_4)	18.60	-	18.72	-	5.79	-	21.0	-	14.0	-
Organic Phos PO_4	-	-	2.18	-	1.12	-	2.775	-	8.0	-
Oil and Grease	127.4	-	111.0	-	61.9	-	736	-	340	-
Ammonia N	-	-	-	-	-	-	-	-	-	-
NO_3-N	-	-	-	-	-	-	0.151	-	0.106	-
NO_2-N	-	-	-	-	-	-	0.005	-	0.006	-

* Assumed Value

** Derived from BOD : COD ratio of 0.6265 for the meal plant

N.S.P. LOUISBOURG

Table 3

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

UNLOADING PLANT

	24.7.74		6.8.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values
pH	-	7.6	-	7.01
Temp.	-	13.50	-	18.34
BOD	748	830.0	623	686.0
COD	1170	1596	862	1125.0
SS	244	173	168	210
TS	768	994	604	566
TVS	536	644	380	412
VSS	147.0	-	121	-
Total Inorganic Phos. (PO_4)	29.8	32.36	25.5	-
Organic Phos PO_4	2.4	3.45	3.10	-
Oil and Grease	150.0	-	150	-
Ammonia N	8.7	1.5	-	-
NO_3-N	0.103	0.153	0.10	-
NO_2-N	0.007	0.010	0.005	-

HOPKINS PLANT

Table 4

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

	25.7.74		26.7.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values
pH		7.25	6.97	
Temp.		16.75	18.12	
BOD		361	748	
COD		610	1140	
SS		201	176	
TS		446	640	
TVS		304	416	
VSS		199	176	
Total Inorganic Phos. (PO_4)		29.55	40.2	
Organic Phos. PO_4		2.85	1.70	
Oil and grease				
Ammonia N				
NO_3-N		.0675	0.120	
NO_2-N		<0.005	0.005	

N.S.P. LOCKEPORT

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

FISH PLANT

Table 5

	25.6.74		26.6.74		27.6.74		22.8.74		23.8.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values
BOD	244	297	253	274	257	259	281	288	320	-
COD	384	430	304	328	388	444	420	410	370	-
SS	88.0	67.0	116	62.4	85.9	98.0	123	192	117	-
TS	33,980	30,338	32,080	29,400	29,500	32,885	34,430	34,813	33,760	-
VS	4,740	4,010	3,690	4,048	2,980	3,905	4,960	-	-	-
OIL & GREASE	70.7	53.3	9.7	-	<5	-	35	-	-	-
Total Inorganic PO_4	20.7	-	38.65	-	46.0	-	58.0 <	-	8.75	-
Total Organic PO_4	4.0	-	<0.005	-	7.15	-	<0.05	-	7.85	-
NO_3-N	0.019	-	<0.005	-	<0.005	-	<0.005	<0.005	<0.005	-
NO_2-N	<0.005	-	<0.005	-	<0.005	-	<0.005	<0.005	<0.005	-
NH_3-N									0.025	(Grab sample)

TABLE 6

NATIONAL SEA PRODUCTS, LOCKEPORT

Liquid Effluent Characteristics (mg/l)

Skinning Outfall

(Fish Plant)

	22.8.74		23.8.74	
Parameter	Daily Composite Values	Average Values	Daily Composite Values	Average Values
BOD	120	100	101	-
COD	210	198	110	-
SS	49	51	66	-
TS	20,140	34,870	34,990	-
TVS	2,030	-	-	-
Oil & Grease	10	-	-	-
Total Inorganic PO_4	2.44	3.21	4.95	-
Total Organic PO_4	5.21	1.88	3.74	-
NO_3-N	<0.005	<0.005	<0.005	-
NO_2-N	<0.005	<0.005	<0.005	-
NH_3-N	0.2 (grab sample)	-	-	-

NATIONAL SEA PRODUCTS, LOCKEPORT

Table 7

Liquid Effluent Characteristics (mg/l)

Meal Plant

Parameters	25.6.74		26.6.74		27.6.74		20.8.74		22.8.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values
BOD	265	408	228	203	68	41.0	60	25	40	-
COD	372	514	472	378	324	230	198	143	86	-
SS	45	89.4	88	119.0	14.6	18.4	26	28	14	-
TS	31,190	30,923	29,940	27,395	33,830	32,905	28,510	32,095	34,930	-
TVS	3,470	3,103	2,420	2,350	3,810	3,650	2,890	-	4,260	-
Oil & Grease	6	-	56	16.2	<5	-	8.0	-	14	-
Tot. In. PO_4	22.62	-	21.0	-	1.34	-	24.25	-	0.025	-
Tot. Org. PO_4	<0.005	-	6.30	-	2.76	-	<0.05	-	0.575	-
NO_3-N	0.013	-	<0.005	-	0.064	-	<0.005	-	0.010	-
NO_2-N	<0.005	-	<0.005	-	<0.005	-	<0.005	-	<0.001	-
pH	-	8.2	-	8.4	-	8.38	-	8.27	8.2	-
Temp. ^oC	-	14^o	-	15.25^o	-	13.75^o	-	18^o	16^o	-

LIQUID EFFLUENT CHARACTERISTICS (mg/l)

Table 8

SWIM BROTHERS, LOCKEPORT

Parameter	25.6.74		26.6.74		20.8.74	
	Daily Composite Values	Average Values	Daily Composite Values	Average Values	Daily Composite Values	Average Values
BOD	134	126.0	118	125.5	1,230**	-
COD	228	209	232	220	1,590	1,530
SS	21.8	22.0	17.3	16.4	199	362.5
TS	32,640	30,603	32,360	29,795	30,990	36,145
VS	4,160	2,883	2,930	2,925	4,360	-
Oil & Grease	169.4	-	<5	-	490	-
Tot. In. PO_4	8.15	-	7.82	-	96	-
Tot. Org. PO_4	22.3	-	2.53	-	<0.05	-
NO_3-N	0.032	-	0.092	-	<0.005	-
NO_2-N	0.005	-	0.005	-	<0.005	-
pH	-	8.2	-*	-*	-	7.6
Temp. (^oC)	9^o	7.5^o	9^o	9^o	-	14^o

*pH meter out of order.
**Value obtained by BOD:COD ratio for sample no. 18686.

TABLE 9

ESTIMATION OF

MEAL PLANT FLOWS
(N.S.P. Louisbourg)

Date	Depth of Flow (inches)	Hours of Sampling	Flow for the period of sampling (Gal.)
11/06/74	3"	3.5	94,049
12/06/74	3"	7.17	192,667
13/06/74	3.25"	7.50	226,062
06/08/74	2.5"	6.25	51,970
07/08/74	2.75"	6.0	55,736

TABLE 10

N.S.P. LOUISBOURG

ESTIMATION OF FISH PLANT FLOWS

DATE	WATER CONSUMPTION BY FISH UNLOADING FACILITIES		WATER CONSUMPTION BY FISH PLANT	
	Period of Operation (hrs.)	Total Flow @10,000 gal/hr. (gal)	Total Fresh Water Consumption per meter readings	Water Consumption by Fish Plant
	1.	2.	3.	4.=3-2
29.5.74	not operating	-	384,800	384,800
30.5.74	not operating	-	322,700	322,700
11.6.74	8.5	85,000	430,500	345,500
12.6.74	not operating	-	365,900	365,900
13.6.74	5.0	50,000	378,000	338,000
24.7.74	6.5	65,000	358,100	293,100
25.7.74	not operating	-	211,000 (for 6.5 hrs.)	211,000
6.8.74	5.5	55,000	398,000	343,100
7.8.74	not operating		175,400	175,400

TABLE 11

N.S.P. LOUISBOURG

COMPARISON OF FLOW ESTIMATES FOR FISH PLANT

DATE	DEPTH OF FLOW IN THE FISH PLANT FLUME (inches)	HOURS OF OPERATION (hours)	FLOW ESTIMATE BY HAZEN-WILLIAM FORMULA (gals)	FLOW ESTIMATE BY METER READING (gals)	PERCENT DIFFERENCE (%)
11.6.74	4"	9	350,858	345,500	1.52
12.6.74	4.25"	9	378,801	365,900	3.40
13.6.74	4"	9	350,858	338,000	3.6
24.7.74	3.75"	6.5	232,977	293,100	25.8
25.7.74	3.25"	6.5	272,869	211,000	7.06
6.8.74	3.25"	9	272,869	-	-
7.8.74	3.75"	9	322,584	-	-

TABLE 12

ESTIMATION OF WATER CONSUMPTION

BY HOPKIN'S PLANT, LOUSIBOURG

PERIOD: June and July, 1974

TOTAL WATER CONSUMPTION: (Estimated)* 480,000 gals.

NO. OF WORKING DAYS = June = 24; July = 27; Total = 51.

WATER CONSUMPTION PER DAY = 480,000/51 gal. per day

= 9,411.76

Assume = 9,500 gpd.

* Obtained from the Town of Louisbourg

TABLE 13

NATIONAL SEA PRODUCTS, LOCKEPORT FISH PLANT

WATER CONSUMPTION

DATE	WATER CONSUMPTION (USGAL)
25/6/74	206,000
26/6/74	191,000
27/6/74	158,000
22/8/74	135,000
23/8/74	145,000

TABLE 14

SWIM BROTHERS, LOCKEPORT

WATER CONSUMPTION

DATE	WATER CONSUMPTION 7:30 am to 5 pm (gals.)
25.6.74	188,000
26.6.74	188,000
20.8.74	169,000

NATIONAL SEA PRODUCTS LOUISBOURG PLANT

Table 15

Estimated Daily Pollutional Load
(Fish Plant)

Date	Flow (mgd)	Roundfish Landed (lbs x 1000/day)	BOD			COD			SS			TS		
			Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.	Conc. mg/l	lbs/day	lbs/1000 lbs.	Conc. mg/l	lbs/day	lbs/1000 lbs.
29.5.74	0.3848	78.515	127.0	407.0	5.18	288	922	11.74	76.0	243.3	3.09	1828	5852	75.0
30.5.74	0.3227	82.425	115.0	308.76	3.74	231	620	7.52	60.0	161.09	1.95	1450	3893	47.23
11.6.74	0.3455	91.88	121.0	347.82	3.78	236	678	7.38	68.0	196.0	2.13	2054	5904	64.25
12.6.74	0.3659	106.685	218	663.65	6.22	260	792	7.42	102	310.5	2.91	2109	6420	60.0
13.6.74	0.338	96.54	142	399.32	4.13	213	599	6.20	76.5	215.13	2.23	1897	5335	55.26
6.8.74	0.3431	98.09	324	925.0	9.40	450	1284	13.09	104	297.0	3.03	1530	4368	44.53
7.8.74	0.1754	68.84	335	488.87	7.10	450	657	9.54	107	156.0	2.26	1336	1950	28.32
Average	0.325		197	505	5.65	304	793	9.65	83.5	229.04	2.52	1722.5	4185	51.66

NO_3-N and NO_2-N were generally found to be below 0.005 mg/l, except on 6.8.74 and 7.8.74. The values for these dates were observed to be 0.145 mg/l and 0.082 mg/l respectively for NO_3-N. This gives total quantity discharged in lbs. per day = 0.41 and 0.119 respectively.

NO_2-N concentration for 6.8.74 = 0.005; which is = 0.014 lbs/day.

*lbs/1000 lbs. of roundfish landed.

(Cont'd..)

NATIONAL SEA PRODUCTS LOUISBOURG PLANT

Estimated Daily Pollutional Load
(Fish Plant)

Date	TVS			TOTAL INOR. PHOS. (PO_4)			GREASE		
	Conc. mg/l	lbs/day	lbs/1000 lbs.	Conc. mg/l	lbs/day	lbs/1000 lbs.	Conc. mg/l	lbs/day	lbs/1000 lbs.
29.5.74	404.0	1293	16.46	17.5	56.02	0.71	38.7	124	1.58
30.5.74	321.0	862	10.45	14.61	39.23	0.48	21.6	58	0.70
11.6.74	450.0	1294	14.08	11.25	32.26	0.35	23.6	68	0.74
12.6.74	500.0	1522	14.27	17.85	54.34	0.50	12.8	39	0.36
13.6.74	300.0	844	8.74	14.85	41.76	0.43	14.1	40.0	0.41
6.8.74	331	945	9.63	21.2	60.51	0.61	90	257.0	2.62
7.8.74	390	569	8.26	16.6	24.22	0.35	--	--	--
Average	400	1183	12.36	16.23	42.37	0.53	51.4	148	1.49

NATIONAL SEA PRODUCTS LOUISBOURG PLANT

Table 16

Estimated Daily Pollutional Load

(Meal Plant)

Date	Flow mgd.	Production lbs/day*	Hours of Sampling	Production for the Sampling Period (lbs)	BOD			COD			SS		
					Conc. mg/l	lbs/day	lbs/1000 lbs.**	Conc. mg/l	lbs/day	lbs/1000 lbs.**	Conc. mg/l	lbs/day	lbs/1000 lbs.**
11.6.74	0.094	11,600	3.5	5075	333	260.4	0.051	532	416	0.081	187	146.0	12.6
12.6.74	0.1926	2,800	7.17	2510	297	476.0	0.19	450	721	0.287	185	296.0	105.7
13.6.74	0.226	9,700	7.50	9094	236	444	0.05	315	592	0.065	136	256	26.4
6.8.74	0.0519	16,200	6.25	12656	1550	670	0.052	2130	920	0.072	1050	453.0	27.9
7.8.74	0.557	15,600	6.0	11700	1104	5116	0.43	2454	11372	0.97	757	3508	224.8
Average	0.304				923.5	2688.2	0.24	1384.5	5894	0.52	593	1827	118.7

*lbs. produced during the day shift.
**lbs. per 1000 lbs. of fish meal produced.

NATIONAL SEA PRODUCTS LOUISBOURG PLANT (Cont'd....)

Estimated Daily Pollutional Load
(Meal Plant)

Date	TS			TVS			VSS			Total Ino. PO_4			Total Org. PO_4		
	Conc. mg/l	lbs/day	lbs/1000 lbs.**	Conc. mg/l	lbs/day	lbs/1000 lbs.**	Conc. mg/l	lbs/day	lbs/1000 lbs. **	Conc. mg/l	lbs/day	lbs/1000 lbs.**	Conc. mg/l	lbs/day	lbs/1000 lbs.**
11.6.74	32967	25782	2223	4428	3463	298	-	-	-	18.60	14.55	1.25	-	-	-
12.6.74	29848	47829	17081	3621	5802	2072	-	-	-	18.72	30.0	10.71	2.18	1.70	0.15
13.6.74	31027	58340	6014	3802	7150	737	-	-	-	5.79	11.0	1.13	1.12	1.79	0.64
6.8.74	33407	14425	890	5275	2238	138	1032	445	27.5	21.0	9.07	0.56	2.78	1.20	0.07
7.8.74	31337	145223	9309	4620	21410	1372	739	3425	219.5	14.0	65.0	4.17	8.0	37.0	2.38
Average	31627.5	79824	8985.5	4448	11824	1105	885.5	1935	123.5	13.395	37.04	5.64	4.56	19.1	1.23

NATIONAL SEA PRODUCTS LOUISBOURG PLANT (Cont'd...)

Estimated Daily Pollutional Load
(Meal Plant)

Date	Oil & Grease			NO_3-N			NO_2-N		
	Conc. mg/l	lbs/day	lbs/1000 lbs. **	Conc. mg/l	lbs/day	lbs/1000 lbs. **	Conc. mg/l	lbs/day	lbs/1000 lbs.**
11.6.74	127.4	99.64	8.59	-	-	-	-	-	-
12.6.74	111.0	177.87	63.52	-	-	-	-	-	-
13.6.74	61.9	116.39	12.0	-	-	-	-	-	-
6.8.74	736	317.81	19.62	0.151	0.07	0.004	0.005	0.041	0.002
7.8.74	340	1575.64	101.00	0.106	0.49	0.031	0.006	0.027	0.002
Average	398.95	837.62	54.795	0.13	0.28	0.018	0.006	0.034	0.002

NATIONAL SEA PRODUCTS LOUISBOURG

Table 17

Fish Unloading Facilities

Estimation of Total Pollutional Load

Date	Flow mgd.	BOD		COD		SS		TS		TVS		VSS		Total Ino. PO_4	
		Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day
24.7.74	0.065	830	449	1170	633	173	94	768	415	536	290	147.0	79	29.8	16
6.8.74	0.055	686	314	1125	515	210	96	604	276	412	189	121.0	55	25.5	12
Average	0.060	758	381	1147.5	574.0	191.5	95	686	345.5	474	239.5	134.0	67	27.65	14

Sampling for Ammonia-N was done only on 24.7.74. The daily composite value and the daily average value as calculated from the 2-hourly composites differ widely -- 8.7 and 1.5 mg/l respectively. Value of 1.5 mg/l is adopted because this value has been obtained by analyzing a number of samples. This (1.5 mg/l) will give the daily load of lbs/day.

NATIONAL SEA PRODUCTS LOUISBOURG (Cont'd...)

Fish Unloading Facilities

Estimation of Total Pollutional Load

Date	Org. PO_4		Oil & Grease		NO_3-N		NO_2-N	
	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day
24.7.74	3.45	2.0	150	81	0.103	0.05	.007	0.004
6.8.74	3.10	1.5	150	81	0.10	0.04	.005	0.002
Average			150	81	0.102	0.045	0.006	0.003

Table 18

HOPKINS PLANT, LOUISBOURG

Estimated Daily Pollutional Load

Flow has been assumed = 9,500 gal./day (U.S.)

Date	TOTAL Packed Weight of Fish Processed (lbs.)	BOD			COD			SS			TS		
		Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.7.74	2,480	361	29	12	610	48	19	201	16	6.4	446	35	14.2
26.7.74	960	748	59	61	1140	90	94	176	14	14.5	640	51	53
Average		554.5	44.0	36.5	875.0	69	56.5	188.5	15	10.45	543.0	43	33.6

*lbs/1000 lbs. of finished product.

Note: (1) In this case, the records for round fish landed weight were not available.
(2) Concentration of NO_2-N was almost negligible.

HOPKINS PLANT, LOUISBOURG (Cont'd...)

Estimated Daily Pollutional Load

Flow has been assumed = 9,500 gal./day (U.S.)

Date	TVS			VSS			Total Inor. PO_4			Organic PO_4			NO_3-N		
	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.7.74	304	24	9.7	199	16	6.34	29.55	2.33	0.94	2.85	0.225	0.09	0.0675	0.0053	0.0021
26.7.74	416	33	34.25	176	14	14.5	40.2	3.17	3.3	1.70	0.134	0.139	0.12	0.0095	0.0098
Average	360.0	28.5	21.98	187.5	15	10.42	34.88	2.75	2.12	2.28	0.180	0.115	0.094	0.007	0.006

Table 19

NATIONAL SEA PRODUCTS, LOCKEPORT FISH PLANT

Estimation of Pollutional Load

Date	Flow (U.S. Gal/ Day)	Production (lbs/day)	BOD			COD			SS			VS		
			Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.6.74	206,000	91,264	297	509	5.58	430	737	8.07	67.0	115	1.26	4010	6873	75.3
26.6.74	191,000	71.815	274	435	6.06	328	521	7.25	62.4	99	1.37	4048	6433	89.5
27.6.74	158,000	44,327	259	340	7.68	388	510	11.5	98.0	129	2.91	3905	5133	156
22.8.74	135,000	56,995	288	323	5.67	410	460	8.07	123.0	138	2.42	4960	5571	97.7
23.8.74	145,000	56,995	320	386	6.77	370	446	7.83	117.0	141	2.47	-	-	-
Average	170,500		297	416	6.63	379	591.5	9.38	92.7	118.5	1.87	4432.5	6003.0	115.7

*lb/1000 lb. of round fish

NOTES:

1. NO_3-N was found to be <0.005 mg/l in all cases except on 25.6.74 when the value was 0.019 mg/l. In all the cases the lbs/day of this parameter discharged can safely be assumed to be negligible.
2. NO2-N was found to be <0.005 mg/l in all cases. The lbs/day discharged can be safely assumed to be negligible.
3. NH_3-N was only observed on 23.8.74 when the value was found to be 0.025 mg/l. The lbs/day discharged in this case can also be assumed to be negligible.

NATIONAL SEA PRODUCTS, LOCKEPORT FISH PLANT

Estimation of Pollutional Load

Date	Oil & Grease			Total Inor. PO_4			Total Org. PO_4		
	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.6.74	53.3	91.3	1.0	20.7	35.48	0.388	4.0	6.85	0.075
26.6.74	9.7	15.41	0.214	38.65	61.42	0.855	-	-	-
27.6.74	-	-	-	46.0	60.47	1.364	7.15	9.4	0.212
22.8.74	35	39.31	0.69	58.0	65.14	1.14	-	-	-
23.8.74	-	-	-	8.75	10.56	0.185	7.85	9.47	0.166
Average	31.5	53.36	0.607	33.38	37.85	0.78	5.93	8.16	0.144

Table 20

NATIONAL SEA PRODUCTS, LOCKEPORT

Estimation of Total Pollution Load (lbs/day)

Skinning Outfall

Parameter	22.8.74		23.8.74	
	Conc. mg/l	lbs/day	Conc. mg/l	lbs/day
BOD	100	4.16	101	4.18
COD	198	8.89	110	5.0
SS	51	2.3	66	2.96
TS	34870	1566	34990	1572
TVS	2030	91.2	-	-
Grease	10	0.5	-	-
Total Inorganic PO_4	3.21	0.15	4.95	0.23
Total Organic PO_4	1.88	0.084	3.74	0.168
NH_3-N	0.2	0.009	-	-

Note: (1) Flow has been estimated = 0.0054 mg.

(2) Values of NO_3-N and NO_2-N are very small (<0.005) and the pollutional load for these parameters is negligible.

Table 21

SWIM BROTHERS, LOCKEPORT

Estimation of Total Pollutional Load

Date	Flow mgd.	Production lbs. round fish	BOD			COD			SS			TS		
			Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.6.74	0.188	39,015	126	197	5.05	209	327	8.4	22	34.4	0.88	30603	47,868	1227
26.6.74	0.188	13,494	125.5	196.3	14.54	220	344	25.5	16.5	25.8	1.91	29795	46,604	3454
20.8.74	0.169	39,504	1230	1729	43.78	1530	2151	54.5	362.5	509.7	12.9	30990	43,574	1103
Average	0.179		677.75	962.65	24.42	869.5	1239.0	31.45	189.5	267.75	6.89	30392.5	45,721	2278.5

* lb/1000 lb. of round fish.
** values negligible.

SWIM BROTHERS, LOCKEPORT (Cont'd...)

Estimation of Total Pollutional Load

Date	VS			Oil & Grease			Total Inor. PO_4		
	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.6.74	2883	4510	116	169.4	265	6.79	8.15	12.74	0.33
26.6.74	2930	4583	340	-	-	-	7.82	12.23	0.9
20.8.74	4360	6130	155	490	766	19.4	96.0	135	3.41
Average	3621.5	5320	228	329.7	515.5	13.095	51.9	73.62	1.87

SWIM BROTHERS, LOCKEPORT (Cont'd...)

Estimation of Total Pollutional Load

Date	Total Org. PO_4			NO_3-N			NO_2-N		
	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*	Conc. mg/l	lbs/day	lbs/1000 lbs.*
25.6.74	22.3	34.8	0.89	0.032	0.05	0.0012	0.005	** -	** -
26.6.74	2.53	3.95	0.29	0.092	0.143	0.01	0.005	-	-
20.8.74	-	-	-	-	-	-	-	-	-
Average	12.42	19.38	0.59	0.062	0.097	0.006	0.005	-	-

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APPENDIX

RAW DATA

Environment Canada / Environmental Protection — Environnement Canada / Protection de l'Environnement

RAW DATA

INDUSTRIAL WASTE ANALYSIS — ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES

COMPANY / *Société*: National Sea Products

LOCATION / *Endroit*: Louisbourg, N. S.

DATE COLLECTED / *Date du prélèvement*	SAMPLING LOCATION / *Lieu du prélèvement*	SAMPLING TIME / *Heure du prélèvement*		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	TVS mg/l	T-inorganic PO_4 mg/l	NO_3-N ppm	NO_2-N ppm	Oil & Grease ppm	Organic Total PO_4 mg/l			BIOASSAY / *Dosage biologique* Survival % TD - 50 HR.	% de survie TD - 50 H.
29/5/74	Fish Plant Sewer#1	Comp. 0800-1000		186->147	362	100	1840	440	16.65	0.010	<0.005	*	2.95				
"	"	Comp. 1000-1200		91-106 63	319	83	2128	440	21.35	<0.005	<0.005	*	2.65				
"	"	Comp. 1345-1500		200-139 593	238	64	1872	388	17.50	<0.005	<0.005	*	1.65				
"	"	Comp. 1500-1700		91-97 49	232	57	1844	348	14.40	<0.005	<0.005	32.2	1.85				
"	"	Daily Comp.		136-136 71.5	294	81	1828	396	14.80	<0.005	<0.005	38.7	3.05				
30/5/74	"	Comp. 0815-1000		113-128 69	250	44	964	220	14.00	<0.005	<0.005	106.7	2.25				
"	"	Comp. 1000-1200		160-136 60	197	55	1684	352	14.25	<0.005	<0.005	25.2	1.35				
"	"	Comp. 1300-1500		130-106 69	243	64	1620	356	14.25	<0.005	<0.005	21.1	2.05				
"	"	Comp. 1500-1700		-103 178 64	231	67	1520	356	15.95	<0.005	<0.005	15.2	2.55				
"	"	Daily Comp.		-107 64	231	105	1528	324	15.50	<0.005	<0.005	21.6	2.25				

*Unable to destroy emulsions.

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Environment Canada / Environmental Protection — Environnement Canada / Protection de l'Environnement

RAW DATA

INDUSTRIAL WASTE ANALYSIS — **ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES**

COMPANY / *Société*: National Sea Products

LOCATION / *Endroit*: Louisbourg

DATE COLLECTED / *Date du prélèvement*	SAMPLING LOCATION / *Lieu du prélèvement*	SAMPLING TIME / *Heure du prélèvement*		NH_3 ppm	BOD mg/l	COD mg/l	SS mg/l	TS mg/l	VS mg/l	Oil & Grease ppm	NO_3-N ppm	NO_2-N ppm	T-inorg. PO_4 ppm	Organic T-Phos ppm as PO_4		BIOASSAY *Dosage biologique* Survival % TD - 50 HR.	BIOASSAY % de survie TD - 50 H.
13-6-74	Sewer #1 A	0800-1000		0.73													
"	" B	"		0.76													
"	" C	"		0.63													
"	Sewer #2 A	"		15.6													
"	" B	"		13.6													
"	" C	"		12.5													
11/6/74	Sewer #1	0800-1000			>73 110 110	168	62.5	1600	368	<5.0							
"	"	1000-1200			>75 106 103	160	79	2252	464	8.3							
"	"	1330-1500			>74 122 123	176	19.2	2500	524	<5.0							
"	"	1500-1700			>72 146 153	220	60.5	1864	436	15.3							
"	"	Daily Comp.			>74 144 163	236	70.5	1488	360	23.6	<0.005	<0.005	11.25	<0.005			
"	Sewer #2	1330-1500			114 107 54	264	74	32980	4420	<5.0							
"	"	1500-1700			>230	800	300	32920	4435	89.4							
"	"	½ day comp.			>230	640	228	32967	4528	127.4	<0.005	<0.005	18.60	<0.005			
12/6/74	Sewer #1	0820-1000			>72 >148 217	244	94	2396	592	41.8							
"	"	1000-1200			>73 >15 213	300	118	1844	392	30.0							
"	"	1330-1500			>140 223	236	97.5	2088	508	50.2							
"	"	Daily Comp.			>140 207	312	110	2056	528	12.8	<0.005	<0.005	17.85	<0.005			

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RAW DATA

INDUSTRIAL WASTE ANALYSIS — ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES

COMPANY / Société: National Sea Products

LOCATION / Endroit: Louisbourg

DATE COLLECTED / Date du prélèvement	SAMPLING LOCATION / Lieu du prélèvement	SAMPLING TIME / Heure du prélèvement		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	VS mg/l	Oil & Grease	NO_3N ppm	NO_2-N ppm	T-inorg. PO_4 ppm	T-phos ppm.			BIOASSAY / Dosage biologique: Survival % TD - 50 HR.	BIOASSAY: % de survie TD - 50 H.
12/6/74	Sewer #2	0820-1000		58 62 63	80	13.7	24788	2637	5.7								
"	"	1000-1200		>140 210	212	75	31928	4189	10.9								
"	"	1330-1500		>230	728	352	31564	4084	176.1								
"	"	1500-1700		>230	880	299	31115	3576	112.9								
"	"	Daily Comp.		>230	448	272	30620	3172	111.0	<0.005	<0.005	18.72	2.18				
13/6/74	Sewer #1	0800-1000		>73 134 153	246	105	2172	360	37.7								
"	"	1000-1200		>73 140 160	160	77	1976	252	<5.0								
"	"	1330-1500		170 >140	228	68	1940	360	16.6								
"	"	1500-1700		>74 123 133	140	56	1500	240	50.7								
"	"	Daily Comp.		156 >140	128	60	1944	300	14.1	<0.005	<0.005	14.85	<0.005				
"	Sewer #2	0800-1000		305 >230	448	224	30664	3484	97.4								
"	"	1000-1200		193 >140	292	92	31144	3232	52.2								
"	"	1330-1500		223 >140	232	125	31404	3540	89.7								
"	"	1500-1700		223 >140	288	102	30895	3256	35.8								
"	"	Daily Comp.		207.0 >230	304	131	31381	3802	61.9	0.011	0.005	5.79	1.12				
"	After Evaporators	08:40 Grab Sample		>2800	4600	2400	31510	6520	108.7								
"	Offal Hopper Sewer	08:45 Grab Sample		>21515	194400	83300	88200	80340	Lost in lab accident.								

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INDUSTRIAL WASTE ANALYSIS

RAW DATA

ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES

COMPANY / *Société*: National Sea Products

LOCATION / *Endroit*: Louisbourg

DATE COLLECTED / *Date du prélèvement*	SAMPLING LOCATION / *Lieu du prélèvement*	SAMPLING TIME / *Heure du prélèvement*		BOD mg/l	COD mg/l	NO_3-N ppm	NO_2-N ppm	T-Inorg. PO_4 as PO_4 ppm	Organic T-Phos as PO_4 ppm	SS mg/l	TS mg/l	TVS mg/l	VSS mg/l	Oil & Grease ppm		BIOASSAY / *Dosage biologique* Survival % TD - 50 HR.	% de survie TD - 50 H.
24/7/74	Vacuum Unloaders	0830-1030		1170 1268 1274	2320	0.185	0.015	56.0	2.0	300	1530	1000					
"	"	1030-1200		670 668 674	1310	0.124	0.006	20.3	7.45	210	756	484					
"	"	1315-1430		370 588 554	1160	0.150	0.010	20.8	0.90	222	696	452					
"	"	Daily Comp.		670 748 714	1170	0.103	0.007	29.8	2.40	173	768	536	147	150			
"	H. Hopkins Main Eff. A			348 354 337	649	0.060	<0.005	31.1	1.60	300	388	268	296				
"	" B			388 374 327	571	0.075	<0.005	28.	4.10	102	504	340	102				
26/7/74	"	0830-1200		748 754 >710	1140	0.120	0.005	40.2	1.70	176	640	416	176				

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INDUSTRIAL WASTE ANALYSIS

PAW DATA
ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES

COMPANY / *Société*: National Sea Products
LOCATION / *Endroit*: Louisbourg

DATE COLLECTED / *Date du prélèvement*	SAMPLING LOCATION / *Lieu du prélèvement*	SAMPLING TIME / *Heure du prélèvement*		NH_3 ppm											BIOASSAY / *Dosage biologique*	
															Survival / % TD - 50 HR.	% de survie TD - 50 H.
24/7/74	Vacuum Unloaders	Daily Comp.	A	8.7												
"	"	"	B	1.5												

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INDUSTRIAL WASTE ANALYSIS

RAW DATA
ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES

COMPANY / *Société*: National Sea Products
LOCATION / *Endroit*: Louisbourg

DATE COLLECTED / *Date du prélèvement*	SAMPLING LOCATION / *Lieu du prélèvement*	SAMPLING TIME / *Heure du prélèvement*		BOD mg/l	COD mg/l	SS mg/l	VSS mg/l	TS mg/l	TVS mg/l	Oil & Grease ppm	NO_3-N ppm	NO_2-N ppm	Inorg. T-Phos ppm	Organic T. PO_4 ppm		BIOASSAY *Dosage biologique* Survival % TD - 50 HR.	% de survie TD - 50 H.
6/8/74	Vacuum Unloader	0830-1030		804 >740	1410	265		640	448								
"	"	1030-1200		808 824 >750	1290	245		680	440								
"	Sewer #1	0815-1000		144 183 146	500	108		1280	304								
"	"	1000-1200		384 413 >380	404	137		1328	348								
"	Sewer #2	0815-1000		>1500	1310	1056		32080	3940								
"	"	1030-1200		>1500	2270	1000	965	33800	5440								
"	Vacuum Unloaders	1300-1400		448 444 453	674	122	119	380	252								
"	Sewer #1	1300-1500		544 516 >370	562	105	105	1844	376								
"	"	1500-1600		264 213 221	336	65	65	1400	296								
"	Sewer #2	1300-1500		>1480	1590	560	552	32690	4530								
"	"	1500-1600		>1500	3350	1585	1580	35060	7190								
"	Vacuum Unloaders	Daily Comp.		688 484 623	862	168	121	604	412	150	0.100	<0.005	25.5	3.10			
"	Sewer #1	Daily Comp.		326 263 281	345	90		1530	380	90	0.145	0.005	21.2	3.95			
"	Sewer #2	Daily Comp.		1326 >739 >355	1800	888	872	31730	3950	736	0.151	0.005	21.0	2.775			
7/8/74	Sewer #1	0800-1000		404 373 332	482	146	146	1076	348								
"	Sewer #2	0800-1000		>1340	3320	685	640	29500	4390								
"	Sewer #1	1000-1200		324 323 326	414	68	68	1596	432								
"	Sewer #2	1000-1200		>1320	3180	1080	1080	32350	5410								
"	Sewer #2	1300-1500		884 653	862	506	496	32160	4060								

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Environment Canada
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RAW DATA

INDUSTRIAL WASTE ANALYSIS

ANALYSE DES EAUX RÉSIDUAIRES INDUSTRIELLES

COMPANY / *Société*: National Sea Products

LOCATION / *Endroit*: Louisbourg

DATE COLLECTED / *Date du prélèvement*	SAMPLING LOCATION / *Lieu du prélèvement*	SAMPLING TIME / *Heure du prélèvement*		BOD mg/l	COD mg/l	SS mg/l	VSS mg/l	TS mg/l	TVS mg/l	Oil & Grease ppm	NO_3-N ppm	NO_2-N ppm	T-inorg. PO_4 ppm	Organic T-Phos as PO_4 ppm		BIOASSAY / *Dosage biologique* Survival % TD - 50 HR.	% de survie TD - 50 H.
7/8/74	Sewer #1	Daily Comp.		324 343 332	517	99	99	1336	428	<5	0.082	<0.005	16.6	0.80			
"	Sewer #2	Daily Comp.		>1270	2120	660	632	32650	5210	340	0.106	0.006	14.0	8.00			

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Environment Canada
Environmental Protection

Environnement Canada
Protection de l'environnement

COMPANY: Swim Bros.

LOCATION: Lockeport

INDUSTRIAL WASTE ANALYSIS

DATE COLLECTED	SAMPLING LOCATION	SAMPLING TIME		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	VS mg/l	Oil & Grease ppm	T-Inorg PO_4 ppm	NO_3-N ppm	NO_2-N ppm	T-org. PO_4 ppm			BIOASSAY Survival % TD-50 HR.
25/6/74		0930-1100		108 144 128	228	23.2	29,470	2160	<5.0							
"		1100-1200		78 74 228	200	17.3	31,160	3330								
"		1600-1700		217 174 108	200	25.5	31,180	3160								
"		Daily Comp.		128 134 228	228	21.8	32,640	4160	169.4	8.15	0.032	<0.005	22.3			
26/6/74		0845-1015		117 114 228	192	18.0	26,810	2380								
"		1015-1145		118 134 108	248	14.8	32,780	3470								
"		Daily Comp.		118 114 108	232	17.3	32,360	2930	<5	7.82	0.092	<0.005	2.53			

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Environment Canada / Environmental Protection — Environnement Canada / Protection de l'environnement

COMPANY: National Sea Products
LOCATION: Lockeport

INDUSTRIAL WASTE ANALYSIS

DATE COLLECTED	SAMPLING LOCATION	SAMPLING TIME		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	VS mg/l	Oil & Grease ppm	NO_3-N ppm	NO_2-N ppm	T-inorg PO_4 ppm	T-org. PO_4 ppm			BIOASSAY Survival % TD-50 HR.
25/6/74	Fish	0830-1030		168	280	912	32950	3930	56.5							
"		1030-1200		164 168	308	45.5	22720	3820	60.8							
"		14:00-1530		204 208	364	44.8	32710	4260	45.4							
"		1530-1700		644 728	700	86.4	32970	4030	50.7							
		Daily Comp.		244 368	364	88.0	33980	4740	70.7	0.019	<0.005	20.7	4.0			
26/6/74		0900-1100		344 528	352	86.4	21670	1820	11.2							
"		1100-1200		224 288	308	56.8	30760	3930	35.9	Ave. COD = 328 Ave. BOD = 274						
"		1315-1430		284 448	336	56.4	31310	6400		BOD = COD = 0.835 ∴ 304 x 0.835 = BOD 253						
"		1430-1600		244 288	318	50.0	33,860	4040	36.0							
"		Daily Comp.		253 328 520	304	116	32080	3690	9.7	<0.005	<0.005	38.65	<0.005			
27/6/74		0845-1015		238 244 108	400	127.6	32410	3630	26.7							
"		1015-1145		297 274 88	484	67.6	33360	4180	<5.0							
"		Daily Comp.		257 304 108	388	85.9	29500	2980	<5	<0.005	<0.005	46.0	7.15			
25/6/74	Meal	0830-1030		232 204 168	360	49.0	31390	3150								
"		1030-1200		37 36 32	48	9.2	29420	2520	<5.0							
"		1600-1700		673 984 1288	1136	210	31960	3640								
"		Daily Comp.		265 274 248	372	45	31190	3470	6	0.013	<0.005	22.62	<0.005			
26/6/74		0900-1100		353 424 388	636	203	32290	3240	23.5							
"		1100-1200		18 14 28	120	36.3	22500	1460	8.9							

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COMPANY: National Sea Products
LOCATION: Lockeport

INDUSTRIAL WASTE ANALYSIS

DATE COLLECTED	SAMPLING LOCATION	SAMPLING TIME		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	VS mg/l	Oil & Grease ppm	T-inorg PO_4 ppm	NO_3 ppm	NO_2 ppm	T-org. PO_4 ppm			BIOASSAY Survival % TD-50 HR.
26/7/74	Meal	Daily Comp.		228 374 668	472	88.0	29,940	2420	56	21.0	<0.005	<0.005	6.30			
27/6/74		0845-1015		43 14 228	144	11.2	32,590	3680	14.9							
"		1015-1145		38 14	316	15.6	33,220	3630								
"		Daily Comp.		58 14 68	324	14.6	33,830	3810	<5	1.34	0.064	<0.005	2.76			

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COMPANY: Swim Bros.

LOCATION: Lockeport

INDUSTRIAL WASTE ANALYSIS

DATE COLLECTED	SAMPLING LOCATION	SAMPLING TIME		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	TVS mg/l	VSS mg/l	Oil & Grease mg/l	NO_2-N ppm	NO_3-N ppm	T-inorg PO_4 ppm	T-org. PO_4 ppm		BIOASSAY Survival % TD-50 HR.
20/8/74		0800-1000		*>1220	2000	433	36080									
"		1330-1530		620	1060	292	36210									
"		Daily Comp.		- 15	1590	199	30990	4360*		490	<0.005	<0.005	96	<0.05		

*all dilutions were depleted.

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COMPANY: National Sea Products

LOCATION: Lockeport

INDUSTRIAL WASTE ANALYSIS

DATE COLLECTED	SAMPLING LOCATION	SAMPLING TIME		BOD mg/l	COD mg/l	SS mg/l	TS mg/l	TVS mg/l	VSS mg/l	Oil & Grease mg/l	NO_2-N mg/l	NO_3-N mg/l	T-inorg PO_4 ppm	T-org. PO_4 ppm	NH_3 ppm	BIOASSAY Survival % TD-60 HR.
20/8/74	Meal Plant	Daily Comp.		40 60 80	198	26	28510	2890		8	<0.005	<0.005	24.25	<0.05		
"	"	1330-1530		20 30	98	19	28640									
"	"	0840-0930		20 20	188	37	35550									
22/8/74	"	Daily Comp.		- 40 -	86	14	34930	4260		14	<0.001	0.010	0.025	0.575		
"	Skinning Outfall	0800-1000		80 150 160	250	62	34550				<0.005	<0.005	3.08	2.51		
"	"	1000-1200		200 60 60	145	36	35180				<0.005	<0.005	2.6	2.11		
"	"	1330-1530		160 90 40	sample missing	57	34880				<0.005	<0.005	3.35	1.02		
"	"	Daily Comp.		80 130 120	210	49	20140	2030		10	<0.005	<0.005	2.44	5.21		
"	Fish Plant	0800-1000		240 321 302	470	222	34570				<0.005	<0.005	10.00	3.62		
"	"	1000-1200		4 256 220	370	132	34680				<0.005	<0.005	9.52	8.58		
"	"	1330-1530		320 321 382	390	222	35190				<0.005	<0.005	25.00	<0.05		
"	"	Daily Comp.		288	420	123	34430	4960		35	<0.005	<0.005	58.00	<0.05		
23/3/74	Skinning Outfall	0900-1130		240 101 140	110	66	34990				<0.005	<0.005	4.95	3.74		
"	Fish Plant	0900-1130		364 240 320	370	117	33760				<0.005	<0.005	8.75	7.85		
"	Sam.A Meal Plant														0.4	
"	Sam.A Fish Plant														0.45	
"	Sam.B Fish Plant														0.2	
"	Sam.B Skinning Outfall														0.2	
"	Sam.B Skinning Outfall														0.2	

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COMPANY: National Sea Products

LOCATION: Lockeport

INDUSTRIAL WASTE ANALYSIS

DATE COLLECTED	SAMPLING LOCATION	SAMPLING TIME	NH_3 ppm												BIOASSAY Survival % TD-50 HR.
23/8/74	Meal Plant Sewer B		0.3												

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