

H. A. Clarke.

ONTARIO MINISTRY OF ENVIRONMENT
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THE
ONTARIO WATER RESOURCES
COMMISSION
REPORT ON
INDUSTRIAL WASTES LOADINGS
in the
TOWN OF BRADFORD

1966

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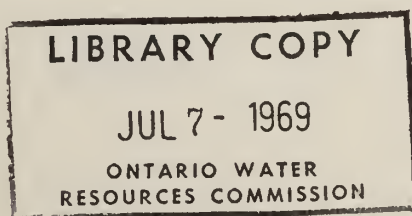
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SECTION I



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INDUSTRIAL WASTES LOADINGS

in

THE TOWN OF BRADFORD

1966

The Town of Bradford is located in the Holland Marsh Area of the County of Simcoe.

The bulk of the industrial production is vegetable washing with limited potato chip manufacturing being carried out. These operations are seasonal, with the heaviest being from September to February. Therefore, the volumes associated with water consumption and waste disposal also vary throughout the year.

The purpose of this survey is to re-evaluate the waste disposal practices and to establish daily waste loadings from each industry. Emphasis has been placed on the applicability of treatment of these wastes in a municipal system, the expansion of which is now under consideration.

SUMMARY

It was found that the wash waters from the industries contained significant amounts of organic material, including vegetable parts, along with silt and grit.

The manufacture of potato chips results in wastes of extremely high organic content, that must be disposed of satisfactorily.

Waste disposal practices of five of the eight industries visited were not satisfactory. Generally, industries with pre-treatment facilities such as settling basins, did not maintain them properly, and more efficient operation of these facilities should be provided.

In summary, the eight industries at present contribute a daily load of 925 pounds BOD, of which 905 pounds is discharged by Holland River Gardens. The report generally recommends that industrial wastes be directed to the municipal sanitary system after adequate pre-treatment.

The following is a brief summary of the findings for each individual industry:

Holland River Gardens Company Limited

The plant effluent was definitely not acceptable for discharge to a watercourse. It was found that the chip plant contributed the major portion of the waste loading.

It was recommended that the plant begin the practice of treating by use of in-plant screening followed by a settling basin and some form of biological treatment. This biological treatment could be provided in the municipal sanitary system or in a separate industrial treatment unit.

Dominion Farm Product Limited

The effluent from this plant is directed to the municipal sanitary system and it was found to be acceptable for continued discharge.

W. A. Fuller and Son Limited

The plant effluent to the storm ditch was totally unacceptable in terms of BOD and suspended solids.

It was recommended that the poorly operated settling tank be cleaned more regularly to reduce the suspended solids concentration and that the effluent from this tank be directed to the municipal sanitary system.

Bailey River Gardens Limited

A sampling program was not carried out at this industry but from the other plants it may be assumed that pre-treatment facilities should be provided and the pre-treated effluent discharged to the sanitary system.

L. and L. Gardens Limited

The effluent from this plant is directed to the municipal sanitary sewer and it was found to be acceptable for continued discharge.

Ontario Farm Produce Company Limited

The effluent from this plant is directed to the municipal sanitary sewer and it was found to be acceptable for continued discharge.

United Farms Limited

Wastes from this plant were found to be entirely unsatisfactory for discharge to a watercourse.

It was recommended that:

- (1) in-plant screening of the wastes be provided
- (2) the in-plant screens and the sedimentation basin be properly maintained

- (3) the effluent from the sedimentation basin be directed to the municipal sanitary system

International Fruit Distributors Limited

The effluent from this plant is not acceptable for discharge to a watercourse. Pre-treatment facilities (floor screens and settling tanks) should be installed to ensure adequate reduction of the suspended solids so that the effluent would be acceptable for discharge to the municipal sanitary system.

SECTION II

HOLLAND RIVER GARDENS COMPANY LIMITED

On August 2, 1966, the Holland River Gardens Plant in Bradford was inspected. Mr. A. W. Walker, General Manager, was interviewed and he supplied information on plant operations and waste disposal practices.

DETAILS OF SURVEY

Personnel

Holland River Gardens Company Limited	- Mr. A. W. Walker, General Manager
	- Mr. E. McMaster, Cost Accountant
Ontario Water Resources Commission	- Mr. G. Grosse
	- Mr. L. Fitz

DESCRIPTION OF PLANT

The plant may be divided into two distinct units -

- (a) vegetable washing plant
- (b) potato chip plant

(a) The vegetable washing plant is engaged in the processing and packaging of vegetables. Celery, bunch carrots and radishes are washed with a spray that is re-circulated. The re-circulated water is dumped once per day. Potatoes are washed in a drum washer followed by a spray. The water in the drum washer is dumped once per day and the spray is discharged continuously.

Vegetables such as carrots, beets and parsnips are washed in a system similar to the potato washer.

(b) The potatoes are processed to chips as follows: - they are washed, skinned, sorted and sliced. The slices are washed in a hot water bath to

remove excess starch, are cooled and then cooked in vegetable oil.

The cooked chips are cooled, salted and packaged.

OPERATING DATA

(a) Chip Plant	- 24 hours per day, 5 days per week
(b) Vegetable Washing Plant	- 10 hours per day, 5 1/2 days per week
Total Employees	- 150

WATER CONSUMPTION (gallons per day)

<u>1966</u>	<u>Chip Plant</u>	<u>Vegetable Washing Plant</u>
January	101,000	20,100
February	101,000	20,100
March	120,000	15,700
April	120,000	15,700
May	121,000	9,500
June	121,000	9,500
July	136,000	12,200
August	136,000	12,200
September (65)	105,000	24,700
October	105,000	24,700
November	95,000	25,800
December	95,000	25,800

SOURCES AND DISPOSAL OF LIQUID WASTES

(a) Vegetable Washing Plant

The main sources of waste in the vegetable washing plant are the carrot washer, the celery washer and the potato washer. In all cases, the wastes discharge to the plant sewers through unscreened floor drains.

(b) Potato Chip Plant

The wastes in this plant originate in the various washes and hot and cold rinses. These wastes all discharge to the plant sewer via a mechanical screen conveyer.

All plant sewers discharge to a large ditch adjacent to the plant which eventually reaches the Schomberg River.

HOLLAND RIVER GARDENS LIMITED
PRODUCTION DATA
(lbs)

(a) Vegetable Plant

MONTH	LOCAL CARROTS	PARSNIPS	IMPORTED CARROTS	RADISHES	CELERY (cartons)	BUNCH CARROTS (cartons)	POTATOES	BEEETS
Jan. (66)	1,864,685	120,568	-	-	2,138	-	-	30,180
Feb.	1,691,505	80,870	-	-	1,626	-	-	3,130
March	1,325,751	74,955	60,070	-	1,913	-	-	3,570
April	15,850	84,684	586,030	-	2,294	-	-	4,867
May	43,950	20,460	459,445	-	1,054	-	-	1,510
June (65)	-	-	442,360	6,250	1,961	-	-	1,300
July	243,116	-	278,457	5,580	6,316	2,615	-	15,360
August	863,890	33,793	-	19,660	7,468	3,111	117,695	20,195
Sept.	1,480,609	98,654	-	12,270	8,963	2,224	291,420	21,900
Oct.	2,408,796	133,529	-	18,150	11,354	45	341,985	43,520
Nov.	2,210,924	93,278	-	4,300	3,235	-	5,440	36,415
Dec.	2,554,645	76,514	-	-	1,724	-	-	21,250

(b) Potato Chip Plant

- Chips - 4,000,000 lbs per year (30% total poundage processed)

SAMPLING ANALYSIS (see figures I and II)

Samples were taken on August 2, 1966, each hour from 1:00 pm to 3:00 pm and combined to yield composite samples representing the following streams:

Vegetable Plant

1. Spray rinse effluent from carrot wash
2. Spray rinse effluent from potato wash
3. Effluent from celery wash and chip line
4. Total plant (vegetable wash and chip line) effluent to ditch
5. Effluent from carrot wash, potato wash and septic tank overflow.

Chip Plant

11. Effluent from barrel potato wash
12. Effluent from barrel wash after caustic rinse
13. Effluent from steady flow rinse after cutter
14. Effluent from hot water bath
15. Effluent from cooling rinse after hot water bath
16. Effluent from second cooling rinse

The following grab samples were also taken from the vegetable washing plant:

21. Grab from carrot barrel wash
22. Grab from re-circulated celery wash
23. Grab from potato barrel wash

All samples were submitted to the OWRC laboratory for analysis in accordance with procedures described in "Standard Methods for the Examination

HOLLAND RIVER GARDENS

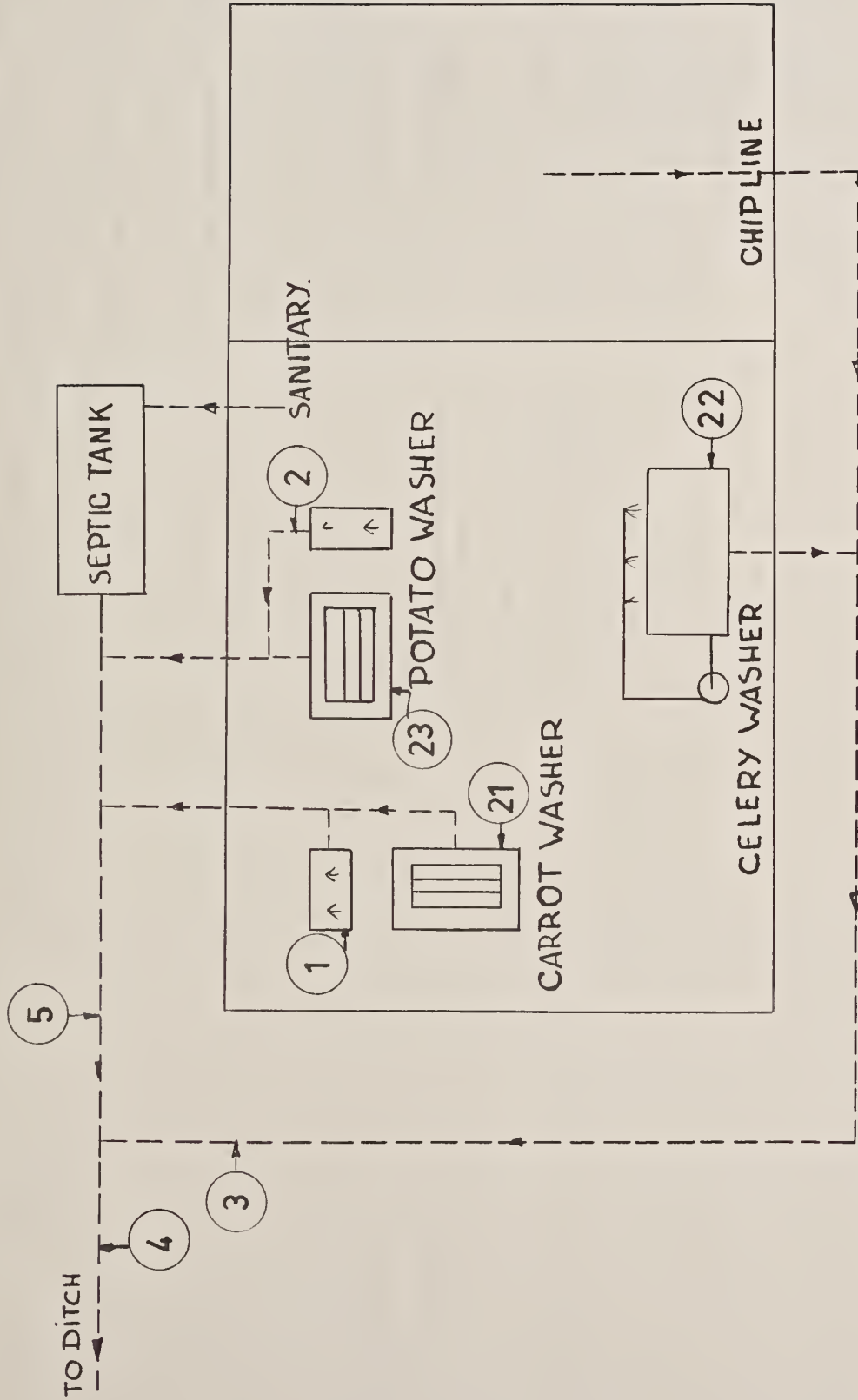


FIG. 1 VEGETABLE WASHING SAMPLE POINTS.

HOLLAND RIVER GARDENS.

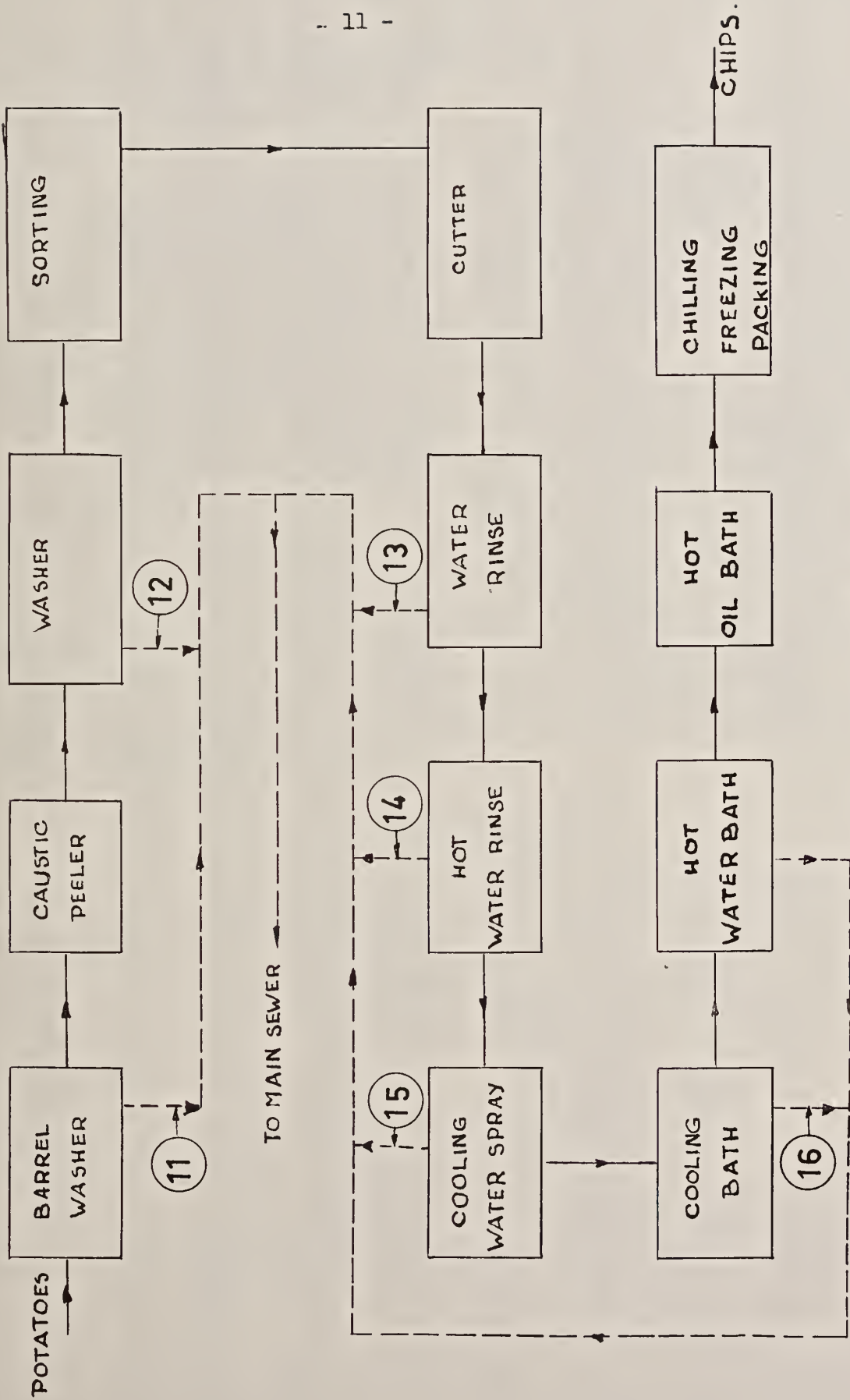


FIG. 11. CHIP LINE SAMPLE POINTS

of Water and Waste Water", Twelfth Edition.

WASTE LOADINGS (lb/day)

<u>Stream</u>	<u>BOD</u>	<u>Suspended Solids</u>	<u>Total Solids</u>
Effluent to ditch - August 2, 1966	525.	1,360	2,630
Effluent from chip line	815.	1,670	2,650
Effluent from carrot and potato wash plus septic overflow	1.3	33	49

A discrepancy in terms of BOD exists between the loading to the ditch and the chip line effluent. It is believed that this was caused by incomplete mixing before the sample of the effluent to the ditch was taken. In other words, the BOD loading of the chip line effluent is more representative of the total effluent BOD loading. It is also readily apparent that the loading from the vegetable washing effluent is negligible compared to the loading from the chip line effluent.

Chip Line Calculations

<u>Unit *</u>	<u>Estimated Flow gpd</u>	<u>BOD (lb/day)</u>	<u>Suspended Solids (lb/day)</u>
Barrel Washer	12,000	12	100
Washer	17,000	680	338
Water Rinse	20,000	390	600
Hot Water Rinse	3,000	324	1,194
Cooling Spray	30,000	99	280
Cooling Bath	18,000	8	4
Boiler and Compressor	7,000	0	0
Total	110,000	1,513	2,516

* See Chip Line - sample point diagram (figure II)

Loading Comparison - Chip Line

<u>Source</u>	<u>BOD (lb/day)</u>
Sample of chip line effluent	815
1965 sampling at Holland River Gardens	1,150.

Loading Comparison with Other Industries

<u>Source</u>	<u>lb BOD/ton Product</u>	<u>Potato Processed</u>
Holland River 1966 (French fries)	36	3 hour composite
Holland River 1965 (French fries)	53	Grab
Potato processing - chip line (pre-washed potatoes)	25	3 hour composite
Potato processing - (22% French fries) remainder, chips and dehydrated products	59	Intensive sampling program
Literature - 4 chip lines (Porges and Towne)	30 - 60	

It is apparent, based on the amount of starch removed, that a French fry line would have lower loadings than a chip line, which has lower loadings than a dehydrated product line.

Based on this knowledge and the above comparative figures, a reasonable figure for Holland River Gardens is 40 lb BOD per ton of potatoes processed or 905 lb BOD per day.

Since the chip line operation is not seasonal, this is a reasonable figure for loading per day for the entire year.

CONCLUSIONS AND RECOMMENDATIONS

The analytical results indicate clearly that the major source of pollution is the chip line. The concentrations of BOD and suspended solids in the plant effluent to the ditch were considerably in excess of OWRC objectives.

It was evident that no in-plant control of highly contaminated waste streams, such as screening, was being practiced.

The company should begin the practice of in-plant screening as well as sedimentation of solids in a settling basin to ensure more efficient removal of the solids. This pre-treated effluent should then receive some type of biological treatment, either in the municipal sanitary system or in a separate industrial treatment facility.

ONTARIO WATER RESOURCES COMMISSION
 CHEMICAL LABORATORIES
 INDUSTRIAL WASTE ANALYSIS

All analysis except pH reported in
 ppm unless otherwise indicated

1 ppm = 1 mgm/litre
 = 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: Holland River Gardens

Date Sampled: August 2, 1966 by: L. Fitz

Lab. No.	5-Day BOD	Solids			pH at Lab.	Volatile Solids %
		Total	Susp.	Diss.		
T-2143	620	8,018	506	7,512	6.6	76.4
T-2144	5.6	308	41	267	7.5	27.9
T-2145	15	680	410	270	7.5	55.3
T-2146	360	2,162	1,356	806	7.0	45.3
T-2147	2.2	272	8	264	7.7	18.4
T-2148	600	1,948	1,228	720	10.7	66.8
T-2149	355	1,774	918	856	10.2	70.4
T-2150	11	406	280	126	7.9	37.5

- T-2143 1. Carrot wash - grab from barrel wash at 1:00 pm
- T-2144 2. Carrot wash - effluent from spray rinse - composite 1:00 pm to 3:00 pm
- T-2145 3. Celery wash - effluent from spray catch tank grab at 2:00 pm
- T-2146 4. Potato wash - grab from barrel wash at 1:00 pm
- T-2147 5. Potato wash - effluent from spray rinse)
- T-2148 6. Effluent from chip line and celery wash) Composite 1:00 pm to 3:00 pm
- T-2149 7. Total plant effluent to ditch)
- T-2150 8. Effluent from carrot wash, potato wash, septic overflow - composite from 1:00 pm to 3:00 pm

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported
in ppm unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals

Municipality: Bradford

Source: Holland River Gardens

Date Sampled: August 2, 1966 by: L. Fitz

Lab. No.	5-Day BOD	Solids			pH at Lab.	% Volatile Solids
		Total	Susp.	Diss.		
T-2151	100	1,386	838	548	7.6	40.7
T-2152	4,000	12,628	1,992	10,636	12.3	86.8
T-2153	1,950	4,200	3,046	1,154	6.7	88.3
T-2154	10,800	20,652	762	19,890	6.5	73.0
T-2155	330	1,082	148	934	6.5	48.6
T-2156	128	500	44	456	6.9	87.3

T-2151	9. Effluent from barrel potato wash	}	Composite 1:00 pm to 3:00 pm)
T-2152	10. Barrel wash effluent after caustic rinse			
T-2153	11. Steady flow rinse after cutter	})) Chip Line
T-2154	12. Hot water batch - 2nd after cutter			
T-2155	13. Cooling rinse after hot bath	}	Composite 1:00 pm to 3:00 pm)
T-2156	14. Effluent from 2nd cooling bath			

DOMINION FARM PRODUCE LIMITED

On August 3, 1966, the vegetable washing plant of Dominion Farm Produce Limited was inspected. Mr. M. Cohen, Manager, was interviewed.

DETAILS OF SURVEY

Personnel

Dominion Farm Produce - Mr. M. Cohen, Manager
Limited

OWRC - Mr. L. Fitz
- Mr. G. Grosse

DESCRIPTION OF PLANT AND PROCESS

This plant washes potatoes, parsnips, celery, and carrots. The carrots, potatoes, and parsnips are washed in rotary barrel spray washers. The effluents discharge through basket-type removal floor screens after passing through portable wooden screened boxes (20 cubic feet). The celery is washed in a conventional re-circulating spray washer.

OPERATING DATA

Hours per day -9
Days per week -5 1/2
Number of Employees -15 -35

WATER CONSUMPTION

<u>1966</u>	<u>Gallons per Day</u>	<u>1966</u>	<u>Gallons per Day</u>
January	16,700	July	2,800
February	16,700	August	2,800
March	9,400	September (1965)	7,300
April	9,400	October	7,300
May	1,400	November	12,600
June	1,400	December	12,600

PRODUCTION DATA

<u>MONTH</u>	<u>IMPORTED CARROTS</u>	<u>LOCAL CARROTS</u>	<u>POTATOES</u>	<u>PARSNIPS</u>	<u>CELERY</u>
Jan. (66)	-	708,873	-	13,240	-
Feb.	-	890,159	-	29,460	-
March	-	951,041	-	7,680	-
April	-	-	-	4,860	-
May (65)	120,944	-	-	-	-
June	301,482	-	-	-	-
July	187,931	126,119	-	-	12,200
August	-	498,950	20,550	2,060	89,960
Sept.	-	438,624	96,600	2,060	64,000
Oct.	-	403,132	33,800	8,160	-
Nov.	-	659,973	2,350	5,500	-
Dec.	-	910,913	-	8,680	-

SOURCES OF LIQUID WASTE AND DISPOSAL

The main sources of waste are the carrot washer, potato washer and celery washer. The effluent from the carrot washer enters a twenty cubic foot screened box. This box discharges to a two-compartment septic tank via a basket-type floor drain. The waste from the potato washer is handled in a similar manner. The celery washer re-circulation tank is

discharged once per day to the same septic tank via a basket-type floor screen.

All sanitary wastes enter the same septic tank and the effluent from this tank is discharged to the municipal sanitary system.

The waste loading throughout the year varies as in figure III.



DOMINION FARM PRODUCE LIMITED.

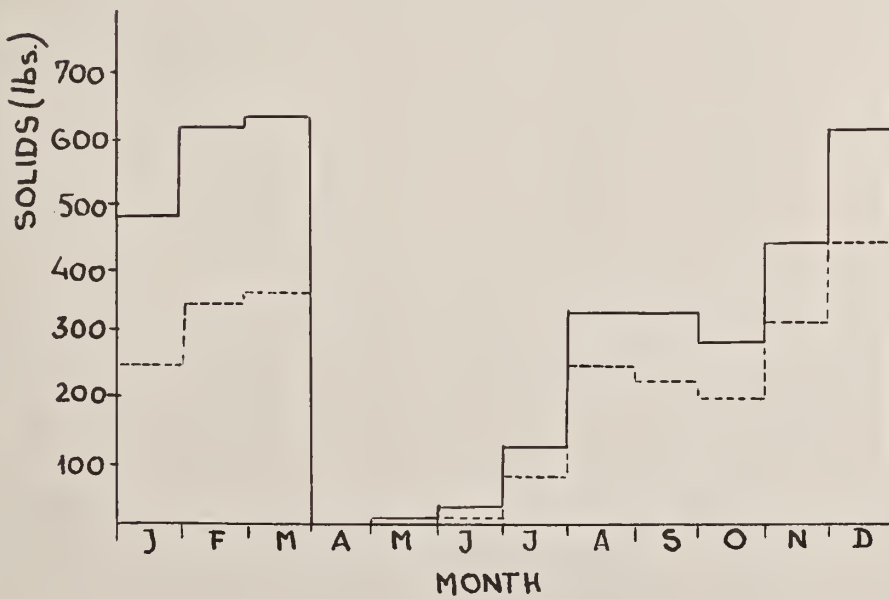
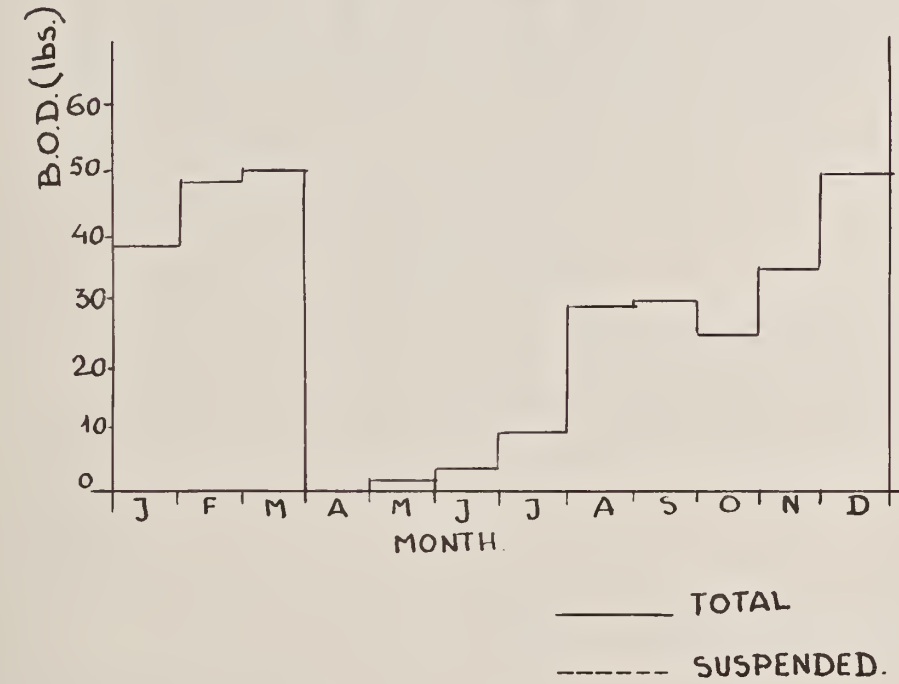


FIG. III. WASTE LOADINGS PER MONTH (lbs.)

SAMPLING AND ANALYSIS

On August 3, 1966 equal aliquots were taken from the following streams each hour from 10:30 am to 12:00 am and were combined to give composite samples representing the average waste flow characteristics.

- (a) Effluent from screened box on carrot wash
- (b) Effluent to septic tank
- (c) Effluent to sanitary sewer

A grab sample of the celery wash re-circulation tank was also taken at 3:00 pm. During the sampling period, carrots and celery were being washed.

WASTE LOADINGS

<u>Stream</u>	<u>BOD</u>	<u>Total Solids</u>	<u>Suspended Solids</u>
Effluent to sanitary sewer (lb/day) on August 4, 1966	1.1	21.7	9.4
<hr/>			
Loading lb/10,000 lbs. carrots to sewer *	.53	6.7	4.9
<hr/>			
Loading per 10,000 lbs. Potatoes to septic tank **	2.08	12.5	7.85
<hr/>			

* Based on production figures from Mr. Cohen, water figures from P. U. C. and samples taken on August 3, 1966, when only carrots and celery were being washed.

** Data taken from another report.

ASSUMPTIONS

- (a) Parsnip and carrot loadings similar
- (b) Celery and bunch carrot loadings negligible in comparison to carrots and parsnips

- (c) Loadings for imported carrots 25% of domestic carrots
- (d) Septic tank operates as efficiently under heavier load
- (e) Portable box screen on potato washer has no effect

DISCUSSION

During the inspection, the septic tank system was operating efficiently and was reducing the BOD by 72% and suspended solids by 74%. The basket-type floor screens and portable wood box screens appeared to be well maintained and operating satisfactorily.

The final effluent to the sanitary sewer met OWRC objectives for discharge to a sanitary system in terms of BOD, suspended solids and pH.

CONCLUSIONS

The effluent from this plant appeared to be satisfactory for discharge to the sanitary system.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported
in ppm unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: Dominion Farm Produce Company Limited

Date Sampled: August 3, 1966 by: L. Fitz

Lab. No.	Solids			pH at Lab.	BOD	Volatile Solids %
	Total	Susp.	Diss.			
T-2159	2,192	1,828	364	6.7	130	75%
T-2160	1,766	1,300	466	7.0	140	67%
T-2161	662	286	376	7.2	46	44%
T-2162	776	336	440	7.2	39	75.5%

- T-2159 1. Effluent from carrot wash after screening
Composite 10:30 am to 12:00 am
- T-2160 2. Effluent to settling tanks
Composite 10:30 am to 12:00 am
- T-2161 3. Grab at 3:00 pm of celery wash effluent
- T-2162 4. Effluent from tanks to sanitary sewer
Composite 10:30 am to 12:00 am
-

ONTARIO FARM PRODUCE COMPANY LIMITED

On August 3, 1966, the vegetable washing plant of Ontario Produce Company, Limited, was inspected. Mr. G. Henderson, Manager, was interviewed.

DETAILS OF SURVEY

Personnel

Ontario Farm Produce Company Limited - Mr. G. Henderson, Manager
Ontario Water Resources Commission - Mr. G. Grosse
- Mr. L. Fitz

DESCRIPTION OF PLANT AND PROCESS

This plant washes carrots, celery, parsnips, beets, and intends to wash potatoes in the future. The celery washer is of the re-circulating spray type and is discharged once per day. Carrots, beets and parsnips are washed in a drum bath (which is dumped twice daily) and are rinsed with a continuous fresh water spray. The carrots are then sorted, graded and packed for market.

Operating Data

Hours per day - 7
Days per week - 5
Employees - 25

Water Consumption

<u>1966</u>	<u>Gallons Per Day</u>	<u>1965</u>	<u>Gallons Per Day</u>
January	20,800	July	NOT IN
February	20,800	August	OPERATION
March	12,800	September	10,800
April	12,800	October	10,800
May	3,900	November	19,700
June	3,900	December	19,700

STATE OF NEW YORK

IN SENATE
January 15, 1911.

REPORT

OF

THE COMMISSIONERS OF THE LAND OFFICE

IN ANSWER TO A RESOLUTION PASSED BY THE SENATE

APRIL 1, 1909.

ALBANY:

1911.

WHELAN

PRINTED BY THE STATE PRINTING OFFICE.

ALBANY, N. Y., 1911.

REPORT

OF

THE COMMISSIONERS OF THE LAND OFFICE

IN ANSWER TO A RESOLUTION PASSED BY THE SENATE

APRIL 1, 1909.

ALBANY:

WHELAN

Production Data

The following production data was obtained from Mr. G. Henderson:

1. August 1, 1966 - 4,500 bushels of local carrots being processed.
2. Peak period - September and October
3. Operating period - July to March

The plant also washes celery, parsnips, and beets.

Sources of Liquid Waste and Disposal

The major source of waste is the barrel dump from the carrot, parsnip and beet wash and the continuous spray over the washed carrots. Of lesser importance is the celery batch dump of re-circulated water, and the domestic wastes. All wastes discharge to the sanitary sewer via a two-compartment septic tank. The septic tank is cleaned twice per month.

WASTE LOADINGS (lb/day)

This was calculated using the results of the composite sampling program plus the analyses of the grab samples from the batch washes.

<u>Stream</u>	<u>BOD</u>	<u>Suspended Solids</u>	<u>Total Solids</u>
Effluent to sanitary sewer	5.6	15.8	52.7

Since the weekly production volume does not change significantly from month to month, these figures should be representative of waste loadings from July to March. For the period April to June, the quantity of waste would be negligible.

DISCUSSION OF FINDINGS

During the composite sampling period, the batch carrot wash and re-circulated celery wash were not dumped. (They were sampled separately). Thus the major effluents were from the spray wash on the carrot line, domestic waste and spillage from the celery washing operation. Since the major contributor, the spray carrot wash, only had a BOD of 48, while the total effluent had a BOD of 82, it is believed that the septic tank was not operating efficiently.

The final effluent, when the batch washes were not being dumped to the sanitary sewer, met OWRC objectives in terms of BOD, suspended solids and pH level. As the batch discharges occur infrequently (once or twice per day) and are of small volume, they should not constitute a significant loading to the municipal treatment system and thus the septic tank effluent should remain satisfactory for discharge to the sanitary system.

CONCLUSIONS

The plant effluent appeared to be acceptable for continued discharge to the sanitary sewer.

It is possible that the septic tank should be cleaned on a more regular basis to ensure efficient BOD removal.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported
in ppm unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: Ontario Produce

Date Sampled: August 3, 1966 by: L. Fitz

Lab. No.	5-Day BOD	Solids			pH at Lab.	% Volatile Solids
		Total	Susp.	Diss.		
T-2163	48	594	242	352	7.3	66
T-2164	640	11,140	9,232	1,908	6.7	82.5
T-2165	42	658	182	476	7.3	35
T-2166	82	754	226	528	7.1	52.5

- T-2163 1. Spray wash on carrot line - composite 1:15 to 3:00 pm
- T-2164 2. Grab at 2:00 pm from batch carrot wash
- T-2165 3. Grab at 3:00 pm from re-circulated celery wash
- T-2166 4. Effluent from settling tank to sanitary sewer - composite
1:15 pm to 3:00 pm

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W. A. FULLER AND SON LIMITED

The vegetable washing plant of W. A. Fuller and Son Limited was inspected on August 17, 1966. The proprietor, Mr. W. A. Fuller, was interviewed.

DETAILS OF SURVEY

Personnel

W. A. Fuller and Son Limited - Mr. W. A. Fuller, Proprietor
Ontario Water Resources - Mr. J. Bakker
Commission - Mr. L. Fitz

Description of Process

This plant is engaged in the washing, waxing and packaging of turnips. The turnips, trucked from nearby farms, are washed in a barrel-type, non-re-circulating rotary washer with a fresh water spray. The turnips are then dipped in molten wax for coating and are packaged when the coating is dry.

Operating Data

Employees - 8 - 15
Operating Schedule - hours per day - 2 (washing period)
- days per week - 5
- months per year - 10
Water Consumption - 250,000 gallons per year
- 1,130 gallons per day
Production Volume - 350 bushels per day (middle of August
to middle of May)

Sources of Liquid Waste and Disposal

The only source of liquid waste originated from the fresh water

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spray on the vegetable washer. This waste is discharged to a storm sewer via a screened floor drain and a settling tank. There were no sanitary facilities.

Sampling and Analysis

At the time of the visit, a grab sample was taken of the total plant effluent to the storm ditch. During the sampling period, (2:30 pm on August 17, 1966) the vegetable washer was in operation.

The results of the analysis were as follows:

<u>Sample</u>	<u>Solids</u>			BOD	% Volatile Solids
	<u>Total</u>	<u>Susp.</u>	<u>Diss.</u>		
Total plant effluent to storm sewer	1,492	1,164	328	110	34

WASTE LOADINGS (lbs/day)

<u>Stream</u>	<u>BOD</u>	<u>Total Solids</u>	<u>Suspended Solids</u>	<u>Organic Solids</u>
Effluent to storm sewer	1.24	16.9	13.1	5.75
Loadings (1b/1,000 bushel) of turnips	3.5	48.5	37.4	16.5

DISCUSSION OF FINDINGS

The total plant effluent exceeded OWRC objectives for discharge to a watercourse in terms of BOD and suspended solids. The high BOD was probably caused by organic material in the soil and vegetable particles in the wash water. At the time of the inspection, the settling tank was filled with silt, thus allowing for little settling, and accounting for the high suspended solids content in the effluent.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported
in ppm unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: W. A. Fuller and Son

Date Sampled: August 17, 1966

by: L. Fitz, J. Bakker

Lab. No.	5-Day BOD	Solids			% Volatile Solids
		Total	Susp.	Diss.	
T-2240	110	1,492	1,164	328	34. %

T-2240 1. Grab of plant effluent to storm sewer at 2:30 pm

CONCLUSIONS AND RECOMMENDATIONS

At the time of this survey, the plant effluent was totally unacceptable for discharge to a storm sewer.

The settling tank should be cleaned more regularly to provide better treatment of the plant wastes. Once the majority of the suspended solids has been removed, the treated effluent should be directed to the sanitary system for final treatment.

L. and L. GARDENS LIMITED

The vegetable washing plant of L. and L. Gardens Limited was inspected on August 4, 1966. The proprietor, Mr. L. Tosca, was interviewed.

DETAILS OF SURVEY

Personnel

L. and L. Gardens Limited	-Mr. L. Tosca, Owner
Ontario Water Resources Commission	-Mr. G. Grosse -Mr. L. Fitz
Operating Data	-Employees - 5 -8 hours per day, 5 days per week

WATER CONSUMPTION

<u>1966</u>	<u>Gallons per Day</u>	<u>1966</u>	<u>Gallons per Day</u>
January	4,100	July	1,600
February	4,100	August	1,600
March	570	September (1965)	3,600
April	570	October	3,600
May	570	November	3,200
June	570	December	3,200

PRODUCTION VOLUME

MONTH	LOCAL CARROTS (bushels)	PARSNIPS (bushels)	CELERY (cases)	BUNCH CARROTS (cases)
January	2,500	200	-	-
February	2,500	200	-	-
March	2,500	200	-	-
April	-	-	-	-
May	-	-	-	-
June	-	-	-	-
July	1,000	-	500	1,000
August	1,000	-	500	1,000
September	2,000	-	-	-
October	2,500	-	-	-
November	2,500	200	-	-
December	2,500	200	-	-

Description of Process

In this plant, carrots and parsnips are all washed on the same line using the typical barrel type washer. The washed vegetables are sorted, weighed and packaged. The bunch carrots and celery are washed on a belt with a high-pressure spray. The spray water is collected in a tank and re-circulated. These vegetables are packaged in crates.

Sources and Disposal of Liquid Wastes

There are three sources of waste in this plant:

- a) Washrooms

b) Barrel type washer

c) Belt washer

The washroom effluent discharges directly to the sanitary sewer. The continuous effluent from the barrel type washer discharges to the sanitary sewer via a basket type floor drain and a two-compartment septic tank. Once per day the belt washer tank is discharged into the same basket trap and septic tank. The septic tank is pumped out three times per month.

Sampling and Analysis

On August 4, 1966, the following composite samples were obtained:

a) Effluent to septic tank system

b) Effluent to sanitary sewer

Equal aliquots were taken at 1:15 pm and 2:15 pm and combined to obtain the composite samples. The samples were analysed in the OWRC laboratory in accordance with procedures described in "Standard Methods for the Examination of Water and Waste Water", Twelfth Edition.

WASTE LOADINGS *

<u>Stream</u>	<u>BOD</u>	<u>Suspended Solids</u>	<u>Total Solids</u>
Effluent from plant to septic tank (lb/day)	3.6	13.9	20.7
Effluent from tank to sanitary sewer (lb/day)	1.3	3.5	9.9
Loading (lbs.) to sewer per 1,000 lbs. of carrots or equivalent	.57	1.54	4.35

* Based on production figures from Mr. Tosca, water figures from P.U.C. and samples taken on August 4 when only the carrot washer was in operation.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in ppm
unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: L. and L. Gardens

Date Sampled: August 4, 1966 by: L. Fitz

Lab. No.	Solids			pH at Lab.	BOD	% Volatile Solids
	Total	Susp.	Diss.			
T-2170	1,296	866	430	7.8	225	68.7
T-2171	622	220	402	6.5	84	49.8

T-2170 1. Effluent from plant to tank system

T-2171 2. Effluent from trap to sanitary sewer

Both (Composite 1:15 pm - 2:15 pm)

L & L GARDENS LIMITED.

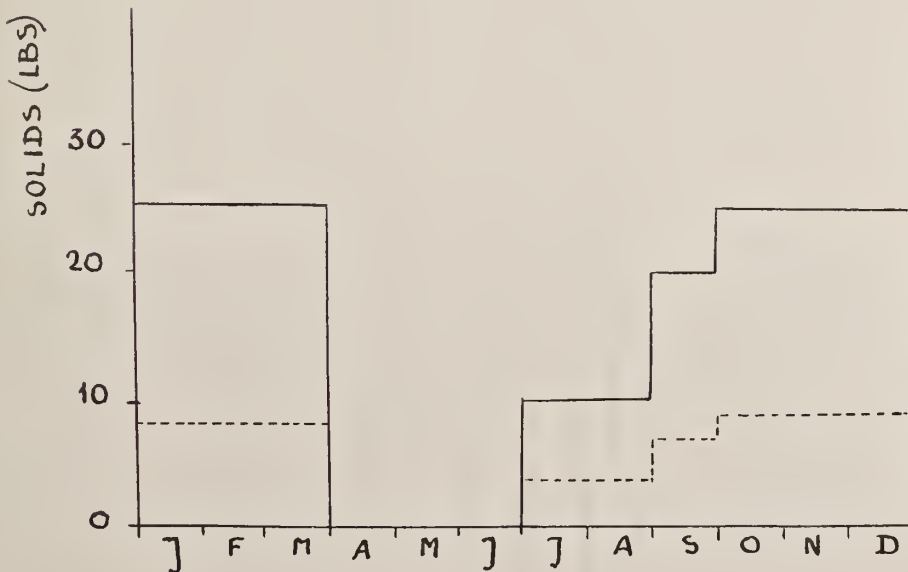


FIG. IV WASTE LOADING TO SANITARY SYSTEM(lbs)

Assumptions

- (a) Parsnip and carrot loadings are similar
- (b) Celery and bunch carrot loadings are negligible in comparison to carrot and parsnip loadings

DISCUSSION OF RESULTS

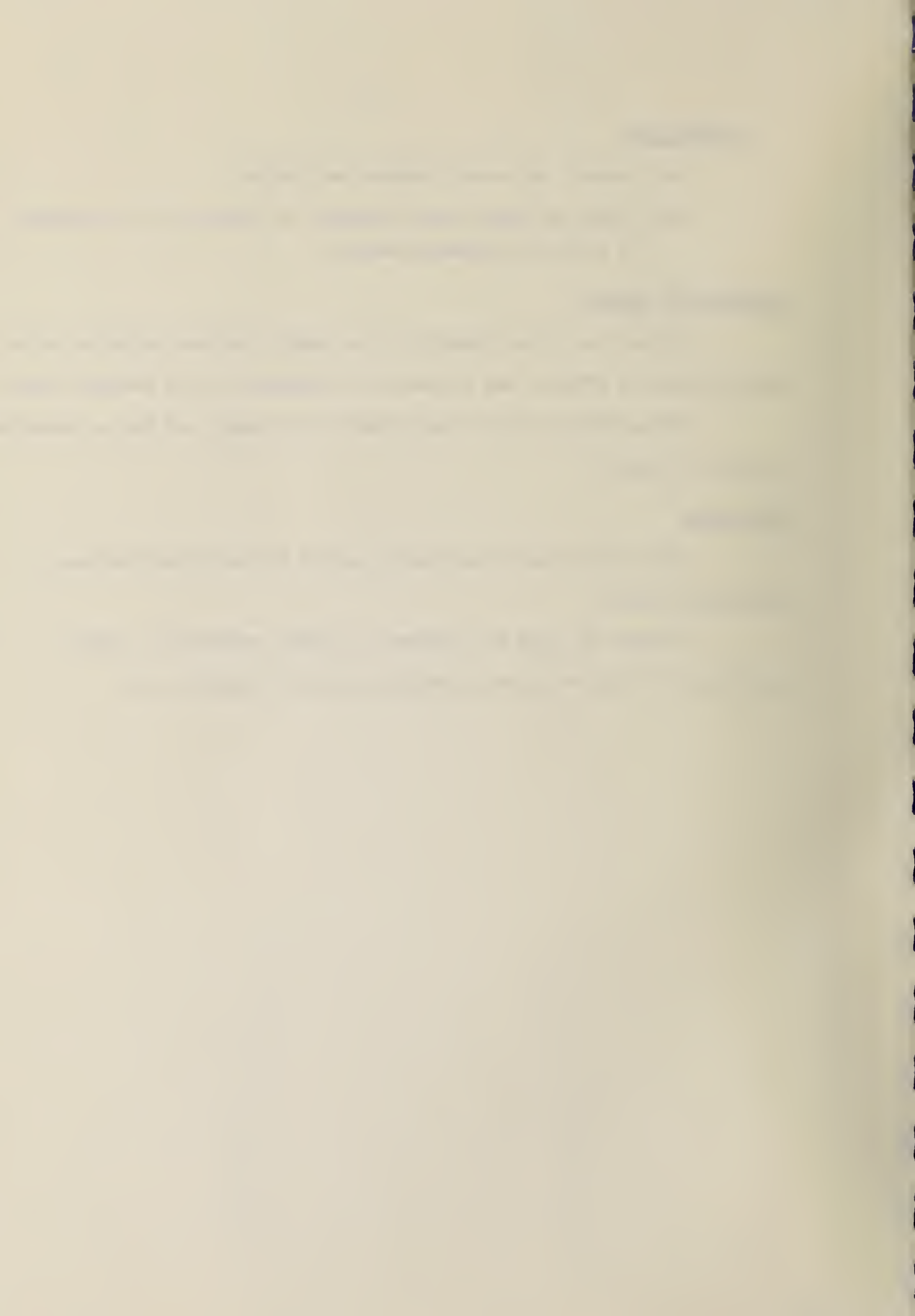
At the time of the inspection, the septic tank was operating satisfactorily and the effluent was acceptable for discharge to the sanitary sewer.

The basket type floor trap seemed to be plugged and was not operating at peak efficiency.

CONCLUSIONS

The effluent was of acceptable quality for continued discharge to the sanitary sewer.

In order to allow the effluent to remain satisfactory, proper operation of the floor screen and septic tank must be carried out.



UNITED FARMS LIMITED

On August 17, 1966, the vegetable washing plant of United Farms Company Limited was inspected. Mr. E. Delzotto, Plant Supervisor, was interviewed and he conducted a tour of the plant as well as a discussion of waste disposal facilities.

DETAILS OF SURVEY

Personnel

United Farms Limited	- Mr. E. Delzotto, Plant Supervisor
Ontario Water Resources Commission	- Mr. L. Fitz
	- Mr. G. Grosse

Description of Plant and Process

This plant contains the following washers:

- 1) Two carrot washers, each consisting of a rotating drum, with spray, which discharges to the main sewer
- 2) One potato washer, consisting of a drum rotating in a tank with a constant water overflow
- 3) A celery and bunch carrot washer consisting of a tank with a re-circulated pressure spray

The vegetables are washed, sorted and packaged for shipment.

Operating Data

Number of Employees	- 35 - 70
Hours per day	- 9
Days per week	- 5 1/2

DECLARATION

I, the undersigned, do hereby declare that the above is a true and correct copy of the original as submitted to me by the applicant.

Signature

Date

Witnessed by me, the undersigned, on this _____ day of _____ 20____.

Signature

Name

I, the undersigned, do hereby declare that the above is a true and correct copy of the original as submitted to me by the applicant.

Witnessed by me, the undersigned, on this _____ day of _____ 20____.

Signature

Name

I, the undersigned, do hereby declare that the above is a true and correct copy of the original as submitted to me by the applicant.

Signature

Date

Witnessed by me, the undersigned, on this _____ day of _____ 20____.

Water Consumption

<u>1966</u>	<u>Gallons per Day</u>	<u>1965</u>	<u>Gallons per Day</u>
January	29,000	July	3,400
February	29,000	August	3,400
March	21,600	September	32,900
April	21,600	October	32,900
May	6,100	November	27,900
June	6,100	December	27,900

Production Data (lb/month)

<u>1966</u>	<u>CARROTS</u>	<u>PARSNIPS</u>	<u>POTATOES</u>
January	600,000	4,300	5,000
February	600,000	4,300	5,000
March	600,000	4,300	5,000
April	-	4,300	-
May	-	4,300	-
June	-	-	-
July	-	-	-
August (1965)	600,000	4,300	5,000
September	600,000	4,300	5,000
October	600,000	4,300	5,000
November	600,000	4,300	5,000
December	600,000	4,300	5,000

Production figures obtained from the company indicate that the same quantity of vegetables is washed each day throughout the operating season.

Sources of Liquid Waste and Disposal

All waste water from the vegetable washers enters a common sewer which discharges to a six-compartment settling tank at the rear of the property. The effluent from the tank discharges to an open ditch.

The sanitary wastes are directed to the municipal sanitary system.

Sampling and Analysis

On August 17, 1966, the following grab samples were obtained from various streams in the plant:

- 1) Re-circulated bunch carrot wash water - 1:12 pm
- 2) Potato wash water tank effluent - 1:10 pm
- 3) Spray effluent from carrot washer - 1:10 pm
- 4) Re-circulated bunch carrot wash water - 1:50 pm
- 5) Discharge to settling tank - 2:00 pm
- 6) Effluent from settling tank - 2:00 pm

All samples were submitted to the OWRC laboratory for analysis in accordance with procedures in "Standard Methods for the Examination of Water and Waste Water", Twelfth Edition.

WASTE LOADINGS

<u>Stream</u>	<u>BOD (lb/day)</u>	<u>Suspended Solids (lb/day)</u>
Flow to settling tank	2.5	43.6
Effluent from settling tank	1.35	4.0
Percent reduction	46%	91%

During the inspection, the carrot washer, potato washer and bunch carrot washer were in operation. Since it was not possible to determine flow

rates, individual loadings for each vegetable operation could not be obtained. Production figures indicate that this was a typical processing day. The production is the same each day from August 1, to March 31.

DISCUSSION OF FINDINGS

The analytical results indicate that the settling basin was operating efficiently. It should be noted, however, that the settling tank had been cleaned just before the inspection. Thus the results of the investigation are better than would normally be expected.

It was evident that, at the time of the visit, no in-plant screening of the wastes was being employed.

CONCLUSIONS AND RECOMMENDATIONS

The plant effluent was not satisfactory for discharge to a watercourse. However, the settling tank lowered the suspended solids concentration to a level acceptable for discharge to the sanitary system.

The following changes should be made:

- (1) Additional in-plant screening of the wastes should be provided.
- (2) The in-plant screens and the sedimentation basin should be properly maintained.
- (3) The effluent from the sedimentation basin should be directed to the municipal sanitary system.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in
ppm unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: United Farms

Date Sampled: August 17, 1966 by: L. Fitz, J. Bakker

Lab. No.	5-Day BOD	Solids			% Volatile Solids
		Total	Susp.	Diss.	
T-2241	22	402	100	302	35.4
T-2242	115	828	464	364	55.3
T-2243	60	612	290	322	53.3
T-2244	46	886	524	362	60.7
T-2245	74	1,776	1,282	494	72.0
T-2246	40	440	118	322	42.3

T-2241 1. Bunch carrot wash - grab at 1:12 pm

T-2242 2. Grab from potato wash at 1:10 pm

T-2243 3. Grab from carrot wash 1:10 pm

T-2244 4. Grab of bunch carrot wash at 1:50 pm

T-2245 5. Grab of flow to settling tank at 2:00 pm

T-2246 6. Grab of effluent from settling tank at 2:00 pm

INTERNATIONAL FRUIT DISTRIBUTING LIMITED

On August 4, 1966, an inspection visit was made to the International Fruit Distributors Limited. The plant manager, Mr. W. Scholl, was interviewed.

DETAILS OF SURVEY

Personnel

International Fruit Distributors - Mr. W. Scholl, Manager
Limited
Ontario Water Resources - Mr. L. Fitz
Commission - Mr. G. Grosse

Description of Process

This plant is engaged in the washing of fresh vegetables. The carrot washer is a rotating drum type with sprays the entire length of the drum. The carrots are washed, sorted, weighed, and packaged for sale. The celery washer is the re-circulating spray type with a constant overflow. The celery is removed from wood boxes, washed and immediately packed in waxed cardboard boxes.

The plant also has facilities for washing beets, parsnips, potatoes, and turnips.

Operating Data

Number of Employees - 8 - 35
Hours per day - 9
Days per week - 5 1/2

Production Volume - Pounds Per Month

1966	CARROTS	CELERY	PARSNIPS	TURNIPS	BEETS	POTATOES
January	205,599	-	11,633	64,550	9,894	6,500
February	140,360	-	6,746	41,250	3,790	-
March	134,240	-	10,092	65,500	2,102	100
April	85,153	-	4,530	7,200	-	15,050
May	88,890	-	4,127	20,000	-	5,900
June	68,950	-	240	250	-	5,000
July	114,735	43,950	432	-	-	61,350
Aug. (65)	263,660	206,800	6,994	22,930	9,740	1,450
September	264,917	115,650	8,606	20,750	22,723	5,950
October	240,000	34,650	16,870	50,500	27,654	63,150
November	312,032	-	22,622	44,600	26,767	4,900
December	196,023	-	7,083	63,750	10,748	9,550

Water Consumption

<u>1966</u>	<u>Gallons per Day</u>	<u>1966</u>	<u>Gallons per Day</u>
January	15,000	July	11,800
February	15,000	August	11,800
March	2,270	September (65)	25,700
April	2,270	October	25,700
May	4,400	November	13,800
June	4,400	December	13,800

INTERNATIONAL FRUIT DIST. LTD.

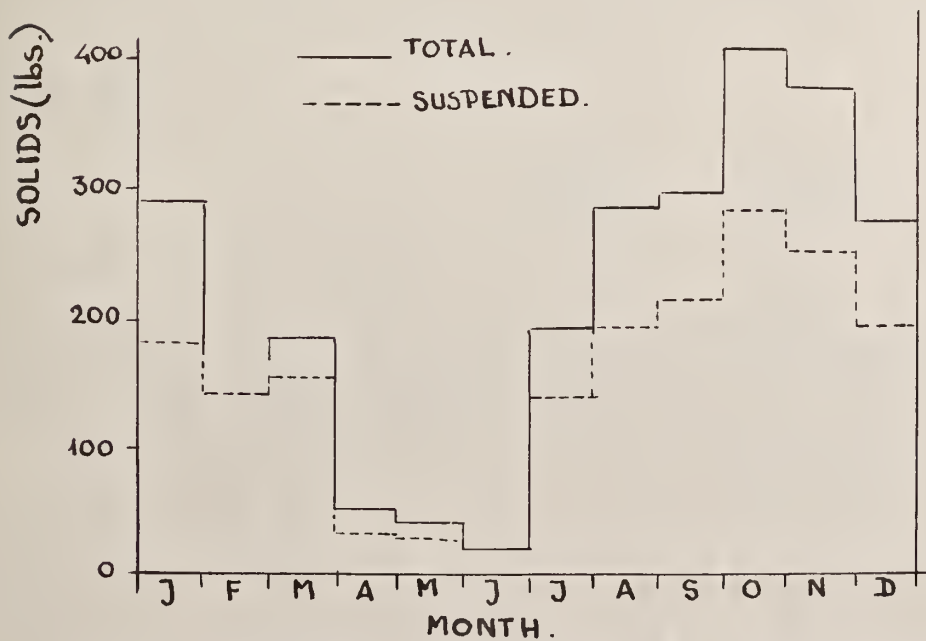
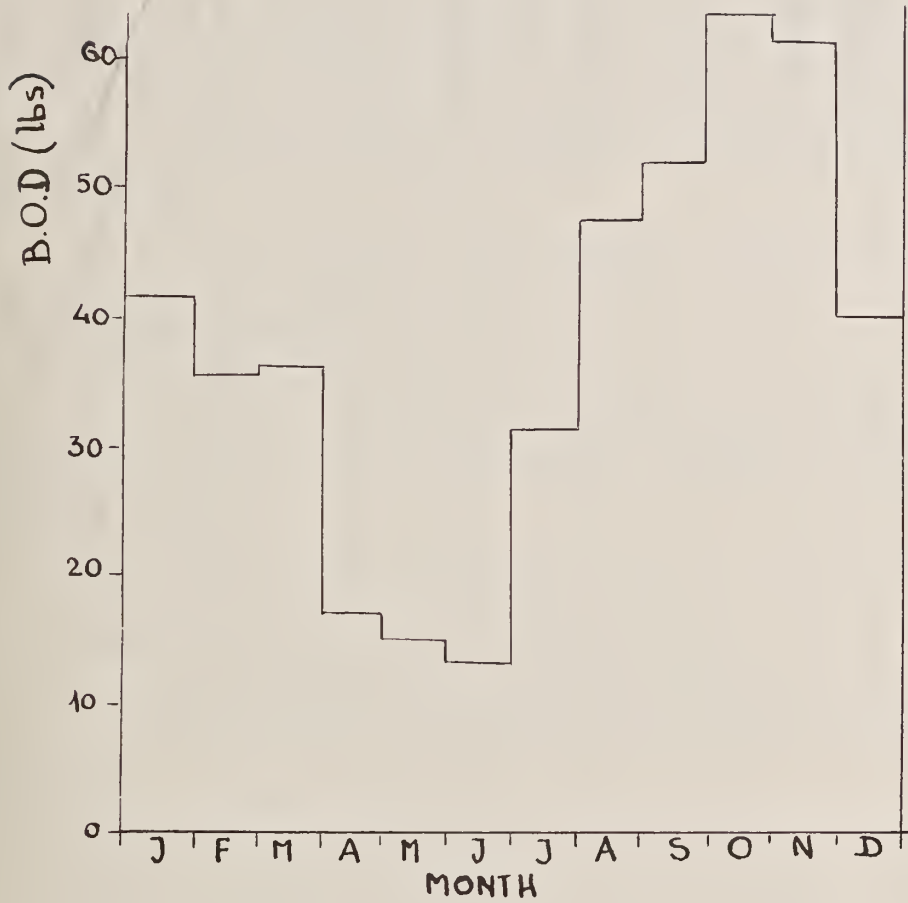


FIG. V. WASTE LOADINGS TO DITCH (lbs.)

Sources and Disposal of Liquid Waste

The main sources of liquid waste are the vegetable washers and the sanitary facilities. Sanitary wastes are directed through a septic tank to a tile field. All water used in the vegetable washers discharges to a ditch behind the plant.

There are no process waste treatment facilities at this plant.

Sampling and Analysis

Equal aliquots taken at half hourly-intervals from 10:30 am to 12:00 am were combined to form representative composite samples of the following streams:

- 1) Total plant effluent to ditch
- 2) Effluent from barrel washer on carrot line

A grab sample was also taken of the celery wash constant overflow at 10:30 am.

All samples were submitted to the OWRC laboratory for analysis in accordance with procedures outlined in "Standard Methods for the Examination of Water and Waste Water", Twelfth Edition.

WASTE LOADINGS

<u>Stream</u>	<u>BOD (lb/day)</u>	<u>Total Solids (lb/day)</u>	<u>Suspended Solids (lb/day)</u>
Total plant effluent to ditch *	8.2	140.0	86.0

* Based on sample taken on August 4, 1966.

PRODUCE WASTE LOADINGS (lb)

<u>Product</u>	<u>BOD</u>	<u>Total Solids</u>	<u>Suspended Solids</u>
Loading per 10,000 lb carrot *	1.58	9.10	6.10
Loading per 10,000 lb turnip **	0.64	8.8	6.8
Loading per 10,000 lb potato ***	2.08	12.5	7.85

* Data taken from a carrot washing plant with no treatment.

** Data from a turnip washing plant.

*** Data from a potato washing plant.

ASSUMPTIONS

- 1) Celery waste loadings negligible
- 2) Carrot and parsnip waste loadings similar
- 3) Beet and potato waste loadings similar
- 4) Carrots for April to July are imported and have 25% of normal local carrot loadings.

DISCUSSION OF FINDINGS

It is apparent from the analytical results that the total plant effluent to the ditch exceeded OWRC objectives in terms of suspended solids (15 ppm) and BOD (15 ppm).

It may be noted that a discrepancy exists between waste loadings calculated for August 4, using the sample results, and those using monthly average. This discrepancy is attributable to the following factors:

- 1) Variation of daily production through month (local carrot season just starting).
- 2) Variability of waste flow characteristics through an operating day.

- 3) Data used in calculating waste loadings in pounds per month, assumed the use of floor screens which would reduce loading figures. Thus, the waste loadings calculated in pounds per month is less than the corresponding loadings calculated using the sample results taken on August 4, 1966.

CONCLUSIONS AND RECOMMENDATIONS

This company employs no in-plant screening or sedimentation facilities for the waste flows. The effluent exceeded OWRC objectives of 15 ppm suspended solids (728 ppm) and 15 ppm BOD (69 ppm).

The following modifications should be carried out:

- 1) Screening and sedimentation facilities should be installed.
- 2) The pre-treated effluent should be discharged to the municipal sanitary system.

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in
ppm unless otherwise indicated

1 ppm = 1 mgm/litre
= 1 lb/100,000 Imp. Gals.

Municipality: Bradford

Source: International Fruit Distributors

Date Sampled: August 4, 1966 by: L. Fitz

Lab. No.	Solids			pH at Lab.	BOD	% of Volatile Solids
	Total	Susp.	Diss.			
T-2167	1,186	728	458	7.1	69	68%
T-2168	2,414	1,948	466	7.4	210	76.5 %
T-2169	426	87	339	7.9	4.0	35.2 %

T-2167 1. Total plant effluent to ditch - Composite 10:30 am to noon

T-2168 2. Effluent from barrel wash - carrot line - Composite 10:30 am to
12:00 noon

T-2169 3. Grab at 10:30 am of celery wash

BAILEY RIVER GARDENS
LIMITED

On August 17, 1966, an inspection visit was made to the Bailey River Gardens Limited, vegetable washing plant. The Plant Manager, Mr. G. Orrigo, was interviewed.

DETAILS OF SURVEY

Personnel

Bailey River Gardens Limited	- Mr. L. Cogo, Foreman
	- Mr. G. Orrigo, Manager
Ontario Water Resources Commission	- Mr. L. Fitz
	- Mr. J. Bakker

DESCRIPTION OF PROCESS

The one washing system in this plant consists of a barrel washer followed by spray washing. The rotating barrel washer is supported in a water-filled tank which is discharged once per day. The vegetables pass through a re-circulated water spray after tumbling through the barrel.

During the inspection, the barrel washer was not in operation and carrots were being washed by the spray.

Production and Operating Data

This washer was being used periodically. Mr. Orrigo estimated that the maximum production would be 1,200 bushels of carrots per month.

There were no water records available which could be used to estimate daily water consumption.

Sources of Liquid Waste and Disposal

The sanitary wastes are treated in a septic tank and tile field.

The periodic discharges of the re-circulated spray and barrel washers are directed to the river via a pipe line.

Sampling and Analysis

During the inspection, the operators were in the process of starting the wash line. Samples taken at that time would not have been representative of actual waste flow characteristics expected during normal operation. Thus, no samples were obtained.

CONCLUSIONS AND RECOMMENDATIONS

Although no samples were taken, it may be assumed from other similar type plants that the waste flow to the river would exceed OWRC objectives in terms of BOD and suspended solids.

The following changes should be made:

- 1) In-plant screening and settling facilities should be provided for the waste flow.
- 2) The clarified effluent should be discharged to the municipal sanitary system.

ONTARIO WATER RESOURCES COMMISSION.
DIVISION OF INDUSTRIAL WASTES.
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