THE
ONTARIO WATER RESOURCES
COMMISSION

INDUSTRIAL WASTE
SURVEY

CITY OF WINDSOR

1960

58-178

ONTARIO WATER RESOURCES COMMISSION

Date July 6, 1961

To: Mr. K. S. Symons

From: Dr. A. E. Berry

Re: Industrial Waste Survey - Windsor

____ Please see me.

____ Please prepare reply for my signature.

____ Please reply to attached, copy to me.

____ Please note and file ( ) or return ( ).

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____ For your comments in form of report ( ); memo ( ).

____ For field inspection and report.

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____ For further action.

_✓_ For your information and filing.

INDUSTRIAL WASTES SURVEY

CITY OF WINDSOR

1960

A Report on the investigation of wastewaters discharged by industries in the city of Windsor to the municipal sewers and natural watercourses.

by

F. J. Dart, A. J. Harris, R.C. Stewart

Industrial Wastes Branch

ONTARIO WATER RESOURCES COMMISSION

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INTRODUCTION

An industrial waste survey was conducted in the city of Windsor by the Industrial Waste Branch of the Ontario Water Resources Commission to provide information on quantities and characteristics of industrial waste waters discharged to the municipal sewers - sanitary, storm and combined, or to the natural watercourses within the city boundaries. The information obtained during the survey was considered to be that which would be of use to the city of Windsor Engineering Department in the layout and design of any future works planned for the transportation or treatment of sanitary sewage carrying waste waters from industrial processes. The field work for the survey was carried out between July and November 1960. Assistance and guidance was solicited from the city of Windsor Building Commission, the city of Windsor Department of Works, the Greater Windsor Industrial Commission, Metropolitan Windsor Health Unit and the Windsor Utilities Commission Water Division.

Much of the previous industrial waste work done in the Windsor area by the Ontario Water Resources Commission was field studies for the International Joint Commission, and only those industries involved in contamination or possible contaminations of boundary waters were concerned.

In summary, this survey indicated that the majority of the industrial waste loading can be attributed to relatively few industries. The food and beverage processing industries, including brewing, distilling, and meat packing discharged 80% of the industrial loading of biochemical oxygen demand, and these same industries, plus the automotive plants, discharged 95% of the suspended solids loading. Plating plants and industries

housing metal finishing operations discharged varying amounts of cyanide and heavy metals such as cadmium, copper, chromium, iron, nickel and zinc. If considered in the design of a sewage treatment plant, the normal total effluent from the industries in the city of Windsor should not have a detrimental effect on the operation of such a plant. The industries discharging waste waters directly to natural watercourses such as the Chrysler Corporation, the Ford Motor Co. and Hiram Walker & Sons, should review their disposal practices with a view to reducing the concentrations of contaminating constituents to meet the Objectives for Water Quality in the Province of Ontario, or should segregate the offending streams for discharge to the municipal sanitary sewers when treatment facilities become available.

It is usually accepted that industry should pay an assessment on the cost of treatment based on their relative needs and that in some cases industry must partially treat their process waste waters before discharge to the municipal system, but that the control of the quantity and quality of the waste waters must be according to the requirement of the municipality.

METHOD OF INVESTIGATION AND CONDUCT OF THE SURVEY

The total number of industries located in Windsor was about 400, but many of these may be arbitrarily defined as dry, or ones having no process waste waters requiring treatment. The dry type industries were eliminated from a complete list of the industries by means of consultation with the Assistant Industrial Commissioner and others familiar with the type of operations carried out in Windsor's industrial community. A check was made to locate all wet process industries by means of the volume of municipal water consumed according to the records of the Windsor Utilities Commission Water Department. This method was successful in locating the number of industries which consumed water at a rate beyond the normal requirements for domestic purposes.

The final list of industries contained essentially all the wet process industries, the major industries, all fermentation, food, meat packing, pharmaceutical, chemical industries, any industry involved to any degree in metal finishing operations such as pickling, anodizing or plating, any industry whose waste characteristics were known from past experience to produce a waste water and all those industries of which process facts were unknown.

A map of the city sewerage system was laid out by the survey party using the facilities of the Department of Works. Five ward-by-ward charts of the sewers graphed by the city's engineering staff were used to plot the public sewers on a 2 x 3½ foot street map obtained from the Windsor Utilities Commission Water Department. This combined map, indicating all storm, sanitary and combined sewers within Windsor greatly

facilitated the locating of sewered outfalls from the industries investigated.

The industrial investigations consisted of consultations with management, interviews with operation personnel, inspection of plant operations and waste disposal facilities and the collection, analyses, and flow measurement of waste waters where this was considered necessary. The analyses were performed in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater" Eleventh Edition 1960, at the Laboratory of the Ontario Water Resources Commission in Toronto.

INDUSTRIAL WATER SUPPLY

The industrial water consumption in the city of Windsor is probably in the order of 10 million gallons per day. Although most of the industries obtained their water from the municipal supply, two plants, Ford Motor Co. and Hiram Walker & Sons, pumped water directly from the Detroit River, and two other industries had private wells to supplement their supply of city water. General Foods Ltd. used well water for cooling purposes, and discharged this water, uncontaminated, down an older well. Windsor Packing Co. Ltd. used ground water for industrial purposes, and discharged it to the city sewers.

Of the total industrial water consumption, approximately 60% was obtained from the municipal water supply and the remainder was pumped from the sources mentioned above, but mainly the Detroit River. A rough estimation of the uses for the industrial consumption of 10 million gallons per day indicated 10% for sanitary use, 40% for use in processes, and 50% for cooling purposes.

The water consumption figures used in the individual industrial reports were averaged values for the first 6 months of 1960, obtained from the Windsor Utilities Commission Water Division.

INDUSTRIAL WASTE DISPOSAL

The total industrial waste flow in the city of Windsor was in the same order of magnitude as the industrial water consumption, that is 10 million gallons per day, most of which was discharged during the eight hour day shift. Approximately 40% of these waste waters were discharged to the city sewers, 15% to the Grand Marais Ditch, which is a natural watercourse joining Turkey Creek, a tributary of the Detroit River, and 45% directly to the Detroit River.

Most of the sewers in the city of Windsor were combined sewers, that is they carry storm water and sanitary wastes. The major portion of Ward 1, and the southern portions of Wards 2 and 5 were the only sections of the city equipped with separate storm and sanitary sewers. All combined and sanitary sewers in the city discharged to the Detroit River. The storm sewers in Ward 1 also flowed into the Detroit River. Storm sewers in Ward 2 emptied into the Grand Marais Ditch and in Ward 5 they jointed the combined sewers.

SEWAGE TREATMENT FACILITIES

At the present time the sewerage system in Windsor does not include treatment facilites. The installations include sanitary, storm and combined sewers for sanitary sewage and storm water, and pumping equipment for the transportation of sanitary sewage, industrial waste waters and storm water to the Detroit River or its tributaries, without pretreatment. The majority of the outfalls discharged along the whole lengths of the Detroit River waterfront. The outfalls are of various sizes from 15 inch diameter to ten feet by six feet cross sections, and of approximately 32 outfalls discharging to the Detroit River, one is for sanitary sewage, four are for storm water and twenty eight are for combined sanitary and storm flows. Numerous sanitary sewers, especially in Wards 1, 2 and 5 tie into the combined sewers. In addition, there are two storm sewer outfalls to the Grand Marais Ditch and one to the McKee drain.

A preliminary sewerage report had been prepared by a firm of consulting engineers and from the limited information available at the time of the compiliation of this report, the general picture is thought to be as follows: Parts I and II dealt with the upstream areas including the towns of Tecumseh and Riverside, Sandwich East Township and a very small section of Windsor. Part III concerned the city of Windsor proper, the town of Ojibway and the townships of Sandwich West, South and parts of East. Proposals were made for directing the sewage flow from the Greater Windsor area to a main sewage treatment plant located downstream near the west bonndary of Windsor with a very small proportion being directed upstream to a plant located in the vicinity of the present Riverside sewage treatment plant.

The following is a brief description to outline the activated sludge process and some of the reasons for adequate control of industrial waste waters to ensure a high quality effluent. The process consists of two stages; preliminary and secondary. In primary treatment the raw sewage is settled, and the collected solid are digested biologically. The liquid effluent from the primary stage enters the secondary, an aeration chamber, where it is oxidized biologically, and then settled. The waste activated sludge from the final clarifier is also directed to the digester, while the overflow from the final clarifier is usually chlorinated, and then discharged to a natural watercourse.

The critical processes in activated sludge treatment plants are the biological digestion and oxidation processes. Since these operations are biological, they must be protected from materials detremental to the growth and survival of the microscopic organisms which are responsible for the biological activity in the sewage treatment plant. To insure efficient or adequate sewage treatment, the plant must be protected from materials that are toxic to the biological processes, and also the plant must not be overloaded hydraulically or in oxygen demand. The responsibility of providing protection for the sewage treatment plant falls to the city of Windsor. Once treatment facilities are in operation, sewer ordinances governing the discharge of industrial wastes to city sewers can be enforced to help assure the continuous and efficient operation of the treatment facilities. Information concerning sewer by-laws is available, and a frequently used reference is the "Manual of Practice Number 3, Municipal Sewer Ordinances" recommended by the Water Pollution Control Federation. Many municipalities in the Province of Ontario

have enacted and are enforcing by-laws based on information in this reference. The limits quoted in the individual industrial reports on the concentrations of sewage or industrial waste constituents usually accepted for discharge to municipal sewers, are those that are suggested frequently in municipal sewer ordinances.

INTERPRETATION OF ANALYTICAL RESULTS

The analyses performed on samples collected for this survey are listed below with a brief explanation of each as an aid in interpreting the significance of the analytical results.

Acidity - The acidity of water is usually caused by small amounts of carbonic acid in equilibrium with dissolved carbon dioxide, mineral acids, and salts of strong acids and weak bases. The presence of acidity in fresh domestic sewage indicates an acidic industrial waste discharge.

Alkalinity - Natural waters are usually alkaline because of the presence of bicarbonate, carbonate and hydroxide components. Industrial discharges high in alkalinity can effect the hardness of the receiving stream and deposit calcium carbonate scale in sewers if hydroxide or "caustic" alkalinity is present. Both acidity and alkalinity are reported as ppm calcium carbonate.

Biochemical Oxygen Demand (BOD) - This test indicates the amount of oxygen required to stabilize the decomposible organic matter of a waste in 5-days under standard laboratory conditions at 20°C. The BOD result is the most commonly used indicator for denoting the relative strength or quality of raw or treated sanitary sewage. The BOD aproach to the evaluation of industrial waste is of limited value and might lead to very substantial underdesign of biological treatment processes because of unsuspected loads which do not react to this procedure or which require acclimatization.

Cyanide - Cyanides are not natural components of surface waters, and if they are present industrial pollution is indicated. Cyanides are probably the most toxic components of industrial wastes. It has been reported that fish can not live indefinitely in water containing as little as 0.1 ppm cyanide ion (CN^-). Low concentrations of cyanide in sewers can liberate hydrogen cyanide which would be especially dangerous to sewerage system workers. Because of this health hazard cyanides should be eliminated from industrial discharges.

Grease and Oil - Oil and grease present an offensive condition in surface water, and adversely affect the operation of a sewage treatment plant. They can coagulate, settle and block sewers. Grease and oil are determined as ether solubles.

Hydrogen Ion Concentration (pH) - The pH is the negative logarithm of the hydrogen ion concentration, and is reported in numbers ranging from zero, very acidic, to 14 which is very basic. At 25°C the neutral point is pH 7. Acidity and alkalinity include the buffering action of a sample while the pH gives the instantaneous activity of the hydrogen ion. The optimum pH at which a sewage disposal plant operates efficiently is in the range 7.8 to 8.0.

Iron - The form of iron in a waste depends on other characteristics of the waste. At low values of pH, below the range recommended for discharge to sewers and natural watercourses, the iron is in solution, and if the pH is in the desired range the iron is in suspension and is detected as suspended solids.

Metals - Metals such as copper, nickel, chromium, cadmium and zinc should be limited to low concentrations for discharge to municipal sewers because they are toxic to the biological processes in a sewage treatment plant. They impede either the oxidation or digestion processes, and cause problems in dewatering the sludge.

Phenols - The results are reported as phenol equivalents, and show the gross phenol content including cresols and higher hydroxy derivatives of benzene which react with either Gibbs reagent or 4- aminoantipyrene. Phenol equivalents are recorded in parts per billion, and small amounts are normally acceptable in a biological oxidation type of sewage disposal plant.

OBJECTIVES FOR WATER QUALITY CONTROL IN ONTARIO

Adopted by the Ontario Water Resources Commission

These objectives are for all waters in the Province of Ontario, and it is anticipated that in certain specific instances, influenced by local conditions, more stringent requirements may be found necessary.

General Objectives:

All wastes, including sanitary sewage, storm water, and industrial effluents, shall be in such condition when discharged into any receiving waters that they will not create conditions which will adversely affect the use of these waters for the following purposes; source of domestic water supply, navigation, fish and wild life, bathing, recreation, agriculture and other riparian activities.

In general, adverse conditions are caused by:

(a) Excessive bacterial, physical or chemical contamination.

(b) Unnatural deposits in the stream, interfering with navigation, fish and wild life, bathing, recreation or destruction of aesthetic values.

(c) Toxic substances and materials imparting objectionable tastes and odours to waters used for domestic or industrial purposes.

(d) Floating materials, including oils, grease, garbage, sewage solids, or other refuse.

(e) Discharges causing abnormal temperature, colour or other changes.

Specific Objectives:

In more specific terms, adequate controls of pollution will necessitate the following objectives for:

(a) Sanitary Sewage, Storm Water, and Wastes from Water Craft: Sufficient treatment for adequate removal or reduction of solids, bacteria and chemical constituents which may interfere unreasonably with the use of these waters for the purposes afore-mentioned.

Adequate protection for these waters, except in certain specific instances influenced by local conditions, should be provided if the coliform M.P.N. median value does not exceed 2,400 per 100 Ml. at any point in the waters following initial dilution.

(b) Industrial Wastes:

(1) Chemical Wastes - Phenolic Type

Industrial waste effluents from phenolic hydro-carbon and other chemical plants will cause objectionable tastes or odours in drinking or industrial water supplies and may taint the flesh of fish.

Adequate protection should be provided for these waters if the concentration of phenol or phenolic equivalents does not exceed an average of 2 P.P.B. and a maximum of 5 P.P.B. at any point in these waters following initial dilution. This quality in the receiving waters will probably be attained if plant effluents are limited to 20 P.P.B. of phenol or phenolic equivalents.

Some of the industries producing phenolic wastes are: coke, synthetic resin, oil refining, petroleum cracking, tar, road oil, creosoting, wood distillation, and dye manufacturing plants.

(2) Chemical Wastes, Other than Phenolic:

Adequate protection should be provided if:

(a) The pH of these waters following initial dilution is not less than 6.7 nor more than 8.5. This quality in the receiving waters will probably be attained if plant effluents are adjusted to a pH value within the range of 5.5 and 10.6.

(b) The iron content of these waters following initial dilution does not exceed 0.3 P.P.M. This quality in the receiving waters will probably be attained if plant effluents are limited to 17 P.P.M. of iron in terms of Fe.

(c) The odor-producing substances in the effluent are reduced to a point that following initial dilution with these waters the mixture does not have a threshold odor number in excess of four due to such added material.

(d) Unnatural color and turbidity of the wastes are reduced to a point that these waters will not be offensive in appearance or otherwise unattractive for the aforementioned uses.

(e) Oil and floating solids are reduced to a point such that they will not create fire hazards, coat hulls of water craft, injure fish or wild life or their habitat, or will adversely affect public or private recreational develop-

ment or other legitimate shore line developments or uses. Protection should be provided for these waters if plant effluents or storm water discharges from premises do not contain oils, as determined by extraction in excess of 15 P.P.M., or a sufficient amount to create more than a faint irridescence.

Some of the industries producing chemical wastes other than phenolic are: Oil wells and petroleum refineries, gasoline fillings stations and bulk stations, styrene co-polymer, synthetic pharmaceutical, synthetic fibre, iron and steel, alkali chemical, rubber fabricating, dye manufacturing, and acid manufacturing plants.

(3) Highly Toxic Wastes:

Adequate protection should be provided for these waters if materials highly toxic to human, fish, aquatic, or wild life are eliminated.

Some of the industries producing highly toxic wastes are: metal plating and finishing plants discharging cyanides, chromium or other toxic wastes; chemical and pharmaceutical plants and coke ovens. Wastes containing toxic concentrations of free halogens and wastes containing resin and fatty acid soaps are included in this category.

(4) Deoxygenating Wastes:

Adequate protection of these waters should result if sufficient treatment is provided for the substantial removal of solids, bacteria, chemical constitutents and other substances

capable of reducing the dissolved oxygen content of these waters unreasonably. In addition to sewage some of the industries producing these wastes are: tanneries, glue and gelatine plants, alcohol, including breweries and distilleries, wool scouring, textile, pulp and paper, food processing plants such as meat packing and dairy plants, corn products, beet sugar, fish processing and dehydration plants.

SUMMARY

The combined industrial discharges in the city of Windsor have a sewered population equivalent, with respect to BOD and suspended solids, of 105,000 persons. This is slightly less than the population of the city of Windsor. Over eighty percent of the BOD loading of 17,250 pounds per day is discharged by five food and drink industries, comprised of a distillery, a brewery, two meat packing plants, and a food processing plant. These same industries, along with the automotive plants, sewer over ninety percent of the industrial suspended solids loading of 20,900 pounds per day.

Oil and grease are discharged by the three automotive plants, the two meat packing plants and the Champion Spark Plug Co. of Canada Ltd. Although grease and oil are capable of causing trouble in municipal sewerage systems, the concentration expected in the industrial wastes, 25 to 35 parts per million, should cause no more problems than the grease and oil in normal sanitary sewage.

Iron does not usually present a problem in the operation of a municipal sewerage system unless large quantities are involved. However, should it present a problem, Canadian Bridge Works and the Kelsey Wheel Co. Ltd. can be reinvestiated since these two companies are the major sources of iron discharged to the city sewers.

Metals such as zinc, copper, nickel, chromium and cadmium, which are toxic to the biological processes in a sewage treatment plant, are sewered from industries engaged in metal finishing. There are several industries of this type in the city of Windsor, and most are involved with

the automotive industry plating and anodizing automotive accessories. Dilution by the industrial waste in the city sewers will reduce the largest of these metal concentrations to one part per million, and further dilution by municipal sanitary sewage should eliminate the toxic effect of these metals on the biological sewage treatment processes.

Another waste constituent of importance discharged by the metal finishing industries, is cyanide. Because of the extreme health hazard of cyanide, cyanide concentrations in municipal sewerage systems must be kept to trace quantities or eliminated. Should the pH of a waste stream carrying excessive amounts of cyanide fall below 7, hydrogen cyanide gas can be evolved. The industrial wastes in the city sewers contain less than 1 ppm cyanide. When all industrial and sanitary wastes in the municipal sewers are collected, the industrial wastes containing less than 1 ppm cyanide will receive a four fold dilution by the sanitary sewage, and thus the toxicity of the cyanide will be reduced.

Phenol is being discharged to the Detroit River, the Grand Marais ditch and the municipal sewers by the three automotive plants. The largest discharge of phenol is from the Ford Motor Co. of Canada Ltd. which discharges one pound per day to the Detroit River. However, the phenol concentration of the waste does not exceed the limit recommended in the Objectives for Water Quality in the Province of Ontario. The wastes from the Chrysler Corporation of Canada Ltd. discharge to the Grand Marais ditch, and the phenol concentration of this waste fluctuates close to the limit recommended for the discharge of phenol to natural watercourses. General Motors of Canada Ltd. sewer the least amount of phenol of the three automotive plants, but its waste has the highest phenol concentration. How-

ever, the waste is discharged to the city sewers and not to a natural watercourse.

The industries in the city of Windsor discharge their waste waters to the municipal sewers with three exceptions. The Ford Motor Co. of Canada Ltd. and Hiram Walker and Sons Ltd. send their industrial wastes directly to the Detroit River, while the Chrysler Corp. of Canada Ltd. directs its wastes to the Grand Marais ditch. The total industrial waste flow is in the order of ten million gallons per day mainly discharged over an eight hour period, and less than 45% of this is carried by the municipal sewers. The municipal sewers also receive the following portion of the total industrial loading, 70% of the BOD, 30% of the suspended solids, all the metals and cyanide, 75% of the grease and oil, and 15% of the phenol.

An important consideration in the operation of a municipal sewerage system, especially the sewage treatment plant, is the handling of intermittent or "batch" discharges of industrial wastes. When an industry dumps a large tank in a short period of time, a shock load may occur in the sewage system which can disrupt the operation of a sewage treatment plant. Because of the intermittent nature of discharges of this type, precautions taken to minimize the effects of these "batches" at the sewage treatment plant are not as effective as eliminating the batch discharges at the plant sites. Neutralization, precipitation, settling or discharging the "slug" slowly over a long period of time are methods of reducing the effects of batch discharges in most cases.

The most important batch discharges from the industries in Windsor contained alkalinity, acidity and iron. Canadian Bridge Works and Kelsley Wheel Co. Ltd. discharge waste pickle liquors whichwere high in acidity and

iron. The pickle liquor from Kelsey Wheel Co. Ltd. was partially treated by neutralization. The batch discharges containing alkalinity originated mainly in bottle washing machines at dairies, bottling plants and the brewery, and in the paint industries where caustic solutions were used for paint removal. The largest and most concentrated of these alkaline batch discharges should be neutralized before they are discharged, while the smaller less concentrated ones could be sewered slowly over a period of several hours.

Three of the four dairies in the city produced cottage cheese several days per week, Silverwoods, Purity and Twin Pines. The waste whey from the cheese production was discharged as a "slug" of waste very high in biochemical oxygen demand. The simplest way of disposing of this whey, if it is acceptable to the city, is to sewer it slowly during the whole day, not as a "slug" at the end of the day. If this method is used the waste whey is included in calculations of the continuous daily wastes from the 3 dairies producing cottage cheese.

The following tables summarize the industrial waste load from the industries in the city of Windsor with the individual waste constituents estimated in pounds. Each of the figures is an approximation of the plant waste load while the plant is operating at full capacity. The first table lists the daily continuous waste discharges calculated in pounds per day, while the second table lists the intermittent industrial discharges reported in pounds per discharge.

Summary of the Continuous Industrial Waste Flows

Company	1000 gal. per day	BOD	Susp. Solids	Acidity	Alk.	Fe	Zn	Cu	Ni	Cr	Cd	HCN	Oil	Phenol
						Pounds of Contaminants Per Operating Day								
Acme Chrome Limited	16.5		23	8				2.0	1.6	4.4		2.2		
The Borden Co., Ltd.	113.8	324	280		166									
Brenner Packers Ltd.	0.4	5												
Burroughs Machines Ltd.	11.3				22						0.25	3.5		
Canadian Bridge Works	222.5		22	480		15.0								
Canadian Motor Lamp Co.	193.2		31	19				0.2	40.4	6.2		8.6		
Carling Breweries Ltd.	280.0	2,677	330	533										
Champion Spark Plug Co. of Canada Limited	110.0		4	44	10		2.6			0.3	. .	4.2	116	
Chrysler Corp. of Canada Limited	1,538.0	817	2,060		2,263						0	0	455	0.3
Coca Cola Limited	18.4				66									
Essex Packers Limited	126.0	1,915	945										651	
Ford Motor Co. of Canada Limited	2,201.0		10,080	0	0						0	0	161	1.0
General Foods Ltd.	119.2	2,791	1,322											
General Motors of Canada Limited	324.0	512	790		505						0	0	350	0.2
Industrial Platers Limited	13.3		47		61		9.3	0.0	0.2	0.0	0	7.6		

Company	1000 gal. per day	Pounds of Contaminants per Operating Day											
		BOD	Susp. Solids	Acidity	Alk.	Fe	Zn	Cu	Ni	Cr	Cd	HCN	Oil	Phenol
Kelsey Wheel Co. Ltd.	255.4		128	102		35								
Krunchee Potato Chip Company	24.9	205	135											
McCord Corporation	60.2		33	133			9.0	3.4						
Oriental Commerce Ltd.	20.5	2	1										0	
Purity Dairies Ltd.	150.0	815	271	27	363									
Silverwood Dairies Ltd.	83.3	214	105	31										
Twin Pines Dairy Ltd.	20.2	119	41	3	57									
Universal Butter Co. of Canada Ltd.	11.6		8		62			0.9	2.9		0	7.1		
Hiram Walker & Sons Ltd.	2,258.0	4,540	2,160		1,760									
Windsor Chrome Plating	8.5		4					0.1	0.8	0.4		0.2		
Windsor Packing Co. Ltd.	84.0	2,310	2,060										546	
Wyeth & Brothers (Canada) Ltd., John	32.8	18	3		19	0								
T O T A L	8,297.4	17,264	20,887	847	5,354	50	20.9	6.5	45.9	11.3	0.25	33.4	2,279	1.5

	1000 gal. per day	Pounds of Contaminants per Operating Day												
		BOD	Susp. Solids	Acidity	Alk.	Fe	Zn	Cu	Ni	Cr	Cd	HCN	Oil	Phenol
Discharged to city sewers	*4,250.0	11,907	6,587	847	1,331	50	20.9	6.5	45.9	11.3	0.25	33.4	1,663	0.2
Discharged to the Grand Marais ditch	1,500.0	817	2,060		2,263								455	0.3
Discharged to Detroit River	4,250.0	4,540	12,240		1,760								161	1.0
TOTAL INDUSTRIAL DISCHARGE	*10,000.0	17,264	20,887	847	5,354	50	20.9	6.5	45.9	11.3	0.25	33.4	2,279	1.5

* estimates to include industries not investigated

Summary of Intermittent Industrial Discharges

Company	Waste Volume	Frequency of discharge	Pounds of Contaminants per Discharge									
			BOD	Susp. Solids	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$	Iron	Cu	Cr	HCN	Ether Solubles	pH
Acme Chrome Limited												
spent 8% H_2SO_4	300	1/week			300		12					<1.0
spent caustic cleaner	300	1/week				150						>13
Bendix Eclipse of Can. Ltd.												
30% sulphuric acid anodizing	150	1/2-3 wk.			525							<1.0
soluble oil wash (two)	750	indef.									300	
dichromate dip	10	1/month							3.5			<1.0
Burroughs Machines Ltd.												
cleaner S61	250	3-4/year				487				0.12	0.1	13.4
detergent N40 tank	300	1/year				1.0					71	10.0
electroclean tank	500	1/year				285						13.0
Canadain Bridge Works												
pickling acid tanks	5,200	1/2wk.			7,340		3,400					2.0
Canadian Pittsburg Industries												
caustic paint remover	2,000	<1/yr.	224			4,670						13.4
caustic paint remover(3 tanks)	3x230	var.	25.8			537						13.4
Canadian Motor Lamp Co.												
6 electrocleaning tanks	6x350	1/mon.				525						13.0

Company	Waste Volume	Frequency of discharge	Pounds of Contaminants per Discharge									pH
			BOD	Susp. Solids	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$	Iron	Cu	Cr	HCN	Ether Solubles	
Champion Spark Plug Co.												
caustic cleaner	225	1/month				137						13.2
dilute acid cleaner	130	1/month			165							0.2
leach agent	20	2/week				32.2			0.175			13.3
caustic parts wash	300	1/week									6.7	9.2
Coca Cola Limited												
3 tanks of bottle-washer	7,500	1/mon.		105		4,125						13.4
Stirillette(phosphoric acid)	40	1/year			54							0.95
Colonial Tool Co., Ltd.												
soluble oil solution	200	1/week										10.
Industrial Platers Ltd.												
3 caustic solutions	400:200:400	var.				550						>13
10% muriatic acid dip	150	var			21							<1
20% sulphuric acid dip	150	var.			30							<1
50% muriatic	150	var.			285							<1
2 chromate dips	100:150	1/week			25				0.75			<1
Kelsey Wheel Co. Ltd.												
neutralized acid	1,860	3/week		656		38	223*					7.0
paint stripping solution	600	1/year		61		172						12.9
soluble oil emulsion	500	1/2wk.									52.9	9.2
chrome acid rinse	600	2/week		12.1	13.9							5.6
Purity Dairies Ltd.												
3 tanks of whey	400 each	var.	456	25.4	37.4							4.5

Company	Waste Volume	Frequency of discharge	Pounds of Contaminants per Discharge									
			BOD	Susp. Solids	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$	Iron	Cu	Cr	HCN	Ether Solubles	pH
Rinshed Mason Co. Ltd.												
caustic paint removing sol.	240	1/4mon.	3.8	7.2		175.5						13.3
Twin Pines Dairy Co.												
bottle wash caustic	1,000	1/3mon.				350						
dump of whey	140	var.	53.2	2.9	4.3							4.5
Universal Button Co.												
caustic cleaner	50	1/2-3wk.				27.5						
Vernor Ginger Ale Ltd.												
3 caustic tanks	1,800	1/mon.				996						13.3
Windsor Chrome Plating Co.												
caustic stripping solution	300-350					140		0.02	0.61			
John Wyeth & Bros. Ltd.												
wash-up (sterilizing)	10	1/day	7.2	1.9								6.4
wash & dairy cleaner	1,000	1/day	11	1.4		19						10.4

GENERAL RECOMMENDATIONS

The following general recommendations are offered as a guide for the construction of sewage treatment facilities for the city. They are based on the acceptance or rejection of certain industrial wastes into the sewers.

1) Industry should be made familiar with the type of municipal sewers now available or planned in their area, for sanitary, storm, or combined flows and whether more than one type of sewer has been installed.

2) Industries with large volumes of uncontaminated process or clean cooling water should be requested to segregate these flows from contaminated streams and direct the clean water to a storm sewer or a natural watercourse where these facilities are available or planned, and conversely the contaminated streams should be directed to the sanitary sewer.

3) The municipality, in co-operation with industry should work toward the enactment of a mutually acceptable by-law for the control of process waste waters discharged to the municipal sewers or to a natural watercourse. Industry would then become familar with problems relating to industrial wastes, in the efficient operation and maintenance of a municipal sewerage system and could then plan their waste disposal programmes accordingly.

4) The municipality, as a general objective, should provide separate sewers wherever possible.

S E C T I O N II

ACME CHROME LIMITED
1165 Westcott Road

Personnel Interviewed: Mr. L. Schollenberger, Acting Manager.

General:

Employing approximately fifteen to twenty people, the company carried out electroplating in copper, nickel and chrome. A miniature silver plating unit was also used occasionally. The plant's operation varied considerably between three to five days per week according to the work load; although once started up, the plant worked a full eight hour day. Based on a four day week, the average water consumption was computed to be 16,500 gallons per day.

Operations:

The usual procedure at the plant was to do any required smoothing or buffing of the articles to be plated, and then to clean the articles in an alkaline cleaner followed by an acid dip. While direct chrome plating on steel was often done, a better quality chrome plate was achieved by plating first with copper, then nickel followed by chrome. Both procedures were followed at this plant as well as a very limited amount of silver plating.

Wastes:

The bulk of the wastes was derived from overflowing rinses used to cleanse the articles after each of the previously mentioned operations. The clean cooling water used in a trichloroethylene vapour degreaser was

Wastes (cont'd.)

reused as a running rinse. Other wastes included the weekly discharge of a five per cent pickling acid and a caustic cleaner from 300 gallon tanks as well as an irregular amount of plant wash-up water.

Sampling:

Representative grab samples were obtained from two floor drains located beneath the false flooring of the work area in the plating section. The samples were obtained during full activity when the flow of the south drain was estimated to be approximately thrice that of the north drain.

Analyses:

The analyses of the two samples obtained indicated the following concentrations of contaminants in the plant effluent (concentrations in parts per million).

Number 1 - South Drain

Number 2 - North Drain

	SOLIDS				Acidity	Copper	Nickel	Chrome	Cyanide	Zn
	Total	Susp.	Diss.	pH	as $CaCO_3$	as Cu	as Ni	as Cr	as HCN	as Zn
1.	404	114	290	5.9	36	9.7	3.3	37.0	9	0.4
2.	650	234	416	4.1	100	18.7	31	0.00	26	0.0

From an industrial waste flow of approximately 16,000 gallons per day, the number of pounds of contaminants released daily to the

Analyses (cont'd.)

sanitary sewer, on Westcott Road, was calculated to be the following:

Suspended solids	-	23.1
Acidity	-	8.3
Copper	-	1.95
Nickel	-	1.6
Chrome	-	4.4
Cyanide	-	2.2

Remarks:

At the time of the survey, the general amount of plating industry seemed to be about constant or in slight decline in the Windsor area, and no expansion of this plating company's facilities should be expected in the near future. However, it should be noted that the concentrations of cyanide, copper, nickel, and chromium salts, were in excessive concentration with respect to the normally considered limitations upon sewered discharges bound for conventional sewage treatment.

AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED
310 Ellis Street East

Personnel Interviewed: Mr. P. Britton, Manager
Mr. K. Lewis, Plant Engineer

General:

The plant operated five days per week with 300 employees on a forty hour week. The plant consumed 22,500 gallons of city water daily in the fabrication and assembly of air-conditioning equipment.

Water Uses:

The operations in the plant were mostly dry fabrication and assembly. A vapour degreaser employing trichloroethylene used cooling water in a heat exchanger and this water was discharged uncontaminated. The plant had a water wall paint booth but the water was completely recirculated. A tank of approximately 1,000 gallons capacity was used for hydraulic testing of the products, and was dumped every two weeks. There was nothing added to the water in this tank. The plant also used water for a high pressure boiler and for cooling compressors and a single welding machine.

Remarks:

The waste waters from this plant consisted of sanitary waste, boiler blowdown and a large volume of uncontaminated cooling water which were discharged to the combined city sewer on Ellis Street. If separate storm and sanitary sewers become available, the uncontaminated discharges should be diverted to the storm sewer.

BANNER METAL PRODUCTS LIMITED
168 Kildare Road

Personnel Interviewed: Mr. A. Frishette, Plant Superintendent

General:

This plant had forty employees and operated five days per week, eight hours per day. It was located in the same building as the Windsor Tool and Die Company which had seventy-five employees and discharged only sanitary waste. The two companies had a jointly metered water supply which averaged 21,700 gallons per day.

Water Use:

Outside of domestic purposes, the plant used cooling water for an air compressor, air conditioning equipment and die casting machines. The waste waters were discharged to the combined city sewer on Kildare Road.

Discussion:

The plant discharged only sanitary waste and uncontaminated cooling water to the combined sewer on Kildare Road.

BENDIX-ECLIPSE OF CANADA LIMITED
1473 Argyle Road

Personnel Interviewed: Mr. C. Minello, Maintenance Foreman
Mr. J. Perrins, Plating Supervisor

General:

The company employed approximately 295 persons, eight to nine hours per day, five days per week, in the production, finishing, and assembly of heavy duty precision mechanisms such as Bendix drives, mechanized brake assemblies, pistons, master cylinders, etc. The industry, essentially a tool and die shop operation was especially suited to supply the needs of the automotive industry. Average water consumption proved to be 94,700 gallons per day. Wastes entered the combined sewer system on Argyle Road.

Operations:

The company carried out machining and finishing upon the crude castings delivered for the work. Because of the nature of the operations, much of the water used left the plant uncontaminated. A great deal of cooling water for the machining operations was used. The machining department also had three washing machines, two of which each contained 370 gallons of caustic cleaner (some oil present) and one containing 60 gallons of soap and water, all dumped once monthly. Some soluble oil solution, about 45 gallons per week, was also believed to enter the sewer. Water for a recirculated water shield on a spray-painting booth was dumped

Operations (cont'd.)

once a month. Buffing and burnishing operations were dry.

A small anodizing operation performed on aluminum components had a small amount of waste. Parts were cleaned in thirty per cent sulphuric acid, rinsed, dipped in dye, rinsed again, and then "sealed" in hot water, whose pH was rigorously controlled by a small amount of acetic acid. The operation functioned only two or three days in the week, and the main source of waste outside the rinse following the acid was the dumping of the 150 gallons of acid itself once every two to three months of operation.

The plant also had plating solutions on hand for the very rare occasions when they might be required. Although plating solutions were available to do copper, tin, zinc, cadmium, and brass plating, many of the solutions had not been used for months. The operations were manual (barrel plating), and the tank sizes were very small varying from 40 gallons for the copper to 130 gallons for the zinc. Dump discharges from this section were limited to two detergent cleaners of nearly 500 gallons each at two month intervals; 20 gallons of trisodium phosphate cleaner, 10 gallons of acidified potassium dichromate, and 10 gallons of dilute muriatic acid once a month.

Sampling:

No samples were taken at this plant as no plating had been scheduled at the time of the survey. The rinses flowing in the anodizing section were shown by pH paper to contain a very negligible amount of acid to have any effect upon the company's regular effluent. Because of the

Sampling (cont'd.)

small size of all the wet industrial processes at this plant, the contaminating flows were considered almost negligible, and estimates based on the working strengths of the materials intermittently discharged were estimated for compilation.

Summary:

This company's wastes can be summarized into a number of batch discharges estimated to contain an approximate amount of contaminants as follows:

150 gallons anodizing acid 30% H_2SO_4	-	525 lbs. acidity
10 gallons acidified potassium dichromate	-	3.5 lbs. chromium
10 gallons muriatic acid	-	5 lbs. acidity
20 gallons trisodium phosphate	-	20 lbs. alkalinity

Remarks:

No excessive concentrations can be expected from the plant due to its relatively high flow of uncontaminated discharges even during plating operations. However, seeing that the company does not have much use for its plating solutions, it should be noted that none of these concentrated solutions can be safely disposed of untreated to the sewers. In addition, an undeterminable amount of machine oil may be entering the sewers from this company.

THE BORDEN COMPANY LIMITED
628 Monmouth Road

Personnel Interviewed: Mr. J. Handrigan, Secretary-Treasurer
Mr. H. Holden, Plant Superintendent
Mr. D. Henderson, Assistant Plant Superintendent
Mr. R. Joyal, Plant Engineer.

General:

Of the one hundred and fifty employees at this plant, one hundred of them were sales and delivery people. Milk receiving took place seven days per week, and the rest of the plant operated five days per week being closed on Sunday and Wednesday. In processing bottled milk products, 113,800 gallons of water were used daily.

Operations:

This plant received milk in tank trucks which had to be washed before leaving the plant. The delivery trucks were also washed each day when they returned to the plant.

The bottling machine which washed and filled the bottles was the other main source of waste in the plant.

All cooling water was recirculated through a cooling tower on the room of the plant with the exception of the water used on the ammonia condenser for the refrigeration system.

Sampling:

All plant wastes discharged through several plant sewers to a city sanitary sewer crossing Wyandotte Street to the north. A six hour composite sample was obtained from a manhole on this sewer. The manhole was located at a service station which was due north of the Borden plant. South of this manhole, the sewer served virtually only the Borden plant.

Results and Waste Loading:

The following is a list of the analytical results and the sewer loading from this plant.

Biochemical oxygen demand	-	285 parts per million 324 pounds per day
Suspended solids	-	246 parts per million 280 pounds per day
Alkalinity	-	146 parts per million 166 pounds per day
pH	-	7.0

Summary:

While the wastes from this plant were found to be normally innoxious for discharge to a sanitary sewer, they do however constitute a heavy loading of BOD and suspended solids. In addition, this plant could conceivably cause adverse conditions at any receiving sewage treatment plant, if they discharged any large amount of waste milk or caustic bottle washing solutions to the sewers at one time. Excess milk could quickly overtax the oxidation capacity of a treatment plant while excess caustic could so inhibit the biological process of treatment facilities that effective treatment would cease.

BORDER CITY WIRE AND IRON LIMITED
961 Walker Road

Personnel Interviewed: Mr. H. Whittall, Assistant Manager
Mr. A. Taylor, Plant Superintendent

General:

This plant employed fifty-five people, five days per week, eight hours per day. The daily water consumption was 1,680 gallons.

Water Uses:

Other than sanitary use, the only use for water in the plant was for cooling welding machines. The plant did not have a boiler.

All wastes were discharged to the combined city sewer between Walker Road and Monmouth Road.

BRENNER PACKERS LIMITED
497 Cataraqui Street

Personnel Interviewed: Mr. F. Miesmer, Manager

General:

This plant had seven employees, and operated five and a half days per week, eight hours per day. Four hundred and twenty-five gallons of city water were used per day in the production of sausages and wieners.

Operations:

The operations in the plant were meat cutting and sausage and wiener stuffing. The pickling process was carried out in two wooden barrels. Water was used in the plant for sanitary purposes, cooling the refrigeration unit and washing the sausage stuffing machinery.

It was estimated that the plant could discharge as much as five pounds of biochemical oxygen demand per day if the pickling barrels were dumped with the normal plant wastes. The plant was connected to the Glengarry Street combined sewer.

BURROUGHS MACHINES LIMITED
804 McDougall Street

Personnel Interviewed: Mr. J. C. Heath, Plant Engineer
Mr. F. Gamble, Parts Manufacturing Foreman

General:

This plant assembled and serviced business machines. The company employed forty people and operated five days per week and eight hours per day. The daily water consumption was 11,300 gallons.

Plant Operation:

The only plant operations producing industrial waste waters were the cyanide hardening and cadmium plating operations. In the hardening process the parts were heated in molten sodium cyanide, quenched in oil, dipped in an alkaline cleaner, and finally rinsed in cold water overflowing at approximately six gallons per minute. For the removal of surface scale the parts were acid dipped, rinsed, dipped in a soluble oil detergent solution and then rinsed again with hot water. The plating operations were employed on some of the work and included electrocleaning, cadmium plating and a final spray rinse. The spray rinse when in operation used roughtly four gallons per minute.

Not all parts were hardened and plated. Some were hardened, some plated and some were given both treatments. Also some parts were merely given a phosphate protective coating, a small operation whose wastes

Plant Operation (cont'd.)

were considered negligible.

Water was also used for boiler make-up and for sanitary purposes. The plant wastes were discharged to the combined city sewers on McDougall Street.

Sampling:

Samples were taken of the alkaline cleaning solution used after the hardening process and which was dumped three or four times per year, the rinse following this cleaning operation, the detergent - soluble oil solution, the electrocleaning tank, and the final rinse that followed the cadmium plating. The samples were analyzed for pH, alkalinity, cyanide, cadmium, and ether solubles. The analytical results and sewer losses based on a continuous eight hour operating schedule, are listed in the following table. The hardening and plating operations were not actually employed on a continuous daily basis, but for the purpose of thesurvey, to obtain data for possible sewage treatment, the maximum work load had to be assumed over a full eight hour day in calculating the pounds of sewered contaminants per day.

Sampling (cont'd.)

Origin of Waste	Volume gpd	pH	Cyanide ppm	Cyanide lb./day	Cadmium ppm	Cadmium lb./day	Ether Solubles ppm	Ether Solubles lb./day
Alkaline cleaner	-	13.4	48	-	-	-	34	-
Rinse following alkaline cleaner	2,880	10.2	2	.0576	-	-	-	-
Detergent cleaner	-	10.0	-	-	-	-	23,700	-
Electrocleaner	-	13.0	-	-	-	-	-	-
Plating rinse	1,920	10.5	179	3.44	13	0.25	-	-
T O T A L	4,800			3.5		0.25		

Discussion:

When the waste stream from the plating section was diluted with waste waters from the rest of the plant, the plant effluent averaged 31 parts per million cyanide and 2.2 parts per million cadmium. This calculation assumed that the plating and hardening operations were continuous throughout the day. If the production schedule required that both processes operated continuously, the waste flow from the hardening operation would be 2,880 gallons per day, and this number was used in the calculations. However, even if the plating operation was continuous, it is doubtful if the waste flow would be as high as 1,920 gallons per day, the figure used in the above calculations.

The normal operation of the plant did not require this continuous operation of the plating and hardening process.

Remarks:

The wastes sewered by this plant were at times excessive in the concentration of cyanide, particularly in regard to possible sewage treatment in the future.

BUTCHER ENGINEERING ENTERPRISES LIMITED
258 Chilver Road

Personnel Interviewed: Mr. W. F. Meisner

General:

This plant operated five days per week, eight hours per day with thirty-five employees. The plant was engaged in applying a rust-resistant coating to automotive parts. Water consumption figures for this plant were not available since other companies in the same building used water from a commonly metered supply. The amount of water used however was small.

Plant Operation:

The solution used in applying the rust-proof coating contained 24 pounds of cleaner, 3 gallons of solvent and 37 gallons of water. After the coating was applied, this solution, used at the rate of 1 pint per minute was rinsed off by a 2 gallon per minute water spray. The coating was applied in a spray booth with a manually operated nozzle having two outlets, one for the carrier water, the other for the phosphate coating solution. The carrier water flowed most of the day, but the coating solution did not. If the coating operation ran continuously for eight hours, the plant would consume 62 pounds of cleaner, 3 gallons of solvent, and 1,020 gallons of water. The floor of the spray booth acted as a settling chamber. When the water drained off, the sludge was shovelled up and trucked to the city

Plant Operation (cont'd.)

dump. This sludge contains soluble oils, grease, dirt, tallow, etc., that had covered the automotive parts when they arrived at the plant.

The plant also used cooling water on spot welders and transformers. This cooling water drained to the spray booth before it discharged to the combined city sewer near Chilver Road.

Discussion:

The amount of phosphating chemicals used was small and the amount that drained from the coated parts was even smaller. When diluted with the spray water and cooling water, the amount of cleaner and solvent would be negligible. Since the floor of the spray booth acted as a settling basin, much of the dirt, grit, etc., was intercepted before the flow reached the city sewer.

Summary:

Wastes from this industry were therefore considered to be negligible.

CANADA PACKERS LIMITED
795 University Avenue West

Personnel Interviewed: Mr. Martin, Assistant Accountant

General:

This plant was a sales office and warehouse for meat. The eighteen employees worked five days per week and eight and a half hours per day. The only water used was sanitary water and refrigeration cooling water which amounted to 4,100 gallons per day. The cooling water was used seven days per week on a twenty-four hour basis. No liquid industrial wastes emanated from this plant. This plant wastes were discharged to the Salter Avenue combined sewer.

CANADIAN BRIDGE WORKS

TRUSCAN STEEL COMPANY OF CANADA LIMITED

(Subsidiary of Dominion Steel and Coal Corp. Ltd.)
1219 Walker Road

Personnel Interviewed: Mr. N. Wallace, Works Manager

Mr. J. Anthony, Manufacturing Engineer

General:

This plant employed between 600 and 850 people. The number of employees at the time of the survey was 843. The company operated five days per week, eight hours per day. From crude steel components, large steel structures and trusses were manufactured at this plant. The daily water consumption was 222,500 gallons. This water consumption was metered at three locations: the office building 5,600 gallons per day; plant number one 144,500 gallons per day; and plant number two 72,400 gallons per day. Plant wastes were discharged to the combined sewer crossing Walker Road at Ottawa Street and another combined sewer running parallel to the Pere Marguette railroad right-of-way.

Plant Operation:

Office Building - Water was used here for sanitary purposes and a small amount was used on a blue print machine.

Plant Number One - Here structural members were cut, formed, shot-blasted to remove rust, and finally spray painted. There was no waste

Plant Operation (cont'd.)

water from these operations. Cooling water was used on a friction saw and as water shields for the comfort of the workers on furnaces used in forming rivets and bolts. Water for boiler make-up and sanitary purposes were the only other uses of water in plant number one.

Plant Number Two - Structural members were formed, pickled and galvanized in this plant. The only waste waters from the entire plant that needed consideration were from the pickling operations.

The steel was first dipped into a caustic cleaner tank, 5,200 gallon capacity, then into one of two 5,000 gallon sulphuric acid pickling tanks, and then rinsed in a cold water running rinse tank with an overflow of 34.4 gallons per minute. In the galvanizing operation, the steel structural members were dipped in a zinc ammonium chloride flux solution in a 2,400 gallon capacity tank, dipped in molten zinc, and then cooled in a running cold water tank. The only tanks with drains were the two acid tanks and the running rinse tanks. When tanks were cleaned, the contents were pumped to an empty tank; the remaining sludge was removed and land dumped; and then the solution was returned to the original tank.

There were two identical pickling and galvanizing arrangements. Of the total of four 5,200 gallon acid tanks, one was dumped every two weeks. Before an acid tank was dumped, however, no fresh acid was added for several days, and scrap iron was added to the tank to raise the pH. The tanks contained approximately four per cent free sulphuric acid when dumped. The two running rinse tanks discharged 34.4 gallons per minute each, for a total of 68.8 gallons per minute from rinsing operations.

The waste waters were discharged to a large combined city sewer crossing Walker Road at Ottawa Street.

Sampling:

A three hour composite sample was taken of the overflowing cold water rinse following the acid dip. A grab sample of a pickling tank was also taken. The acid tank that was sampled was scheduled to be dumped the day before the sample was taken. However, due to production requirements more acid was added and this tank continued in operation.

Analyses and Sewer Loading:

The following table contains the analytical results in parts per million and resultant sewer loadings from the pickling section of the plant.

Source	Volume	pH	Suspended Solids		Acidity		Iron	
			ppm	lb/day	ppm	lb/day	ppm	lb/day
pickling tank	5,200 gallons every 2 weeks	0.7	-	-	142,000	7,100	23,000	1,150
rinsing tank	31,000 gallons per day	5.6	70	22	1,550	480	48	15

Summary:

The only wastes from this company that had substantial significance with reference to sewage treatment appeared to come form the pickling operations. Here the main waste, the spent pickling acid, even after maximum saturation with scrap iron, had an extremely high iron and acidity concentration for discharge to municipal sewers. Moreover, it is known that treatment with scrap iron alone could not raise the pH to safe levels even

Summary (cont'd.)

to protect the sewers. Before a sewage plant could safely receive such wastes in the volume here available, the wastes would undoubtedly require pretreatment, such as neutralization and settling of resultant solids formed on such neutralization. The rinse water following the pickling dip was high in iron and low in pH as well - although it would receive considerable dilution from the relatively uncontaminated wastes from the rest of the plant. Some of this uncontaminated cooling water, however, could even be satisfactorily diverted out of the combined sewer and into a storm sewer system should one become available.

CANADIAN MOTOR LAMP COMPANY LIMITED
2429 Seminole Street

Personnel Interviewed: Mr. Colby, Plant Manager
Mr. Demers, Plant Superintendent

General:

The plant produced chrome plated parts such as hub caps, grills, wheel covers and lamps, for the automotive industry. One hundred people were employed 5 days per week, eight hours per day. The daily water consumption was 193,200 gallons of which 155,600 gallons per day were used in the plating section, and the remainder used throughout the rest of the plant.

Operations:

Stamping andforming the products were dry operations. Plating with copper, nickel and chromium, anodizing, phosphatizing, and buffing were the processes producing contaminated waste waters.

The plant operated a very large plating section. The three automatic plating lines each had caustic cleaning, electrocleaning and dilute acid dipping, for which rinsing operations were required. One line plated only chromium while the other two plated copper, nickel and then chromium.

For parts too large for the automatic lines, tank plating was employed using a crane to move parts from one tank to another. A small

Operations (cont'd.)

manually operated barrel plating operation was also included in the plating section.

Anodizing with a chromate sealing dip, phosphatizing and buffing were the only other "wet" operation. In the buffing and polishing operation, the water was recirculated and dumped once a week.

Sampling:

All wastes from the plating section drained to a main sump then through the plant sewer to the city sewer. A three hour composite sample was taken from the sump in the plating section, and represents the total effluent from the plating operations.

The following table contains the analytical results of the analyses performed on the sample and the waste load from the plating section. With the exception of pH the values are recorded in parts per million and pounds per day respectively.

Component	Effluent from Plating Section	
	ppm	lbs./day
Suspended solids	20	31.1
pH	6.8	-
Acidity as $CaCO_3$	12	18.7
Copper as Cu	0.15	0.23
Nickel as Ni	25.9	40.4
Chromium as Cr	4.0	6.2
Cyanide as HCN	5.5	8.6

Discussion:

Industrial wastes discharged to a biological sewage treatment plant are usually limited to the following concentrations:

Copper	-	1 part per million
Nickel	-	1 part per million
Chromium (hexavalent)	-	3 parts per million

These limits are employed through a city by-law to help protect the biological processes in the sewage treatment plant. Some metallic ions adversely affect the oxidation process while others accumulate in the digestor and impede the digestion of sludge. The suggested limit for the discharge of cyanide to municipal sewers is 2 parts per million. Excessive cyanide concentration in the sewers can in certain instances liberate hydrogen cyanide gas which is a hazard to workers either in the sewers or in the sewage plant.

CANADIAN PITTSBURG INDUSTRIES LIMITED

WINDSOR PAINT WORKS
1160 Central Avenue

Personnel Interviewed: Mr. C. H. Manne, Factory Superintendent

General:

The plant employed fifty-four people, five days per week and eight hours per day. The daily water consumption was 82,200 gallons. Automotive finishes and latex paints were the main products of this plant.

Plant Operation:

The largest waste flow was cooling water from the ball mills where pigments were ground and prepared. This flow amounted to almost the entire plant water consumption.

Solvents used to clean equipment were collected and distilled for recovery. Cooling water from the condenser was the only sewered waste from this operation, and this was the second largest waste flow from the plant.

Latex paints were prepared in a tank of 1,200 gallon capacity. When the batch was finished, the tank would be filled with water, and occasionally a small amount of caustic would be added. When the tank had soaked clean, the water was discharged to the city sewers.

In the lye house, small paint drums and pails were cleaned in a large lye tub, and moveable vats were filled with caustic solution to

Plant Operation (cont'd.)

clean them. The caustic solution was mixed in a ratio of 900 pounds of caustic in 400 gallons of water. In the usual operation of the lye house, no caustic solution was dumped to the sewers. When one vat was clean, the caustic would be pumped from it to the next one to be cleaned. While the vats were being cleaned, they were heated by live steam blown into the caustic solution. This occasionally caused a caustic filled vat to overflow slightly. In the case of an emergency when an extra vat was needed andnone available, the caustic solution from such a vat may be sewered. This did not happen often. All wastes from the lye house drained to a catch basin in the plant yard which was cleaned every four months.

The only other uses of water in the plant were for sanitary purposes and for boiler water make-up. All plant wastes were discharged to the city sanitary sewer on Central Avenue.

Sampling:

A grab sample of the caustic stripping solution was taken from one of the moveable vats.

Analysis:

The following table contains the analytical results in parts per million and the waste loading in pounds per day that would result from dumping one 500 gallon moveable vat.

Analysis (cont'd.)

	ppm	pounds
biochemical oxygen demand	11,200	56
suspended solids	1,400	7
pH	13.4	-
alkalinity - total	233,600	1,168
- phenol-phthalein	194,400	972

Summary:

The day-by-day operation of the plant produced waste waters that would have no harmful effect on a municipal sewerage system. However, the dumping of a batch of the caustic cleaning solution would discharge in a very short period of time a 500 gallon slug of waste containing 1,168 pounds of total alkalinity including 775 pounds of caustic soda.

This would have a deleterious effect upon any biological sewage treatment process in the event that such a treatment system was installed. The high pH associated with such a waste would have an inhibiting effect upon the biological processes necessary for the efficient operation of such treatment. In the event of sewage treatment, such wastes should not be discharged to the sewers - at least not without neutralization.

CARLING BREWERIES LIMITED
515 Riverside Drive West

Personnel Interviewed: Mr. J. A. Pulford, Chief Engineer

Operating Schedule:

A total of two hundred and fifteen employees were engaged in brewing, bottling and canning. The brewing section, which included the aging cellars, operated twenty-four hours per day, six days per week. Bottling or canning was extended over sixteen hours per day with the third shift reserved for bottling equipment and room cleaning.

Raw Materials:

Malt, rice, hops and yeast, caustic soda, sodium hypochlorite, salt, and carbon.

Products:

Approximately 20,000 gallons per day of bottled or canned lager beer.

Water Consumption:

An average of 301,000 Imperial gallons per day was used between January and June 1960, according to the records of the Windsor Utilities Commission Water Division. All water consumed was municipal water.

Process Units:

The processes normal to brewing operations were used and included the following units:

(a)	Cereal cooker	- 3,000 gallons
(b)	Lauter tank	-
(c)	Brew kettle	- 7,000 gallons
(d)	Hop jack	- 6,800 gallons
(e)	Fermenters	-
(f)	Aging cellars	-
(g)	Bottling, including pasteurizing	-

Source of Waste Waters:

(a) Cereal Cooker - Approximately 100 gallons per cook of wash water after the contents are dropped to (b).

(b) Lauter Tank - Spent grains from strainer are sold wet. A small amount of wash water is sewered after each cook which carries a small amount of the spent grains.

(c) Brew Kettle - Some wash water after the contents are dumped to (d).

(d) Hop Jack - Wash water is used after the wort is drained. Some spent hops are carried to the sewers by the wash water.

(e) Fermenters - The sewered material was the initial and final draw-off of yeast and the tank wash-out water. The wash-out water contains some sludge like substance washed from the bottom of the tank.

(f) Ageing Cellars - Wash water is used to remove the small amount of beer adhering to the sides of the tanks and any sediment settled during the thirty days of ageing.

Source of Waste Waters (cont'd.)

(g) Bottling - In the daytime, the waste water would be slightly alkaline from the carry-over of alkaline cleaners. The waste water was similar to that obtained from any standard beverage bottling machine, but in addition the pasteurizer associated with the beer bottling operations, would provide a large volume of uncontaminated cooling water.

The spent caustic cleaning solution from the recirculation tank was dumped at regular intervals. The night shift cleaned the bottling machine and bottling roon using a five per cent caustic solution which discharged to the sewer.

(h) Caustic Solutions - Equipment sterilizing and cleaning was carried out with various strength of caustic solutions at scheduled intervals. Caustic solutions up to five per cent were used. The cleaning of vessels and floors was estimated to consume up to seventy-five per cent of the water used.

Description of Sewers and Volume of Flow:

All drains, with the exception of the carbonation room, entered the sewer on Bruce Street fifty feet from the corner of Riverside Drive. The carbonation room sewer had a separate sump 100 feet from Riverside Drive on Bruce Street.

The sewer flow was estimated from the consumption of municipal water after allowance for the volume of water in the product. The total flow was 280,000 Imperial gallons per day of which ninety-seven per cent discharged to the sewer on Bruce Street fifty feet from the corner of

Description of Sewers and Volume of Flow (cont'd.)

Riverside Drive.

Sampling;

Hourly samples were collected and composited on September 1, 1960 between the hours of 10 a.m. and 4 p.m. from both drains.

Analytical Results:

All analyses, except for pH, are in parts per million.

Sample Number 1 - Main sewer manhole at Bruce Street and Riverside Drive.

Sample Number 2 - Carbonating room sewer at Bruce Street.

Sample Number	5-day BOD	Solids Total	Susp.	Diss.	pH	Acidity as $CaCO_3$
1	800	2,724	114	2,610	3.9	180
2	6,000	12,166	278	11,888	4.2	524

NOTE: The presence of caustic cleaners in the effluents were not indicated in these results since they would appear outside the period of sampling.

Quantity of Waste:

The quantities of waste in pounds per day for each sewer were calculated from the analytical results and the estimated volume of flow.

Quantity of Waste (cont'd.)

	Number 1	Number 2	Total
5-day biochemical oxygen demand	2,173	504	2,677
suspended solids	307	23	330
acidity	489	44	533

Sewered Population Equivalents:

Based on a waste loading of 0.167 pounds of 5-day BOD per day and 0.02 pounds of suspended solids per capita per day, the sewered population equivalent of the waste load from the Carling Breweries Limited was as follows:

for 5-day biochemical oxygen demand - 16,030 persons

for suspended solids - 1,650 persons

Remarks:

The recommended limits for concentrations of 5-day BOD, and suspended solids discharged to a sewerage system containing a sewage plant are 300 parts per million and 350 parts per million respectively. The recommended pH range is 5.5 to 9.5.

The waste waters from the Carling Breweries Limited exceed these recommended limits for 5-day BOD, and the pH range.

The exceptionally high oxygen requirements of brewery wastes would impose a loading upon the oxidation processes of a municipal sewage

Remarks (cont'd.)

treatment plant which would probably interfere with efficient operation. It is therefore recommended that the quantity and concentrations of the discharge be regulated by a municipal ordinance.

The pH range should be controlled so that neither acids or alkalis would be discharged directly to the sewers from batch operations, and that at no one time should the pH vary outside the recommended range.

CHAMPION SPARK PLUG COMPANY OF CANADA LIMITED
1624 Howard Avenue

Personnel Interviewed: Mr. A. W. Ferguson, Plant Engineer
Mr. D. C. Smith, Plant Manager

General:

This plant, manufacturing spark plugs, operated sixteen hours per day, five days per week with the exception of the office and the plating section which operated eight hours per day. There were two hundred and sixty employees, and the plant water consumption was 110,000 gallons per day of which 17,760 gallons per day were used in the plating processes.

Sources of Waste Waters:

The main source of waste waters from this plant was the zinc plating section. In preparation for plating, the component parts were cleaned in an alkaline cleaner, rinsed, dipped in dilute H_2SO_4 and rinsed again. When the parts were removed from the plating tank, they were rinsed, dipped in Macro L6 containing HNO_3, rinsed dipped in Macro Leach number 1 containing NaOH and Na_2CO_3 and rinsed. Then they were rinsed in cold and hot water and finally dried. All the rinsing operations produced a continuous waste flow. The alkaline cleaner and the dilute sulphuric acid were dumped once a month, the Macro Leach number 1 was dumped every two weeks, and the remainding tanks were not dumped.

Another source of industrial waste was the parts washer. Here the parts were washed in a detergent then dipped in soluble oil for rust prevention.

Sources of Waste Waters (cont'd.)

Air coming into the plant was treated in two dust removal units. The incoming air was scrubbed by a water spray which removed the dust from it. This water was discharged to the plant sewers.

The plant also used cooling water in four compressors. This flow of uncontaminated cooling water was not recycled but discharged after use to the sewers.

All plant wastes discharge to the combined city sewer on Howard Avenue.

Sampling:

Grab samples were taken of the most significant plating wastes from this plant. They included four of the seven running rinse tanks and four tanks that were periodically discharged to the sewer.

Results:

From the analytical results (see analysis sheet) the normal daily waste loading in pounds per day of contaminants emanating from the company's plating section was calculated in the following table.

Results (cont'd.)

Component	Rinse following caustic	Rinse following acid dip	Rinse after plating	Rinse after Macro L6 dip	Total
Flow gal.per min.	5	6.4	8.5	7.1	27
pH units	11.2	1.9	-	10.8	
Alkalinity as $CaCO_3$	9.65				9.7
Acidity as $CaCO_3$	44.5				45
Cyanide as HCN			4.17		4.2
Zinc as Zn			2.61		2.6
Chromium				0.27	0.27

In addition to the normal flow from the running rinses in the plating line, there were also certain solutions dumped at regular intervals to the sewer. The table below summarizes these wastes calculated in pounds per day.

	Caustic cleaner	Acid dip	Macro Leach number 1	Parts Washer
Volume gallons	255	130	70	300
pH units	13.2	0.2	13.3	9.2
Alkalinity as $CaCO_3$	138	-	32	-
Acidity as $CaCO_3$	-	166	-	-
Chromium as Cr	-	-	0.18	-
Ether solubles (oil)	23	-	-	6.7
Frequency of dump	once/month	once/month	every 2 weeks	once/month

Summary:

The normal flow of sewered wastes from this plant were comprised mainly of uncontaminated flows up to about 230 gallons per minute (110,000 gallons per day). This would indicate that the cyanide content in the company's overall discharge was high at an estimated 3.8 parts per million HCN. Treatment to remove some of this cyanide may be necessary. The other components of the wastes however proved to be negligible including the dump discharges which were all under 300 gallons each. At the time of the survey, it was the company's practice to dump their caustic cleaner simultaneously with the acid dip solution. This practice is a good one as the two solutions neutralize one another.

ONTARIO WATER RESOURCES COMMISSION

CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSIS

Municipality: Windsor
Source: Champion Spark Plugs Limited
Date Sampled: September 1, 1960 by: F. J. Dart

Lab. No.	Solids			pH	Alkalinity as $CaCO_3$		Ether Solubles	Acidity		Cyanide as HCN	Zinc as Zn	Total Chrome as Cr
	Total	Susp.	Diss.		Total	Phenol		Total	Mineral			
T-1191	will	not	dry	13.2	54,000	41,000	9,000					
T-1198				9.2			2,220					
T-1192	650	40	610	11.2	402	230						
T-1193	1,266	407	859	0.2				127,000	111,500			
T-1194	will	not	dry	1.9				1,450	1,175			
T-1195										102	64	
T-1196	520	96	424	10.8								8.0
T-1197	will	not	dry	13.3	46,000	38,000						250

T-1191 1. caustic cleaners (meter T-103)
T-1198 8. caustic wash
T-1192 2. overflowing rinse after caustic
T-1193 3. sulphuric acid dip
T-1194 4. overflowing rinse after acid dip
T-1195 5. overflowing rinse after zinc plate
T-1196 6. overflowing rinse following Macro L6
T-1197 7. leach agent (Macro Leach #1)

CHRYSLER CORPORATION OF CANADA LIMITED
2450 Chrysler Center

Personnel Interviewed: Mr. J. J. Payne, Utilities Engineer, Plants 1 and 3

Mr. H. Jarman, Superintendent of Plant Engineer, Plant 2

General:

The Chrysler Corporation of Canada Limited operated three plants in Windsor, Plant 1 was the truck plant, Plant 2 was the engine plant and Plant 3 was the car assembly plant. The plants operated five days per week and twenty-four hours per day. The daily water consumption was approximately 1,590,000 gallons, obtained from the city of Windsor.

Plant Operations:

Car Assembly Plant - Many of the component parts used in assembling the cars arrived at the plant covered with a protective coating of soluble oil. The oil was washed off in a dilute caustic solution before the part was used. Cooling water for the many welding machines used in assembling the cars was recirculated.

Metal treating for corrosion resistance and in preparation to painting was a major "wet" process in the assembly plant. The partially assembled bodies and chasis were dipped in an alkali cleaning solution followed by two water rinses. A phosphate dip, a rinse, a chromic acid dip and another rinse followed. The parts were then ready for the rust prevention

Plant Operations (cont'd.)

coating which is a water soluble latex coating. Any of the latex coating on the outside of the body was washed off with the washings going to a waste disposal system. After drying in a gas fired dryer, the bodies were ready to be painted. Two primary coats and two final colour coats were applied in water walled paint booths. The water in the paint booths was to adsorb fumes and was recirculated. There was another system similar to the one just described, only smaller, for unassembled components such as fenders.

The water used on the wall of the paint booths was directed to one of four large settling tanks. In these tanks the paint was skimmed off and the water was recirculated to the paint booth. The paint sludge was trucked away and land dumped.

The frames used to carry the bodies and parts through the painting process were cleaned by having the paint stripped off them in acidic or alkaline solutions.

The wash water used following the latex coating operation was coagulated with activated silica and alum, and then pumped to a flotation unit where the "paint" sludge was removed and trucked away, and the water recirculated to the latex washing operation. This waste treatment process had a capacity of 120 gallons per minute and the whole system required ten to fifteen gallons per minute make-up water.

There was a large automatic plating process in the assembly plant for zinc plating nuts and bolts for rust prevention. The plating process was a cyanide process. Before plating, the nuts and bolts were cleaned in alkali, sulphuric acid, an alkaline electroclean tank, and muriatic acid.

Plant Operations (cont'd.)

There was a rinse between each of these cleaning operations. The parts were then dipped in a cyanide preparation tank and then plated. Following the plating operation, the parts were dipped in a drag out tank, were rinsed, then were given a nitric acid bright dip and a final rinse. The acidic and basic rinse waters neutralized each other in a tank of 2,000 gallon capacity. The rinse water containing cyanide was collected in one of two 2,000 gallon tanks while a previous amount was being treated with hypochlorite in the other tank. Each tank had a retention time of three hours. There was also a hand plating operation for parts that can not be put through the automatic plating machine. The rinses from the hand plating operation were treated with those from the automatic machine.

Truck Plant - The operations in the truck plant were similar to those in the car assembly plant only on a smaller scale. Cooling water from welding machines was not recycled. The metal treating operations were not the same as in the car plant. In the car plant the bodies were dragged through the solutions, while in the truck plant, the parts remained stationery and the solutions are sprayed onto them. The waste waters from the spraying operations were not treated or recycled as in the car plant but were sewered.

Engine Plant - Throughout the engine plant were washers used to remove oil from engine parts. These washers used caustic cleaners containing sodium metasilicate and tripolyphosphate, and were dumped every six to eight weeks. There were no welding machines that use cooling water

Plant Operations (cont'd.)

in this plant. Grinding and cutting operations required soda water for cooling and lubrication, and the soda water was dumped when it became rancid.

After the engines were tested by running them under their own power, the oil and water was removed from the engine. Any water that got into the oil system or oil that got into the water system was separated in a Boosey system. The oil was recovered and the water was wasted to the sewers.

Description of Sewers:

Most sanitary waste was discharged to the city sanitary sewers. The process wastes from the eastern parts of plants 2 and 3 were discharged to a 27 inch diameter city storm sewer that emptied into the Grand Marais Ditch just east of the salvage building. The process waste from the west side of plants 2 and 3 was discharged to a 60 inch diameter plant sewer that also discharged into Grand Marais Ditch. Plant 1, the truck plant at Mercer Street and Tecumseh Boulevard, discharged all wastes to the municipal combined sewers.

Sampling and Flow Measurements:

Eight hour composite samples were taken from both sewers before they reached plant 2 and also at the outfalls to the Grand Marais Ditch.

The flows through the two sewers were measured at their outfalls to the ditch with an Ott velocity meter.

Results:

The following table lists the analytical results of analyses performed on samples taken from the two sewers on October 26 and 27, 1960 by members of the Ontario Water Resources Commission, the results of a survey conducted in June 1956 by Chrysler Corporation, and limits on the discharge of wastes to storm sewers and natural watercourses recommended by the Ontario Water Resources Commission. The results are reported in parts per million, with the exception of pH and phenol.

Component	Recommended Limit	60" sewer		27" sewer	
		1960	1956	1960	1956
Biochemical oxygen demand	20	63	-	45	-
Suspended solids	15	144	483	90	412
pH	5.5 to 10.5	9.7	8	7.2	7
Phenol (parts per billion)	20	15	-	30	-
Oil	15	16	262	92.7	769
Cyanide	0	0	8.3	0	-

The results of the flow rate measurements indicated a flow of 850 Imperial gallons per minute from the 60 inch sewer, and 197 gallons per minute from the 27 inch sewer at 10 a.m. on November 2, 1960. This flow and the preceeding analyses indicate the following amounts of waste discharged daily to the Grand Marais ditch.

Results (cont'd.)

Component	60 inch Sewer	27 inch Sewer	Total
Flow - gallons per day	1,250,000	288,000	1,538,000
Biochemical oxygen demand - pounds per day	687	130	817
Suspended solids - pounds per day	1,800	260	2,060
Oil - pounds per day	188	267	455
Phenol - pounds per day	0.188	0.086	0.274

Discussion:

The 27 inch storm sewer carried waste that exceeded the recommended limit on discharges to a storm sewer or natural watercourse with respect to biochemical oxygen demand, suspended solids, phenol and oil. Of these, oil and suspended solids, greatly exceeded the recommended limit. Most of the polluting constituents seemed to enter this sewer south of Ypres Boulevard indicating that the major source of pollution of the 27 inch storm sewer originated in the eastern part of plant 2.

The 60 inch process sewer exceeded the recommended limit on discharges to natural watercourses in respect to biochemical oxygen demand, suspended solids and oil, with biochemical oxygen demand and suspended solids representing the major polluting constituents. The majority of these constituents entered the 60 inch sewer from the west part of plant 3.

Although the waste waters in the 60 inch and the 27 inch sewers contained excessive concentrations, this survey indicated a vast improvement

Discussion (cont'd.)

in the quality of the effluent since 1956 when the Chrysler Corporation conducted an Industrial Process Waste Survey at the Canadian Plants number 2 and 3. This improvement occurred in spite of the heavy waste load imposed when the rust and corrosion proofing process was recently added to the production line.

COCA COLA LIMITED
1650 Howard Avenue

Personnel Interviewed: Mr. Frank Morrow, Plant Foreman

General:

As the largest soft drink bottling company in Windsor, this company produced approximately 500,000 cases of soft drinks a year and employed approximately seventy persons during the busy season (summer) and approximately forty-five persons during the winter months. Though the plant normally operated eight hours per day, five days per week, in summer the operations generally extended to a second shift with a total of thirteen to fourteen hours per day, six days a week. Average water consumption for the plant was 18,400 gallons daily with a high of 25,000 gallons during the active months.

Operations:

Water and sugar were added to the concentrated coca cola extract to produce a beverage syrup used in the bottling operations. The bottling operations used automatic machines which mixed syrup, soda water, and softened water to fill the bottles of pop.

Wastes:

The main wastes of this plant were derived from bottle washing and sterilizing. The 3.5 per cent caustic solution used to clean the

Wastes (cont'd.)

bottles was followed by a caustic rinse in addition to being dumped itself as frequently as once a month in summer. The caustic solution was divided between three tanks with originally 219 pounds of caustic soda being added to each tank. The most exhausted tank of caustic was dumped each time. In addition, 40 gallons of stirilette solution (19% phosphoric acid) was dumped annually. Other possibly wastes oustide of domestic would be the wash-up of the syrup-blending tank and the bottling machine.

Sampling and Analysis:

A grab sample of the caustic bottle washing solution and the stirilette solution was taken at this company. The samples were then analyzed for the concentration of contaminant materials to give the following results.

	Total	Susp.	Diss.	pH	Alkalinity as $CaCO_3$	Acidity as $CaCO_3$
Caustic bottle wash	60,060	1,400	58,660	13.4	55,000	-
Stirilette solution	-	-	-	0.95	-	137,500

Summary:

Part of the water used at this company went into the product (about 18 per cent). Bottle rinsing was estimated to add about 60 pounds of alkalinity to the sewer each day, while the disposal of bottle washing caustic every one to three months releases 350 pounds of alkalinity. Every year as well 40 gallons of stirilette solution adds about 54 pounds of acidity due to its content of phosphoric acid.

COLONIAL TOOL COMPANY LIMITED
1691 Walker Road

Personnel Interviewed: Mr. St. Pierre, Maintenance Foreman

General:

This was a tool and die shop employing one hundred people. Most of the employees worked the day shift, five days per week, with twelve men on the second shift and two on the third shift.

Plant Operation:

The main plant operations were machining and hardening. The hardening operations consisted of heating the parts and quenching them in an oil bath. There was no liquid waste from this process, only uncontaminated cooling water.

Discussion:

The waste waters from this plant consisted of 500 gallons of water per week containing some trisodium phosphate, 200 gallons of water per week containing a small amount of soluble oil, cooling water and sanitary waste. These wastes were discharged to the combined sewer on Mohawk Street.

The contamination of the industrial wastes from this plant were considered to be negligible. Since the Colonial Tool Company Limited was one of the larger tool and die shops in Windsor, and its operation was

Discussion (cont'd.)

typical of that of other tool and die shops in the area, no other industries of this type were inspected in the city of Windsor.

Summary:

As this waste from this plant was of very small quantity and relatively inoffensive, the process wastes from this plant were considered negligible in terms of possible sewage treatment.

DOMINION FORGE LIMITED
2480 Seminole Street

Personnel Interviewed: Mr. R. T. Waddington, Metallurgist
Mr. Gordon Drouillard, Technician

General:

The plant employed approximately four hundred and fifty people, five days per week, one shift per day. Occasionally two shifts were needed. The plant consumed 254,000 gallons of city water daily in the production of alloy and carbon steel forgings for the automotive, aircraft and railroad industries.

Plant Operations:

There were a number of sections for the various operations such as heat treating, cold trimming, board and steam hammering, forging, pressing and upsetting. Most of the manufacturing operations could be classified as dry. The following description mentions processes and operations that used water or produced water-borne wastes.

In heat treating metal, the material was heated in a furnace then quenched in an oil bath, cooled by water circulating in a heat exchanger unit. The cooling water remained uncontaminated. In some operations materials were water quenched. In these cases, the waste cooling water overflowed from a basin where the scale was allowed to settle, and the scale was shovelled out of the basin and trucked to a dump. The oil

Plant Operations (cont'd.)

quenched metal was usually heated in another furnace that burned off the oil film and thus no oil was sewered.

In the hammer shop the tongs used by the workmen in moving red hot forgings were stored in barrels cooled by a continuous water overflow. The workers changed tongs every few minutes as they became hot. The overflow water was uncontaminated.

Boiler make-up was obtained from condenser cooling water, and was passed through ion exchangers before being admitted to the boilers. Steam returned from the "steam hammer mill" had the oil recovered before the condensate was put back into the boilers. Before steam was used in the cylinders of the steam presses, oil was injected into it to lubricate the inside of the steam cylinder.

Sewers:

The waste waters from this plant were discharged into combined city sewers that along with the Walker Road sewer joined the Argyle Road sewer which flowed to the Detroit River.

Summary:

The waste waters from this plant, other than sanitary waste, were mainly uncontaminated cooling waters. The amount of chemical contamination from processes such as quenching and boiler water treatment was considered

Summary (cont'd.)

to be insignificant. The majority of the sewered process water was spent cooling water. Segregation of any potentially contaminable waste flows should be undertaken if separate storm and sanitary sewers become available.

DUPLATE CANADA LIMITED

(Windsor Division)
1850 Walker Road

Personnel Interviewed: Mr. Sooley, Plant Engineer

General:

This plant employed one hundred people, five days per week and eight hours per day, for the production of automotive windshields. The daily water consumption was 159,000 gallons.

Plant Operation:

Glass used as the raw material was cleaned. Two sheets were then put together with a strip of plastic between them. These were placed in an oil filled autoclave and heated to 300°F. at a pressure of 165 psi. The formed windshields were then cooled by pumping the surrounding oil through water cooled heat exchangers. Cooling water was also used on four large compressors. A terrycloth filter removed oil from the water reused as boiler make-up.

Water Use:

Sanitary uses	-	3,000 gallons per day
Glass washing	-	5,000 gallons per day
Cooling	-	151,000 gallons per day
T O T A L	-	159,000 gallons per day

Summary:

The only contaminated waste water from this plant was the water used to wash the glass. When this was diluted with the large amount of cooling water from the rest of the plant it became negligible. The wastes were discharged to the Walker Road combined sewer.

ELECTROLINE MANUFACTURING COMPANY LIMITED
1305 Windsor Avenue

Personnel Interviewed: Mr. R. J. Dellard, Comptroller

This small industry produced die castings for fuel pumps and general electrical equipment for the automotive plants. Outside of a 14,700 gallons per day use of water for cooling dies and general domestic use, the company was essentially a dry industry. The uncontaminated cooling water entered the city combined sewer system on Windsor Street. Such uncontaminating cooling water would be acceptable for discharge to a storm sewer if one became available.

ESSCO STAMPING PRODUCTS LIMITED
444 Hanna Street West

Personnel Interviewed: Mr. S. Flagg, Plant Superintendent

General:

The plant employed twenty people, five days per week, eight hours per day. When two shifts were needed, the number of employees rose to thirty-five. Metal parts were stamped at this plant. The operations were essentially dry.

The only water used in the plant, other than sanitary water, was cooling water for the spot welding machine. These wastes were discharged to the combined city sewer on Hanna Street.

ESSEX PACKERS LIMITED
897 Mercer Street

Personnel Interviewed: Mr. D. McPharlin, Plant Manager
Mr. C. McMartin, Plant Engineer

General:

This plant had one hundred and thirty employees, ten of whom were on the night shift. The workers were employed five days per week and eight and a half hours per day.

The company engaged in slaughtering, meat dressing and sausage manufacturing operations. An average of thirty-five cattle per day were processed in the morning, and eight hundred and fifty hogs per week were processed during the afternoon.

The daily water consumption was 126,000 gallons per day and 80 per cent of this, or 100,800 gallons per day, was used in the slaughtering, dressing and rendering operations. The remainder was used in sausage processing (25,200 gallons per day).

Operation:

After the cattle and hogs were slaughtered and dressed, the carcasses were hung in cold storage. Blood and wash water from the killing floor was discharged to a sump in the plant yard and thence to combined city sewer on Mercer Street. Waste waters from the dressing and butchering operations drained to a settling basin for grease recovery

Operation (cont'd.)

and then to the sump. Paunch manure however was sewered directly to the small sump in the yard.

Clean fat from the dressing operations was rendered to produce edible lard. Waste water from the rendering cooker was discharged to the settling basin. The inedible portion of the animals, such as bones, hooves, skulls, horns, internal organs, etc., were ground, cooked and pressed into cakes to be sold as fertilizer. The liquid waste from this operation went to the sump in the yard.

In the manufacture of sausages, meat was ground and blended with additives before being stuffed into natural or artificial casings. The waste waters from this section included membrane soak and rinse water, in addition to water from general equipment cleansing. All wastes from this area were discharged to a special settling basin and thence to the general drain carrying the remainder of the plant wastes to the combined municipal sewer on Mercer Street.

Sampling:

Eight hour composite samples were taken of the effluent from the sausage section settling tank, the slaughter house settling tank and of the total effluent from the slaughter house.

Results:

The following analytical results are in parts per million, with the exception of pH. Also listed are analytical values for strong domestic

Results (cont'd.)

wastes for comparison with the wastes from this plant. The table includes the sewer loading in pounds per day based upon the average volume of waste flow and the analtyical results.

Component	Normal Strong Sewage	Slaughter house settling basin		Total waste from slaughter house		Sausage plant settling basin	
	ppm	ppm	lb./day	ppm	lb./day	ppm	lb./day
Biochemical oxygen demand	300	900	-	1,600	1,613	1,200	302
Suspended solids	350	276	-	886	893	206	52
pH	5.5-9.5	6.2	-	6.0	-	5.5	-
Total Kjeldahl	90	160	-	144	145	68	17
Free ammonia	50	91	-	38	38	16	4
Ether solubles	100	235	-	460	463	740	188

Sewer Loading from the Entire Plant:

Biochemical oxygen demand - 1,915 lb./day

Suspended solids - 945 lb./day

Total kjeldahl - 162 lb./day

Free ammonia - 42 lb./day

Grease (ether solubles) - 651 lb./day

Discussion:

The effluent from this plant proved to be strong in terms of

Discussion (cont'd.)

sanitary sewage due to its high 5-day biochemical oxygen demand, suspended solids, nitrogens and ether solubles. Overall the strength and volume of wastes would be of major consideration in the design of future sewage treatment facilities.

ESSEX WIRE CORPORATION LIMITED
1664 Windsor Avenue

Personnel Interviewed: Mr. R. S. Crichton, General Manager
Mr. G. Roe, Sales Engineer

General:

This plant employed approximately three hundred people on a five day, eight hour shift basis. Ten months of the year two shifts were employed. Manufactures of the plant included ignition coils, electrical cables, and general equipment for the electrical systems of automobiles. The daily water consumption averaged 64,100 gallons.

Plant Operations:

The operations at this plant were mainly confined to dry processes such as winding coils and weaving fabric insulation on electrical cables. Cooling water was used on spot-welders and plastic-extruding machines for coating wire. No contamination resulted in these uses of water. In addition, a small hand operation for lead-coating battery lead terminals employed muriatic acid as a fluxing agent. The volume of waste here however was negligible being under two gallons per dump discharge. No wire-forming or plating operations were carried out at this plant.

Summary:

Only cooling water and sanitary wastes were sewered from this

Summary (cont'd.)

plant whose processes can be basically considered dry. The wastes entered the city's combined sewer system on Windsor Avenue.

FORD MOTOR COMPANY OF CANADA LIMITED
Windsor Manufacturing Operations
278 Riverside Drive East

Personnel Interviewed: Mr. W. D. Chute, Plant Engineer
Mr. R. Corin, Assistant Plant Engineer

General:

The operations of the Ford Motor Company of Canada Limited in Windsor employed approximately five thousand people for the production of automotive engines, driveshaft tubes, tail pipes, gas tanks, wheels and a few other components of automobiles. Most of the plant operated one eight hour shift per day, five days per week. The power house operated twenty-four hours per day. The plant used 185,000 gallons of city water daily and 42,000 gallons of river water per minute in the normal operations of the plant.

Plant Operations:

The plant could be divided into four sections, the power house, the foundry, the machining building and the engine assembly building.

Cam shafts, crank shafts, heads, and fly wheels were case in the foundry. Engine blocks were not cast here but were brought in from an outside supplier. There was a cyanide hardening process in the foundry which was a decreasing operation. Where there once had been fifty cyanide pots,

Plant Operations (cont'd.)

only four were left. A major use of water in the foundry was in a dust collector on the roof of the building.

The machining operations took place in Plant 2. The main waste water from this plant was the soda water. The soda water contained such additives as oil, soap, and sulphides and was used as a coolant and lubricant in the machining operations. As the soda water was used it gradually became contaminated with oil from the hydraulic systems of the machines, and this oil was removed in a three compartment oil separator before the soda water was sewered. Several systems for recirculating the soda water were used but the purpose of each system was the same; to remove the metal cuttings and grindings for sale, if possible, as scrap, and to recycle the soda water. The soda water was sewered before it became rancid.

Cyanide plating of copper and chromium was carried out in Plant 2. The acid and alkali rinse waters were used to neutralize each other and the cyanide containing wastes were treated with hypochlorite to destroy the cyanide.

Throughout Plant 2 were water cooled welding machines, washers for removing oil from parts and a water-walled paint booth which did not have a water recirculation system but did have paint sludge removal. Other processes in this building, such as producing wheels and exhaust systems were dry operations.

In the Engine Plant, six and eight cylinder engines were assembled and tested. Washers using hot water and detergents for removal of oil from parts, a water walled paint booth with sludge removal and water

Plant Operations (cont'd.)

recirculation, the phosphate coating of cam shafts, and soda water recirculation systems as in Plant 2, were the equipment and processes discharging waste waters from the Engine Plant.

The main use of water in the Power House was cooling water for the turbine condensers. When an extension was built on the power house, an additional turbine had been installed and the raw water intake could no longer handle the cooling water requirements. As a result, a new raw water intake and pumping station was built at the east end of the company property. The old intake was still being used. Fly ash from the power house was pumped, as a slurry, to a pit near the waterfront, allowed to settle, and then trucked away.

Water Supply:

The plant used 185,000 gallons of city water per day for drinking, washing and for cooling in some machines that would become clogged if river water had been used. The city water used was refrigerated.

The power house was equipped with two 28,000 U.S. gallon per minute pumps for water used in the power house, and several 6,000 gallon per minute pumps for service water, but only two of these pumps operated at one time. The power house used water at a rate of 30,000 gallons per minute and the rest of the plant used 12,000 gallons per minute. In a normal eight hour operating period, the plant used 2,016,000 gallons of river water. All water pumped from the Detroit River was screened and chlorinated.

Sewers and Outfalls:

Sanitary waste throughout the plant was discharged to the city sewers. All process waste was discharged to the main process sewer which ran benealth the east side of the Engine Plant and Plant 2, and discharged to the Detroit River through a partially submerged 7 foot by 7 foot concrete outfall, north of the power house. The old water intake was approximately 10 feet east of the outfall and the new water intake was approximately 600 feet east of the process sewer outfall. The process sewer began as a 20 inch concrete pipe, changed to a 48 inch concrete pipe at the south end of the Engine Plant, a 60 inch brick pipe at the south end of Plant 2, and ended as a 60 inch concrete pipe from the north end of Plant 2 to the outfall.

Sampling:

An eight hour composite sample of the process waste was obtained from the outfall of the process sewer to the Detroit River. "Grab" samples of this effluent were also taken when an excessive amount of fly ash was visible. An eight hour composite sample of the Detroit River was also taken from the plant's old raw water intake.

Results:

The following table contains analytical results and the estimated waste loading from the plant during the eight hour production period. The other sixteen hours per day the power house operated, but at reduced capacity.

Constituent	Raw Water (Detroit River)	Plant Effluent	Net Loading
Biochemical oxygen demand	11 ppm	10 ppm	0
Suspended solids	84 ppm	134 ppm	10,080
pH	8.3	8.4	-
Alkalinity	120 ppm	96 ppm	0
Phenol	10 ppb	15 ppb	1 lb./day
Cyanide	0	0	0
Oil	-	0.8 ppm	161 lb./day

Plant Sampling Programme:

Twice monthly samples of the plant effluent were taken by plant personnel and analyzed for total solids, ignited solids, pH, iron, chromium, cyanide and oil. In reviewing the analytical results of these analyses the only problem seemed to be oil which on a few occasions reached a concentration of 10 to 15 parts per million.

Discussion:

From an inspection of the analytical results, it was seen that no waste constituent was being discharged by the Ford Motor Company of Canada Limited in excess of the concentrations suggested for discharge to natural watercourses, with the exception of suspended solids. Although the recommended limit on the concentration of suspended solids discharged

Discussion (cont'd.)

to a natural watercourse is 15 parts per million, and the plant was discharging waste containing 134 parts per million, the concentration of suspended solids in the Detroit River at the raw water inlet to the Ford Motor Company was 84 parts per million. This indicates that the plant was producing an effluent with a net suspended solids concentration of 50 parts per million. This is in excess of the recommended limit of 15 parts per million.

THE GENERAL FIRE EXTINGUISHER CORPORATION (CANADA) LIMITED
978 St. Luke Road

Personnel Interviewed: Mr. T. Siimes, Plant Manager

General:

Fire extinguishers were fabricated and assembled at this plant. Linen hose was produced and chemicals for charging fire extinguishers were dry-bagged. The plant employed sixty-five people who worked five days per week, eight hours per day. The daily water consumption was 10,250 gallons.

Plant Operation:

The fabrication and assembly of the extinguishers was mainly a dry operation. Soldering was a very small operation, the steps being: an acid dip, a cold water running rinse, and a hot water rinse. The amount of waste from this operation was insignificant. Although the water used in the hydraulic testing of linen fire hose was not recycled, the water used for testing the extinguishers themselves was. A water walled paint booth also had a recirculating water system which was dumped less than once a week. Cooling water was used on a compressor at a rate of 20 gallons per minute, eight hours per day. Three welding machines used about 1 quart of cooling water each, per minute.

This plant planned to move in the future but the operations at

Plant Operation (cont'd.)

the new location would be the same as at the present site. At the present time, the waste waters are being discharged to the combined city sewer on St. Luke Road.

Summary:

Of the 10,250 gallons of water used per day by this plant, over 9,000 gallons was discharged as uncontaminated cooling water. Furthermore, most of theremaining 1,250 gallons was sanitary water. Thus the amount of contaminated industrial water discharged was essentially negligible.

GENERAL FOODS LIMITED
1001 Wyandotte Street West

Personnel Interviewed: Mr. L. B. Dickhout, Plant Manager
Mr. M. A. Korol, Manager of Technical Services
Mr. M. A. Wood, Plant Engineer.

General:

This plant, employing one hundred and sixty people, operated five days per week. The office and packaging departments worked eight hours per day. The daily water consumption averaged 119,200 gallons, not including cooling water, which was pumped from a private well and returned to an abandoned well. The products included foods, such as breakfast cereals, instant rice, instant potatoes, tapioca, puddings, and cake mixes.

Process:

Building "F" - This was the cereal processing building. Two dust collectors, one for the Sugar Crisps manufacture and one for the Alphabits drying used eight and six gallons of water per minute respectively. These dust collectors were used continuously. A larger source of waste water was the wheat washer, which used approximately 30 gallons per minute. This was a continuous waste flow whenever the washer was in operation. The waste from this operation depended largely upon the quality of the wheat being processed, and the operating schedule of the process varied

Process (cont'd.)

upon the demand for wheat in other departments. The intermittent process would operate for only a few days then shut down for several days. Another source of waste was the "candy" coating process. The process itself produced no waste waters, but there was a daily clean-up of the equipment. The clean-up waste would contain an oakite cleaner and waste sugar.

The packaging operations were carried out in a room where the humidity was controlled. The dehumidifier contained a lithium chloride solution which was regenerated with steam. No contaminated liquid waste was derived from this type of dehumidifier.

In Building "D" such products as flour, tapioca, and baking powder were processed and packaged. All these operations were dry.

Rice and grapenut flakes were processed in Building "C". The production of grapenut flakes discharged no liquid wastes while rice processing was a major source. Both products were prepared alternately with some of the same equipment. After the rice was cooked, it was cooled and washed with water. This water was basically recycled except for approximately 35 gallons per minute which was screened and centrifuged before discharge. The collected solids were removed and sold as cattle feed and the liquid portion of the waste discharged to the sewers.

Waste waters from the wheat washer and dust collectors were discharged to an uncharted plant sewer that ran westward beneath Building "F" to the combined city sewer on Wellington Avenue. Sanitary and rice processing waste discharged to the Crawford Avenue combined sewer which in turn flowed into the combined sewer on Wellington Avenue.

Sampling:

Composite samples, covering a four hour production period, were taken. The waste flows from the sugar crisps dust collector and from the rice processing were sampled. The dust collector on the Alphabits dryer proved inaccessible for sampling. In addition, at the time of the survey, the wheat washer was not operative.

Results:

The following table contains the analytical results of the analyses performed on the samples and the resulting estimated waste load from the plant. Except for pH, all analytical results are in parts per million and loadings are in pounds per day.

Component	Rice Processing	Sugar Crisps dust collector	Alphabits dust collector	Wheat Washer
Flow - gpd	50,400	11,520	8,640	43,200
Biochemical oxygen demand - ppm	3,000	5,700	5,700*	300*
- lb/day	1,512	657	492	130
Suspended solids - ppm	1,944	1,224	1,224*	220*
- lb/day	980	141	106	95
Total nitrogen - ppm	15.3	41.2	41.2*	
- lb/day	7.7	4.8	3.5	
pH	5.4	5.8		

* estimated concentrations considered easily obtainable under normal operating conditions.

Results (cont'd.)

The following table contains the daily waste load from the plant which occurred whenever the wheat washer and rice processing equipment were simultaneous, in addition to the dust collectors which operated continuously. The total effluent concentrations were calculated from the daily waste load and the average daily water consumption. For comparative purposes, the maximumimum concentrations of components in industrial effluents recommended for disposal with sanitary sewage are also included in the table.

Component	Total Plant Effluent		Recommended Maximum in an Industrial Effluent - ppm
	pounds per day	parts per million	
Biochemical oxygen demand	2,791	2,340	300
Suspended solids	1,322	1,110	350
Total nitrogen	20	17	75

Summary:

The above table indicates that the waste from this plant was much stronger than that acceptable for treatment with normal sanitary sewage with respect to biochemical oxygen demand and suspended solids. The nitrogen analyses indicate that this waste is nitrogen deficient for sewage treatment, since the ratio of biochemical oxygen demand to total nitrogen

Summary (cont'd.)

is 140 to 1 whereas the normal operation of the biological treatment processes require a biochemical oxygen demand to nitrogen ratio of 8 to 1. This plant would be a major contributor to any future sewage treatment plant and any innovations to reduce or remove contaminants from these wastes would greatly ease the loading upon treatment facilities.

GENERAL MOTORS OF CANADA LIMITED
(Motor Division)
1487 Walker Road

Personnel Interviewed: Mr. P. Rudge, Manager
Mr. F. C. Pearce, Resident Accountant
Mr. J. Neilson, Safety Director
Mr. J. Pearson, Methods and Plant Layout

General:

This plant produced automotive engines for Pontiac, Chevrolet and Buick automobiles. Production was eighty Pontiac or Chevrolet six - cylinder engines per hour and eight Buick V8 engines per hour. The plant used 324,000 gallons of city water daily.

Plant Operation:

Plant 2 had assembly lines for the production of six-cylinder Chevrolet and Pontiac engines. Sub-assembly lines were used for the block and crank-shaft where cleaning produced some liquid waste. The main assembly line completed the engine and no liquid wastes result from the operations.

The machine floor, which prepared the component parts for the assembly line carried out such operations as cleaning, reaming, milling, grinding, drilling, granodizing, dry machining, lapping, and honing. In many of these operations a coolant was required which may be soda water or

Plant Operations (cont'd.)

a solution of soluble oil and water in the ratio of 40 to 1. The amount of body to the coolant will depend upon the material to be worked. Coolants were cleaned and recirculated until rancid and then dumped. The coolant recirculation system was usually a part of the machine where foreign matter was settled from the coolant or removed by magnetic pick-up.

Cam shafts received an etching process called granodizing which prevented scoring when two dissimilar metals such as cast-iron and steel are assembled. The process consisted of two hot water rinses, a lubrite (granodine) dip, a cold water rinse and finally a dip in a warm soluble oil and water solution for rust protection.

A maintenance section which provided machine repair service and tool making did not produce liquid waste.

A quality check was run on the assembled engines with a dynamometer. Cooling water used on the brake of the dynamometer was discharged, uncontaminated, to the sewers.

As a final test, the engines were run under their own power. After the test the water was recovered and recirculated, and the oil was drained, filtered, heated and reused.

Plant 2 had two water walled paint booths where the assembled engines were painted. The water used in these booths was recirculated and contained an alkaline additive which aided in the coagulation of the paint. The paint scum was removed daily.

Plant Operations (cont'd.)

Plant 2 also contained an assembly line for Buick V8 engines. This was mainly an assembly line with little machining done. The parts did have the soluble oil washed off them. Rocker arms were heat treated and machined. The hardening process contained the following operations - heating of the rocker arms in a propane furnace, quenching in an oil bath, and decarbalizing in an electric furnace. There was no liquid waste from this process.

Sheet metal parts such as oil pans, valve covers and crank shaft covers were cleaned and dipped in soluble oil (2 gallons to 100 gallons of water) for rust prevention.

The power house was equipped with three coal fired boilers having a capacity of 70,000 pounds per hour. However, the maximum steam used did not exceed 30,000 pounds per hour. The boilers operated on 100 per cent make-up in summer and 50 per cent returns during the winter. There was a continuous blowdown of 5 to 7 per cent. Boiler feed water was waste cooling water from the compressors, and was treated with chemical softeners.

Plant Sewers:

Process waste from the main plant and from plant 2 was picked up by six feeder lines, mostly 12 inch crock pipes, running east to the combined city sewer on Walker Road. Each of these sewers were thought to be equiped with lamp holes through which samples could be taken. However, only

Plant Sewers (cont'd.)

two of these lamp holes were located. The ones located serviced areas in the plant that discharged more waste waters than the rest of the plant, with the exception of the power house. Lamp hole number 2 was located 318 feet south of the north wall of the main building. Lamp hole number 5 was located 450 feet south of number 2 lamp hole. The lamp holes were between the main building and Walker Road.

Sampling:

Eight hour composite samples were taken from number 2 and 5 lamp holes, on October 26, 1960, between 8:45 a.m. and 4:45 p.m.

Waste Load:

Since the sampled feeder sewers drained the heaviest operating portion of the plant, the following table represents the maximum sewer loading from the plant. The actual loading is less than the values in the table. The calculations are based on the average of the analytical results of the two samples.

Constituent	Average Concentration (ppm)	Loading lb./day
Biochemical oxygen demand	158	512
Suspended Solids	244	790
Oil	108	350
Phenol	50 (ppb)	0.169

Discussion:

Should the city of Windsor build a sewage treatment plant the city should also enact and enforce by-laws limiting the discharge of industrial wastes. These limits are needed to help protect the biological sewage treatment processes and the equipment such as sewers and pumps from the uncontrolled discharge of industrial wastes. Slugs of industrial waste can corrode equipment and can disrupt the biological sewage treatment processes leaving them ineffective for several days or even several weeks.

Since the General Motors plant discharged its waste to the combined city sewer on Walker Road, its effluent would be controlled by the city by-law. The only contituent in the waste from this plant that exceeds the limits usually cited in municipal by-laws is oil. Oil of mineral origin is usually limited to 15 parts per million for discharge to a municipal sewerage system, and the effluent from this plant contained over 100 parts per million.

INDUSTRIAL PLATERS LIMITED
2468 Ouellette Street,
Sandwich West Township

Personnel Interviewed: Mr. J. Scislowski, Manager and Owner

Mr. M. Tyler, Plating Operator

General:

The company carried out zinc and chromium electroplating, the latter involving copper and nickel underplating. The company employed less than ten people and operated on a varying schedule averaging five days per week. Water use averaged 13,300 gallons daily.

Operations:

Three plating units were present. The unit doing zinc plating was automatically operated and included electrocleaning, acid pickling, zinc plating, and dichromate brightening. Running rinses were used following each operation. Another unit operated on a manual basis carrying out chrome plating with the following sequence of operations each requiring a running rinse: electrocleaning, hydrochloric acid pickling, copper strick and copper plating, sulphuric acid pickling, nickel plating, and chromium plating. In addition reclaim tanks were employed after each plating operation. The third plating line was used for barrel-plating of small parts. Its operations were limited to electrocleaning and either zinc or cadmium plating followed by a dichromate dip in the case of zinc. Rinses were

Operations (cont'd.)

employed with each operation. A minimum of buffing equipment was also in the building but it was a dry operation.

Wastes:

The continuous industrial wastes at this plant included the flows from about fifteen rinse tanks when all the facilities were in use. In addition, there were a number of dump discharges to be included. At regular intervals three 150 gallon acid solutions would be discharged as well as three alkaline electrocleaning solutions and two dichromate brightening dips. The only other wastes were from cooling and sanitation. The wastes entered a grease trap on the south-west corner and then entered the sanitary sewer on Ouellette Street.

Sampling:

A grab sample was obtained from the grease sump of the sewer containing the entire waste flow from the company, while plating processes were in normal operation.

Results:

The results of the analyses are tabulated below in parts per million, with the exception of pH

pH	Alkalinity as $CaCO_3$	Cyanide as HCN	Zinc as Zn	Copper as Cu	Nickel as Ni	Chromium as Cr
10.3	460	57.2	70	0.13	1.2	0.32

Results (cont'd.)

The pH, cyanide, and zinc concentrations were high in the wastes. The wastes were computed, from flow figures and analytical results, to add to the sanitary sewer the following amounts of contaminants in pounds per day.

Alkalinity as $CaCO_3$	- 61
Cyanide as HCN	- 7.6
Zinc as Zn	- 9.3
Copper as Cu	- 0.02
Nickel as Ni	- 0.16
Chromium as Cr	- 0.04

Whenever the dumping of the acid dichromate tanks occurred, an additional quantity of chromium was released. From a 150 gallon tank, the approximate amount of chromium would be 0.45 pounds. There were two such tanks available.

Summary:

The wastes reaching sanitary sewers from this company contained a relatively large amount of cyanide and zinc. These chemical components in quantity can inhibit normal sewage plant biological processes as can also copper, nickel, and chromium. It is notable that the quantity of these latter contaminants could also become excessive under certain operating conditions. Such contaminants may have to be limited in concentration in the event that full sewage treatment is installed in the future. Cyanide in the sewers also contributes the hazard of poisonous sewer gases, which are a risk to municipal employees working on such sewerage

Summary (cont'd.)

systems. Moreover, dump discharges from the plant should not be carelessly done. Discharges of acid and alkali should be coincided with one another to achieve approximate neutralization of each other before reaching the sewers. The dumping of dichromate dip tanks also contributed a large amount of chromium, aforementioned as one of the undesirable components in sewage treatment operations.

C. E. JAMIESON AND COMPANY (DOMINION) LIMITED
(formerly Nyal Drug Company Limited)
414 Riverside Drive West

Personnel Interviewed: Mr. M. F. Kulbacki, Vice-President

This company employed approximately thirty people and formulated a number of drug remedies. The plant operated on a forty hour week, five days a week with processes that were essentially dry, such as pill manufacture and tonic blending and bottling. The use of water in the plant was confined mainly to domestic uses, boiler make-up, and wash-up operations all amounting to less than 1,400 gallons per month. The process of this industry was considered to be dry.

THE KARCO COMPANY LIMITED
938 Walker Road

Personnel Interviewed: Mr. I. Pare, Assistant Secretary

The plant operated five days per week, eight hours per day, with thirty to thirty-five employees. Automotive accessories were produced here. The waste water from the plant totaling 4,080 gallons per day consisted only of sanitary waste and cooling water used on welding machines. These wastes were discharged to the combined sewer on Walker Road. With respect to liquid industrial wastes outside of cooling water, this company was dry.

KELSEY WHEEL COMPANY LIMITED
309 Ellis Street East

Personnel Interviewed: Mr. J. G. Hoba, Plant Superintendent
Mr. L. N. Savoie, Plant Engineer

General:

This company produced a large variety of automobile components from brake drums, hubs, wheel rims to other miscellaneous parts. The company at the time of the survey employed one hundred and twenty-five employees on an eight and a half hour day, five days a week, although the company normally employed from two hundred and seventy-five to three hundred and twenty-five. At busier seasons a second shift was occasionally used but not very often. The water consumed by the plant amounted to 255,000 gallons daily.

Operations:

The company was equipped to carry out finishing operations on automotive parts, particularly wheel components. Upon receiving the unfinished castings, the possible operations included stamping, milling, lathing, pickling, plating, coating, and spray painting.

Wastes:

From the pickling department, wastes included an overflowing rinse which followed the pickling acid treatment. The three acid tanks, in

Wastes (cont'd.)

addition, were each neutralized and dumped every week. The tanks averaged 1,500 gallons, each containing 180, 150 and 130 gallons of 66° Baume sulphuric acid respectively and were neutralized by approximately 600 pounds of lime in a lime slurry before discharge. Once a year, this section dumped 600 gallons of paint-cleaning caustic. A mildly alkaline hot rinse tank of 600 gallons was also dumped each day.

In the machine shop section of the plant, a 500 gallon caustic spray washer solution and a 350 gallon washer containing soluble oil were dumped and recharged every two weeks. The company had a phosphatizing unit. From this operation 1,100 gallons of iron phosphate solution were dumped every two months as well as 600 gallons of chromic acid sealer every three days.

Sampling and Analyses:

Grab samples of the significant wastes of the plant were taken for analyses. One exception to this rule had been the zinc plating unit which was not operating during the duration of the survey. The analyses are indicated on the attached analytical sheet.

Summary:

The continuous overflow from the rinse following the pickling acid dip at an estimated 18 gallons per minute added about 35 pounds of iron and 102 pounds of acidity. This would be liberally diluted by the company's overall 255,000 gallons per day use of water. The daily

Summary (cont'd.)

continuous flow of waste from this plant appeared not too excessive for inclusion into sewage treatment. The company however also had some dump discharges from tanks regularly emptied as below.

Waste	Volume in Gallons	Pounds of Contaminants: Susp. Solids	Alkalinity	Acidity	Other	pH	Frequency of Discharge
Neutralized pickling acid	2,040	719	41.6	-	244 iron	7.0	Three per week
Paint stripping solution	600	61	172.6	-	-	12.9	Once per annum
Caustic wash solution	500	6.8	2.7	-	-	9.8	Once every two weeks
Soluble oil solution	357	-	-	-	54 oil	9.2	Once every two weeks
Iron phosphate solution	1,100	13.2	-	32	13.2 iron	5.6	Once every two months
Chromic acid dip	600	-	-	2.2	0.36 chromium		Once every three days

Of these dump discharges, at least three wastes appeared to be unsuitable for discharged by their present method, in the event of a future sewage treatment plant. The neutralized pickling acid contained too much iron and suspended solids and would be best settled free of such contaminants before discharge to a sewage treatment plant. Resultant sludges settled out would be then removed and land dumped. In addition, the caustic paint stripping solution and the chromic acid dip had high

Summary (cont'd.)

alkalinity and high chromium for direct sewer discharge. It is notable that these latter wastes could be added to waste pickling acid and would, after acid neutralization and settling, become suitably treated for discharge to the sewers.

ONTARIO WATER RESOURCES COMMISSION

CHEMICAL LABORATORIES
INDUSTRIAL WASTE ANALYSES

Municipality: Windsor
Source: Kelsey Wheel Company Limited
Date Sampled: August 31, 1960 by: F. J. Dart

Report to: F. J. Dart

Lab. No.	Solids			pH	Chrome as Cr	Ether Solubles	Alk. as $CaCO_3$		Acidity as $CaCO_3$	
	Total	Susp.	Diss.				Total	Phenol-phthalein	Total	Mineral
T-1168	134,110	35,246	98,864	7.0	-	-	2,040	-	-	-
T-1169	35,820	10,170	25,650	12.9	-	-	28,700	26,500	-	-
T-1170	4,258	1,356	2,902	9.8	-	-	540	246	-	-
T-1171	-	-	-	9.2	-	15,100	-	-	-	-
T-1172	10,290	1,096	9,194	5.6	-	-	-	-	2,900	-
T-1173	1,154	40	1,114	5.6	60	-	-	-	376	0
T-1199	2,530	1,486	1,044	2.6					1,175	

T-1168 3. acid neutralizing tank discharge
T-1169 5. paint stripping tank
T-1170 6. caustic wash
T-1171 7. single stage soluble oil solution
T-1172 8. iron phosphate solution
T-1173 9. chromic acid rinse
T-1199 2. overflow rinse after pickling acid

KRUNCHEE POTATO CHIP COMPANY
3255 Wyandotte Street East

Personnel Interviewed: Mr. E. Oestman, Manager

General:

Potato chips and pop-corn were produced at this plant. The plant employed forty people, some of whom were driver salesmen on the road, and operated eight hours per day, five days per week. The daily water consumption was 24,900 gallons per day.

Operations:

The potatoes were first placed in the peeler. Here they were peeled and washed by rotating them in a roughened drum under a spray of water. The peelings were screened out and the waste water discharged to the plant sewer. The peeler operated six hours per day. The potatoes were then sliced in a rotary slicer under a spray of water to keep the slicer blades clean and free from pieces of potato. They were then tumbled and rinsed in water to remove the excess starch and finally fried in hot oil, salted and packaged. The last three operations produced no liquid wastes.

The processing of pop-corn also at this plant consisted merely of popping and packaging. These operations were dry.

Sewers:

At the time of the investigation, the plant was in the midst of

Sewers (cont'd.)

an expansion programme. The building addition being constructed during the survey will double the floor space of the original plant although it will basically serve as storage area only. The new section was being equipped with separate storm and sanitary sewers, a grease trap, and catch basin. The plant sewers from the old section will be rerouted to the sewers in the new section of the plant, and then to the separate sanitary and storm sewers on Wyandotte Street East.

Sampling:

Composite samples covering a four hour production period were taken of the waste from the potato peeler, and from the slicing and rinsing operation.

Water Consumption:

The following was an approximate distribution of water used in the plant.

sanitary use	-	1,200 gallons per day
peeling and washing	-	9,000 gallons per day
slicing and rinsing	-	14,700 gallons per day
T O T A L	-	24,900 gallons per day (metered water consumption)

Results and Waste Load:

The following table contains the analytical results of the

Results and Waste Load (cont'd.)

analyses performed on the samples and the resultant daily waste load from the plant.

Constituent	Peeling	Slicing	Total
Biochemical oxygen demand			
parts per million	560	1,050	*823
pounds per day	50.4	154.5	205
Suspended solids			
parts per million	1,216	176	*542
pounds per day	109.5	25.9	135
pH	5.5	5.0	-

Discussion:

The discharge of industrial wastes to sanitary sewers in a municipal sewerage system, including a sewage treatment plant, is usually limited to 300 parts per million biochemical oxygen demand and 350 parts per million suspended solids. These limits are imposed through a city by-law and their purpose is to insure that the sewage treatment plant has adequate capacity to treat the incoming sewage.

Summary:

The wastes from this plant were stronger than normal domestic sewage with respect to biochemical oxygen demand and suspended solids. The amount of waste from this plant would contribute, at 205 pounds of

* these concentrations were calculated from the daily waste load and the daily water consumption.

Summary (cont'd.)

biochemical oxygen demand and 135 pounds of suspended material each day, a heavy loading effect upon any future sewage treatment facilites. The company should seek as much recovery of suspended waste materials, e.g. potato peelings, as possible.

LA SALLE LEAD PRODUCTS
680 Wyandotte Street East

Personnel Interviewed: Mr. D. Benson, Service Manager

This industry proved to be a service station, employing seven people. The maximum use of water at the station was for checking leaks in tires. Occasionally though, the service station would make up lead storage batteries for a line of buses which the station serviced. The assembly of the batteries however resulted in very little waste as all the components and solutions were obtained already prepared for assembly. Thus this industry was essentially dry. The plant was connected to the combined sewer on Wyandotte Street.

LIQUID CARBONIC CANADA CORPORATION LIMITED
(Industrial Gas Division)
2440 Central Avenue,
Sandwich West Township

Personnel Interviewed: Mr. J. Pepper, Acting Superintendent

Employing only eight people, this company sold industrial welding gases, such as acetylene and oxygen, as well as general welding supplies. Oxygen, but not acetylene, was bottled on the premises. Oxygen production from air involved a twenty-four hour, seven day a week distillation process of liquefied air. The process required make-up water for a recycled cooling water system. Cooling water entered storm sewers on Central Avenue.

MANUFACTURERS PLATING LIMITED
666 Ellis Street West

Personnel Interviewed: Mr. E. F. Cygan, General Manager
Mr. W. Hywa, Maintenance

The operations at this plant were ceasing at the time of the survey. The operations have been a series of copper, nickel, and chrome plating lines. While twenty-five people had been formerly employed at the company, only three were left in winding up operations. The company was expected to be non-subsisting by the end of 1960. No plating operations were being carried out and hence waste samples were unobtainable. No industrial wastes were expected from this industry.

McCORD CORPORATION
890 Walker Road

Personnel Interviewed: Mr. G. W. Tutton, Manager

General:

This plant manufactured automotive radiators. The one hundred and ten employees worked eight hours per day, five days per week, and the number of employees had been as high as two hundred and thirty-six. The daily water consumption was 60,200 gallons.

Plant Operation:

Before soldering some parts were given a bright dip. The bright dip solution was five parts water, one part nitric acid, and two parts sulphuric acid, and the tank held approximately 80 gallons. This solution was not dumped, but sludge was removed daily. Following the bright dip the parts were rinsed in a hot water tank and a running cold water tank. The overflow from the cold water tank was estimated at 15 gallons per minute.

The component parts were soldered using zinc chloride as a flux. After assembly more soldering was carried out using hydrazine monohydrobromide flux. There was no liquid waste from this soldering operation because the excess flux was burned off in the soldering process.

The radiators were then given a hydraulic test in a tank containg water. There were approximately eight of these test tanks and each had an

Plant Operation (cont'd.)

overflow waste water flow of approximately 3 gallons per minute.

After testing the radiators were washed in 2 per cent muriatic acid. The washer contained nearly 300 gallons and was dumped twice a day. When the radiators were removed from the washer, they were rinsed in running cold water, and then in hot water. The running rinse tank had a waste flow of 40 gallons per minute, and there was no continuous waste from the hot water tank.

The radiators were finally painted in a water-walled paint booth that had total recirculation of the water.

The plant also used water for cooling and for boiler make-up.

The industrial wastes were discharged to the combined city sewers and entered the Detroit River through the Argyle Road sewer.

Sampling:

Grab samples of the bright dip cold water rinse, the overflow from a testing tank, the 2 per cent muriatic acid washer, and the water rinse following the washing operation were taken during full activity.

Analyses:

The samples were analyzed for the following, solids (total, dissolved and suspended), pH, acidity, copper and zinc.

Waste Load:

The following table lists the amount of wastes leaving the plant

Waste Load (cont'd.)

in an eight hour operating shift. Not included in the list are sanitary wastes, cooling waters, boiler wastes, and cooling and rinse water from the soldering machine that used zinc chloride flux. Except for pH, the analytical results are in parts per million.

Source	Flow gpd	Suspended Solids ppm	Suspended Solids lb/day	Copper ppm	Copper lb/day	Zinc ppm	Zinc lb/day	pH
Bright dip rinse	7,200	16	1.1	37	2.68	-	-	3.7
Test tanks	11,520	218	24.9	-	-	35	4.04	6.9
Acid Wash	600	628	3.8	80	0.48	600	3.60	0.9
Wash rinse	19,200	16	3.1	1.0	0.19	7.0	1.34	3.0
T O T A L	38,520	-	32.9	-	3.35	-	8.98	-

Discussion:

From the daily water consumption of 60,200 gallons and the losses of solids, copper, and zinc, a hypothetical total plant effluent was calculated that contained 55 parts per million suspended solids, 14.9 parts per million zinc and 5.6 parts per million copper. The concentrations of copper and zinc from this plant thus proved to be high for direct discharge to a sewer system with a treatment unit. In the event of sewage treatment, the copper and zinc contamination from this company should be reduced to much lower levels. The main objectional waste component is the 5.6 parts per million copper. The suggested limit on the discharge of copper

Discussion (cont'd.)

to a municipal sewerage system is 1 part per million because of the adverse effect of copper on the operation of a biological sewage treatment plant. Copper inhibits the aerobic oxidation of sewage and if the sewage plant influent reaches 5 parts per million enough copper will accumulate in the digester to impede the digestion process and reduce the production of sewage gas.

H. C. NELSON CHEMICALS LIMITED
1555 Kildare Road

Personnel Interviewed: Mr. C. Molyneaux, Manager

General:

This plant employed nine people including office, plant, salesmen and truck drivers. The daily water consumption was 510 gallons. The operations in the plant were the dry compounding and bagging of chemicals, mainly industrial cleaners. Waste waters consisted of water used to wash the compounding machine and water used to wash out drums. Most of the drums used, however, were non-returnable or had a replaceable polyethylene liner. The waste waters were discharged to the combined city sewer on Kildare Road.

This plant was classified as a "dry" industry.

O'KEEFE BREWING COMPANY LIMITED
Windsor Division
790 Walker Road

The brewing operations at this plant were suspended in 1957.

The offices on the premises were now used as a headquarter for sales personnel only.

ORIENTAL COMMERCE LIMITED
1574 Lincoln Road

Personnel Interviewed: Miss Anna Lee, Chemist

General:

This plant produced canned and frozen chinese foods. Fifty people were employed five days per week, eight hours per day. The plant water consumption was 20,500 gallons per day.

Plant Operation:

The fresh vegetables were washed before cooking and the resultant wash water entered floor drains. The plant germinated its own bean sprouts, and these were washed before cooking. Chicken was received in a frozen state and thawed out in a tank of about 30 gallons capacity. This tank was dumped each day. Spareribs were also soaked in a 30 gallon tank which was dumped once a day. When the vegetables and meats were cooked, the cooking water was left with the product. When production ended each day, there was a general clean-up of all the equipment. The plant used a large amount of cooling water for the refrigeration system most of which was recirculated.

The plant wastes were discharged to the combined city sewer on Howard Street.

Sampling:

Grab samples of the waste waters from the chicken thaw tank, the rib soak tank, and bean sprout washer were taken.

Analyses:

The samples were analyzed for biochemical oxygen demand, solids (total, suspended and dissolved), pH and ether solubles.

Results:

The analytical analyses revealed the following concentrations of contaminants in parts per million.

Flow	5-day BOD	Suspended Solids	Ether Solubles
Chicken thaw tank	1,650	152	10
Rib soak tank	300	142	48
Sprout wash water	10	12	-

Summary:

The three waste flows that were sampled contributed a negligible sewer loading of less than 2 pounds of biochemical oxygen demand, 1 pound of suspended solids and 0.03 pounds of grease. The only other waste stream that could be considered was the vegetable wash water. Most of the vegatables used were such vegetables as celery and tomatoes, and the wash water would undoubtedly contain even less biochemical

Summary (cont'd.)

oxygen demand and suspended solids than the bear sprout washings, and would thus be considered negligible.

The wastes from this plant were entirely acceptable for discharge to a municipal sewerage system. If separate storm and sanitary sewers become available, the uncontaminated cooling water should be diverted to the storm sewer.

PURITY DAIRIES LIMITED
1501 Howard Avenue

Personnel Interviewed: Mr. F. F. Mansell, Plant Superintendent
Mr. R. Daynes, Chief Engineer

General:

The plant employed two hundred and fifty people, one half of whom were driver salesmen who were in the plant only three hours per day. The processing departments of the plant operated five days per week producing bottled milk products, ice-cream, and cottage cheese. The plant received approximately 140,000 pounds of milk daily, 7 days per week, and the daily water consumption averaged 150,000 gallons.

Operations:

Raw milk was received at the plant in cans. Washing these cans was one of the major sources of waste in the plant. Washing bottles and cleaning the processing equipment was another source of waste.

The production of cottage cheese involved a third major source of waste. Three tanks were available for the production of cottage cheese each having a capacity of roughly 340 gallons. If each tank were charged with 3,400 pounds of milk, 8,500 pounds of waste whey would result. On some days all three tanks would be used. The whey was discharged directly to the sewer.

The manufacture of ice-cream was a dry process except for the

Operations (cont'd.)

daily wash-up of equipment. To wash-up approximately 60 gallons of cleaning solution was prepared, and circulated through the equipment. The cleaner was then dumped to the sewer.

The plant used cooling water in compressors and in ammonia condensers in the refrigeration system. Cooling water from the condensers was recirculated while that from the compressors was not. Water was also used as make-up for the boiler which operated at approximately 10 per cent returns.

Plant Sewers:

Most of the wastes (90 per cent) drained to the main sump in the basement of the plant. From here they were discharged to the combined city sewer on Howard Avenue. The discharge line from the sump was equiped with a valve and a pump so that in heavy rains, when the sewers backed up, the valve could be closed and the wastes pumped from the basement.

South of the main building and north of the milk receiving building was another sump that collected boiler blow-down and wastes from the milk receiving and can washing operations. This sump also discharges to the Howard Avenue combined sewer.

Wastes from the ice-cream section of the plant however discharged to the combined city sewer on Highland Avenue.

Sampling:

Composite samples covering a three hour period were taken from the two sumps described earlier. Samples of the waste whey and the discarded cleaning solution from the ice-cream process were also taken.

Results:

The following table contains the analytical results of the analyses performed on the samples and the daily waste loading from the plant.

Analytical results are listed in parts per million, except for pH, and waste loadings are in pounds per day.

Component	Main Sump	South Sump	Waste Whey	Wash from ice-cream section
Biochemical Oxygen demand -				
parts per million	300	1,140	38,000	78
pounds per day	405	86	324	.05
Suspended solids -				
parts per million	156	554	2,120	8
pounds per day	211	42	18	.001
pH	10.8	8.5	4.5	11.0
Alkalinity ($CaCO_3$) -				
parts per million	252	306	-	858
pounds per day	340	23	-	0.5
Acidity ($CaCO_3$) -				
parts per million	-	-	3,120	-
pounds per day	-	-	27	-

Total waste load -

Biochemical oxygen demand	-	815 pounds per day
Suspended solids	-	271 pounds per day
Alkalinity	-	363 pounds per day
Acidity	-	27 pounds per day

This total waste load accumulated when the production of cottage cheese was at its peak. When no cheese was being processed, the waste load was as follows:

Biochemical oxygen demand	-	491 pounds per day
Suspended solids	-	253 pounds per day
Alkalinity as $CaCO_3$	-	363 pounds per day

Summary:

The waste loading from this dairy was found to be very high with the consequence that it would be a major consideration in the design of a sewage treatment plant. It is notable that the whey derived from cottage cheese manufacture proves to be well over one hundred times as concentrated as ordinary sewage in terms of 5-day biochemical oxygen demand and could contribute as much as 40 per cent of a maximum loading of 815 pounds of biochemical oxygen demand per day.

Furthermore, large batch discharges of waste milk being even

Summary (cont'd.)

stronger than whey could easily load a sewage plant beyond its capacity. Batch discharges of caustic bottle washing solution can disrupt the biological sewage treatment process. Safeguards against such contingencies should be considered.

RINSHED-MASON COMPANY OF CANADA LIMITED
845 Wyandotte Street West

Personnel Interviewed: Mr. H. Franklin, Plant Engineer

General:

This plant, a manufacturer of paints and varnishes, consumed an average of 17,300 gallons of water daily. The plant employed ninety people five days per week, eight hours per day. Waste waters were discharged to the combined city sewer on Crawford Avenue.

Plant Operation:

The largest use of water in the plant was for cooling the ball mills where the paint pigments were ground. The only other use for industrial water was boiler make-up. The plant did not have water cooled compressors but an air cooled one.

Equipment was cleaned with solvents which were collected in drums and sent to Toronto for recovery. Some vats were cleaned with a strong caustic solution. These vats were four feet in diameter and three feet deep (240 gallon capacity) and one of these vats was dumped every four months. The one that was sampled was only three weeks old and would not be dumped for another three months.

The plant plans to install a rosin cooking operation which will probably include a barometric condenser.

Sampling:

The only sample taken was from a caustic vat and the analytical results are listed below. Except for pH, the analytical results are in parts per million.

5-day biochemical oxygen demand		-	1,600 parts per million
Solids -	total	-	65,280 parts per million
	suspended	-	2,990 parts per million
	dissolved	-	62,290 parts per million
pH		-	13.3
Alkalinity -	total	-	73,200 parts per million
	caustic	-	63,600 parts per million

Summary:

Wastes from the daily operation of this plant should have no adverse effect on a municipal sewerage system. However, the dumping of one of the caustic vats would produce a "slug" of waste that could have a detremental effect on a sewerage system.

The dumping of such a caustic vat would result in the discharge of the following to the combined city sewer.

5-day biochemical oxygen demand	- 3.8 pounds
Suspended solids	- 7.2 pounds
Total alkalinity	- 176 pounds
Caustic alkalinity	- 153 pounds

This amount of alkalinity would have an adverse action upon biological processes necessary to the efficient operation of a sewage plant. The wastes would probably require neutralization before being discharged to the sewer or could be land dumped.

R. P. SCHERER LIMITED
1370 Argyle Road

Personnel Interviewed: Mr. H. H. Larsen, Plant Manager

General:

The plant had fifty-five employees, most of whom worked eight hours per day, five days per week. Soluble gelatin capsules containing general pharmaceuticals were produced and capsule machines operated twenty-four hours per day. The daily water consumption was 13,900 gallons.

Operations:

The preparation of the pharmaceuticals was carefully controlled to eliminate any loss of the expensive solvents and solutions to the sewers.

The gelatin solution used for the capsules was prepared in 45 gallon portable tanks. After the tanks were connected to the capsule machine and completely drained, the small amount of gelatin adhering to the sides of the tank was washed out. The resulting wash waters contained gelatin, glycerin, dyes and various inert pigments such as titanium dioxide.

The capsule machine extruded the gelatin as a ribbon about four inches wide then cut, shaped and formed the capsules. During the forming operation the capsules were filled and sealed. After filling, the capsules were hardened by dehydrating with a solvent and dried under infra-red lamps. The solvents used to dry the coating of the capsules were recovered by a distillation process. The bottoms from the distilling

Operations (cont'd.)

operation was used for conditioning roads.

The plant used a large amount of cooling water which was recycled through two cooling towers and two Centravac units.

Waste waters were discharged to the combined city sewer on Argyle Road.

Summary:

The contaminated waste streams from the operations in this plant were small. The only contaminated industrial waste was from washing the tanks in which the pharmaceuticals and gelatin was prepared. The waste loading from the wash water was considered insignificant so no samples were taken.

SILVERWOOD DAIRIES LIMITED
427 Chatham Street East

Personnel Interviewed: Mr. Innes, Plant Superintendent
Mr. Robb, Accountant

General:

This plant received 50,000 pounds of milk daily, seven days per week, with the remainder of the plant operating five days per week. Milk in bottles and wax-coated containers and cottage cheese were the products of this plant. Cottage cheese was produced two or three days per week, depending upon demand. The plant employed one hundred and ten people, mostly drivers, and had a daily water consumption of 81,200 gallons.

Operations:

The sources of waste in the plant were can washing, bottle washing, cheese processing and equipment washing.

Raw milk was received in cans and washing these cans was a major source of waste. After processing, the milk was either bottled or packaged in wax-coated containers.

The waste from the bottling machine contained milk and some of the caustic cleaner used on the bottles, while the waste from filling the waxed cardboard containers was only uncontaminated water used to rinse the containers before filling.

Whenever cottage cheese was prepared the tanks were charged with

Operations (cont'd.)

2,400 pounds of milk. This produced 400 pounds of cheese and approximately 2,000 pounds of waste whey per day.

Cooling water was used on compressors, in the refrigeration system and for cooling the milk after pasteurization. The cooling water was recycled except for that used on the compressors. This was used as boiler make-up.

Sampling:

Waste waters from the bottling machine were discharged to a sump in the plant. From here they entered a second sump which collected all plant wastes. The wastes flowed to the combined city sewers and were directed towards the Detroit River through the McDougall Avenue combined sewer.

Grab samples were taken of the bottling waste and the total plant effluent from the two sumps mentioned above.

Waste Load:

The following table lists the analytical results and the daily waste load. The analyses are in parts per million except for pH. The waste load was calculated in pounds per day, for a day when cottage cheese was being produced.

Waste Load (Cont'd.)

Component	Bottling Machine	Plant Effluent	Whey	Total
5-day Biochemical oxygen demand				
- parts per million	530	170	38,000	*255
- pounds per day	-	138	76	214
Suspended Solids				
- parts per million	120	124	2,120	*130
- pounds per day	-	101	4	105
pH	9.7	6.7	4.5	-
Acidity as $CaCO_3$				
- parts per million	-	31	3,120	-
- pounds per day	-	25	6.2	31
Alkalinity as $CaCO_3$				
- parts per million	160	-	-	-
- pounds per day	-	-	-	-

* These concentrations were calculated from the daily waste load and from the daily water consumption. The calculation of these values assumed that the waste whey was discharged evenly during the operating day.

Discussion:

The waste from this plant would be acceptable for discharge to a city sewerage system including a sewage treatment plant, on days when cottage cheese was not produced.

It would be advisable to discharge the whey evenly over the operating day and not as a sudden "slug" over a short period since a batch

Discussion (cont'd.)

discharge of whey could represent one-third of the daily waste load. The plant should also guard against "slug" discharges of milk and of bottle-wash caustic solution. These precautions would be necessary to prevent a severe overdemand on the oxidative capacity of a sewage treatment plant.

STANDARD PRODUCTS (CANADA) LIMITED
945 Prince Road

Personnel Interviewed: Mr. J. Lafleur, Plant Engineer

General:

This plant produced moldings and weather stripping for the automotive industry. The number of employees was between two hundred and fifty and three hundred. These employees worked five days per week, one shift per day. The plant water consumption was 41,500 gallons per day.

Plant Operation:

The only contaminated waste stream was a small flow from washing soluble oil from component parts. By far the majority of the water used in the plant was for cooling compressors and welding machines. The plant had discontinued plating and anodizing operations and such equipment was no longer present in the plant.

The wastes from this plant were being discharged to the combined city sewer on Prince Road.

SWIFT CANADIAN COMPANY LIMITED
847 Janette Avenue

Personnel Interviewed: Mr. Waterfield, Salesman

General:

This was a sales office and warehouse employing thirteen people, five days per week, forty-four hours per week. No meat processing took place here, and the 6,340 gallons of water used per day was for sanitary purposes and cooling for the refrigeration system.

The plant discharged sanitary wastes and cooling water to the combined city sewer on Janette Avenue.

TEXTILE SPECIALTIES MANUFACTURING COMPANY
420 Kildare Road

Personnel Interviewed: Miss N. Cox, Office Manager

General:

The number of employees in this plant was usually eighty, but varied from one hundred and sixty to fifty. The plant operated five days per week, and eight hours per day. The operations in the plant were cutting and sewing material to make sportswear. There were no wet processes, such as dying or washing, in the plant.

The plant discharged only sanitary wastes to the combined city sewer on Brant Street.

TOLEDO SCALE COMPANY OF CANADA LIMITED
2462 Howard Aveue

Personnel Interviewed: Mr. L. N. Baldock, Treasurer

Mr. J. B. Clancey, Vice President in-charge-of-Manufacturing

General:

Eighty people were employed by this company five days per week and eight hours per day. The plant machined and assembled automatic scales and food machines. The daily water consumption was 11,900 gallons.

Plant Operations:

The only uses for water in the plant were for cooling a compressor, cooling a vapour degreaser, and for boiler make-up.

The plant discharged sanitary waste and cooling water to the combined city sewer on Howard Avenue.

TWIN PINES DAIRY COMPANY LIMITED
636 Aylmer Road

Personnel Interviewed: Mr. S. N. Cohen, Plant Manager

General:

This plant produced bottled milk products, ice cream, popsicles, and cottage cheese. The fifteen employees worked forty-eight hours per week with the plant being closed a half day Sunday and Wednesday. The plant received 25,000 pounds of milk daily, seven days a week. The daily water consumption was 20,200 gallons.

Operation:

The plant received milk in tank trucks and cans. After separation, pasteurization, and cooling, the products were bottled. Washing of the tank trucks, cans and bottles produced waste containing small amounts of milk and caustic cleaner. About 1,000 gallons of caustic cleaner used in the bottling machine were dumped every three months.

The only waste from the production of ice cream and popsicles was miscellaneous wash water.

Cottage cheese was produced on an intermittant basis. The tank available for its production had a capacity of 140 gallons. If this tank was charged with 12,00 pounds of milk, approximately 200 pounds of cheese and 1,000 pounds of whey were produced. The whey was sewered.

Operation (cont'd.)

Periodically all equipment and piping was rinsed with chlorine and phosphoric acid to disinfect and remove casein scale.

Cooling water used in the refrigeration system compressor was not recycled but some of it was used as boiler make-up. Cooling water from the condensers was recycled.

Sewers and Sampling:

Cooling water from the refrigeration system, boiler blow-down and wash water from a floor drain in an area where a small milk can washing operation was carried on, discharged to a sump on the south side of the plant. All other plant wastes went to the main sump on the north side of the plant. Each sump discharged through a plant sewer to the combined city sewer on Aylmer Road.

A four hour composite sample was taken from the main sump. The flow in the south sump was too small to measure.

Results:

The following table contains the analytical results of the analyses performed on the sample of the north sump and the waste load calculated from these results assuming the sewer flow was equal to the water consumption. The analyses are reported in parts per million with the exception of pH.

Results (cont'd.)

Component	Main Sump	Whey	Total
5-day Biochemical Oxygen Demand			
- parts per million	400	38,000	*590
- pounds per day	81	38	119
Suspended Solids			
- parts per million	190	2,120	*203
- pounds per day	39	2	41
Alkalinity as $CaCO_3$			
- parts per million	282	-	-
- pounds per day	57	-	57
Acidity as $CaCO_3$			
- parts per million	-	3,120	-
- pounds per day	-	3	3
pH	10.7	4.5	-

* These figures are hypothetical concentrations calculated from the daily waste load (including the whey) and the daily water consumption. They also assume that the whey was being discharged evenly throughout the day.

Summary:

The normal discharge of this plant is not much stronger than ordinary domestic sewage and should not cause treatment difficulties in a treatment plant due to its relatively small volume. However, this company must guard against batch discharges of bottle washing caustic

Summary (Cont'd.)

and waste milk. Such discharges in large amounts can overload the normal biological functioning of a treatment plant. It may be advisable to replenish a little of the bottle washing caustic solution each day rather than discharge the entire waste at one time. The whey waste being of small quantity should not cause such difficulties.

UNIVERSAL BUTTON COMPANY OF CANADA LIMITED
1076 Walker Road

Personnel Interviewed: Mr. W. Atherton, Plant Superintendent

General:

The Universal Button Company produced metallic buttons and fasteners. The plant had thirty employees who worked five days per week and eight hours per day. The plant water consumption averaged 11,600 gallons per day. This water consumption decreased in the summer and increased in the winter.

Plant Operation:

Stamping of the fasteners was a dry operation. After the fasteners were formed they were plated with brass, copper, cadmium, and nickel. The plant had a compressor using cooling water at about 20 gallons per minute, but the waste flows of importance were derived from the plating section.

The buttons and fasteners were placed in a rotating drum with an alkali cleaner. After cleaning, the parts were rinsed by spraying water into the rotating drum. The waste rinse waters overflowed onto the floor and then drained to a pit before entering the plant sewers. The items were then put into the plating tanks, which were water-cooled. The cooling water was estimated to flow at approximately 14.3 gallons per minute, and also discharged to the pit. After plating, the parts were

Plant Operation (cont'd.)

rinsed in the rotating drums as before. Water used in the rinsing operations was an intermittant flow, and was estimated at 1,000 gallons per day. The fasteners were then centrifuged and dried. In the plating section was a running rinse tank that workers used mainly for rinsing their hands. The overflow from this tank was slightly less than 1 gallon per minute.

The water consumption and waste flow from the plating section was approximately 8,300 gallons in an eight hour production shift.

Sampling:

A one hour composite sample was taken from the pit in the plating section. This represented the total waste from the plating section.

Results:

The following table contains the analytical results in parts per million and the calculated sewer losses in pounds per day from the plating section.

Component	Concentration ppm	Sewer loss lb/day
Suspended solids	92	7.6
Copper	10.6	0.9
Cyanide	86	7.1
Nickel	35	2.9
Cadmium	trace	-

Discussion:

This plant discharged its waste waters to the combined city sewer along the Pere Marquette railway. If the city of Windsor provides a sewage treatment plant, it will also have to enact and enforce by-laws covering the discharge of industrial wastes to protect the biological treatment process and the equipment in the system. The waste from this plant will be governed by the city by-law, as will all industrial effluents.

Most sewer by-laws suggest a limit of one part per million copper for discharge to a sanitary sewer system. This is because copper entering a sewage treatment plant will accumulate in the digester and disrupt the digestion process. The suggested limit on the discharge of cyanide to municipal sanitary sewers is 2 parts per million. This limit is imposed because of the toxicity of hydrogen cyanide gas. If the cyanide content of a waste stream becomes excessive, hydrogen cyanide gas can be liberated and could become hazardous to workmen in the sewers or at the sewage treatment plant.

Summary:

The wastes from this plant were particularly concentrated in respect to the contaminants of cyanide, copper, and nickel for inclusion in a sewage system equipped with sewage treatment facilities. It would be necessary for the municipality to regulate the amount of contaminants entering the sewers in order to ensure that the biological action

Summary (cont'd.)

of a sewage treatment plant would not be adversely effected. In addition, the presence of high cyanide in a sewer system creates the additional hazard of poisonous hydrogen cyanide gas being released in the sewers where workmen would be endangered by it.

VERNOR'S GINGER ALE LIMITED
1030 Walker Road

Personnel Interviewed: Mr. R.S. Dufty, Vice-President

General:

This was a soft drink plant producing Vernor's Ginger Ale in bottles as well as draft and Hires Root Beer. The plant operated five days per week with twenty employees working eight and a half hours per day. Two of these employees were on the night shift. The daily water consumption was 14,850 gallons.

Operations:

Extracts were prepared and aged for four years. This was a dry operation.

Bottle washing was the major wet process. The bottles were washed in three alkaline solutions, first a $3\frac{1}{2}$ percent solution of caustic soda, then a $2\frac{1}{2}$ percent and finally a 1 percent solution. The bottles were then rinsed and filled. The rinse waters were considered insignificantly contaminated, but a major waste occurred from dumping these three caustic solutions approximately once a month.

A large amount of water was used for washing the trucks and for cooling a compressor.

Water used in the product and for rinsing bottles was treated in a carbon filter and a sand filter before use.

The plant wastes were discharged to the combined city sewer just west of the Pere Marquette Railroad.

Sampling:

A grab sample of the strongest caustic solution in the bottle washing machine was taken.

Summary:

The amount of carry-over of caustic from the washing to the rinse water was considered to be insignificant. The main waste load from the plant comes from dumping the three caustic tanks on the bottle washer. The following table contains the sewer loading caused by dumping the three tanks once a month.

	Tank #1	Tank #2	Tank #3
Volume (gallons)	608	576	643
Approximate % caustic	3.5	2.5	1
BOD ppm	800	-	-
pounds	4.9	-	-
Suspended solids			
ppm	90	-	-
pounds	0.5	-	-
Total alkalinity			
ppm	69,200	-	-
pounds	420	*285	*127
pH	13.3		

* estimated values

The day to day wastes from this plant would cause no problem in a municipal sewerage system. Once a month, the plant discharges a 1,827 gallon slug of waste containing 832 pounds of alkalinity and small amounts of biochemical oxygen demand and suspended solids. This amount of caustic solution may prove to be excessive for discharge to a municipal treatment plant due to its high alkalinity and such untreated wastes may have to be neutralized before discharge.

HIRAM WALKER & SONS LTD.
2072 Riverside Dr. East

Personnel: Mr. Carson - Vice President

Mr. J. J. Magill - Plant Engineer

Personnel Interviewed: Mr. F. P. Mascarin - Assistant Plant Engineer

Mr. F. D. Leeder - Superintendent of Manufacturing and Maturing

Mr. J. F. Hyan - Chief Operating Engineer

Mr. R. Bayne - Chief Chemist

General:

The Walkerville plant of Hiram Walker and Sons Ltd. is a distillery for grain spirits, and the only plant that produces Canadian Club Whisky. Since this plant is the residence of the head office of all operations, there are a large number of office workers employed here. Of the 1100 workers, 75 of them are on 3 eight hour shifts, 6 days per week in the processing departments, and the remainder are on 1 shift 5 days per week in the plant and office.

The plant used approximately 138,000 gallons of city water daily for sanitary purposes, for use in the product and for equipment wash. The process water, mostly cooling water used on equipment such as coolers and barometric condensers, was screened and pumped from the Detroit River at approximately 2 million gallons per day, not including cooling water used in the power house and in the mash cooler.

Process:

After milling, the grains were cooked in preparation for the fermentation process. Before being pumped to the fermenters the cooked mash was cooled in the double pipe mash cooler.

The fermented mash was pumped to the beer still where the alcohol fraction was removed for rectification and further purification, and the slop was directed to the feed recovery building.

Feed Recovery:

The slop from the bottom of the beer still was screened, with the screenings going to a rotary dryer and the liquid being centrifuged. The solids collected by the centrifuge were also directed to the rotary dryer. Liquid from the centrifuge passed through a quadruple effect evaporator, and the syrup from the evaporator was divided between the rotary dryer and a drum dryer. The saleable products from the slop were the recovered grains from the rotary dryer and the product Stimuflav from the drum dryer.

Sewers and Outfalls:

The Walkerville plant was serviced by four main process sewers which discharge to the Detroit River through outfalls on three of these sewers, the 26" Brick sewer and two 30" cast iron sewers.

The 26" Brick sewer was a city sewer that passes through Hiram Walker's property to the Detroit River. Power house waste was discharged to this sewer. The waste contained boiler blow-down, lime-soda water softening sludge, deionized waste and a large quantity of cooling water.

Fly ash is not sewered but is trucked away. When the city sewer reaches the distillery property, it contains 305 ppm BOD and 154 ppm suspended solids; on leaving distillery property these constituents have been diluted to 53 ppm BOD and 78 ppm suspended solids.

The dry house or feed recovery waste effluent entered the Detroit River through a 30" cast iron sewer. This flow was estimated by plant personnel at approximately one million gallons per day and contained the barometric condenser cooling water from the quadruple effect evaporator. This was the strongest waste stream leaving the plant.

Wastes from the cooking and fermenting operations and cooling water from the mash cooler were collected in a sump which discharged to the feed recovery sewer and hence to the Detroit River. This waste flow was mainly cooling water and had a BOD concentration of 6.8 ppm and suspended solids concentration of 34 ppm.

Condenser cooling water, stream condensate and occasionally wash water were the wastes from the still building, and they discharged through a 30 inch cast iron pipe into the Detroit River. The flow was estimated by plant personnel at approximately one million gallons per day.

Sampling:

Eight hour composite samples were taken of each of the above described flows. The 26" brick sewer was sampled where it empties into the river and also before it enters the distillery from a manhole on Riverside Drive. The feed recovery waste stream was sampled at a manhole just east of the recovery building. The mash cooler, fermenter and cooker waste was sampled at a manhole just west of the Mill building and east of recovery

waste manhole. A sample of the still building effluent was obtained from a manhole near the north east corner of the still building.

Results:

The amount of biochemical oxygen demand and suspended solids in the waste reaching the Detroit River were estimated in the following table.

Waste Stream	Flow gal/day	Concentration (ppm) BOD	Susp. Sol.	Pounds per day BOD	Susp. Sol.
26" brick sewer at outfall to the River		53	78		
26" brick sewer before it enters the Distillery		305	154		
Dry House waste (Feed Recovery)	1,000,000	410	174	4100	1740
West end of processing area (cooking, fermenting, mash cooling)		6.8	34		
East end of processing area (still building)	1,000,000	44	42	440	420

Discussion:

The power house waste discharged to the 26" brick sewer increased the flow in the sewer and reduced the concentrations of biochemical oxygen demand and suspended solids already present, indicating that this waste stream was not of major importance in abating pollution of the Detroit River.

The waste from the feed recovery building was the strongest of the four waste streams since it contained the barometric condenser waste. There

was one quadruple effect evaporator in the recovery process and a second unit was being installed. This second unit will increase the capacity of the recovery system but the addition of a second quadruple effect evaporator could increase the polluting effect of entrainment and carry-over of components with the vapours entering the barometric condensers and the condensed vapours used in heating each of the effects.

Fermenting, cooking and mash cooling waste was low enough in BOD concentration for discharge to a natural water course but not with respect to suspended solids.

The still building discharged mainly condenser cooling water and steam condensate. The small amount of biochemical oxygen demand and suspended solids in this waste were probably due to equipment wash.

Wherever possible waste streams containing constituents contributing to the BOD and suspended solids concentration, such as equipment wash water, should be directed to the dry house for recovery, and not discharged directly to the river. In this way, three of the four waste streams would be suitable for discharge to a natural water course and the polluting constituents would be contained in one waste stream, the effluent from the recovery process. The polluting constituents in this waste stream can be minimized by improved operation of the multiple effect evaporators, the finishing pan and the barometric condensers. The undesirable components of this waste stream consist of carry-over or entrainment losses which condense in each effect and which are carried over into the barometric condensers. These losses can be diminished by decreasing the vapourization rate or installing entrainment separators in each effect of the evaporator. It would be prefered, if possible,

to discharge the contaminated waste flow from the recovery process, to the city sewerage system once a sewage treatment plant is installed, and discharge the uncontaminated wastes directly to the Detroit River.

WINDSOR CHROME PLATING CO.
663 Glengarry St.

Personnel Interviewed: Mr. S. Battiston, Foreman

General:

This plant was a chrome plating shop plating parts for the automotive industry. The parts plated were mainly bumpers. The plant operated 5 days per week and 9 hours per day with 9 employees. The daily water consumption was 8,500 gallons.

Operations:

The plating process comprised the following operations, caustic cleaner degreasing, electro-cleaning, copper striking, sulphuric acid dip, nickel plating, and chrome plating with a water rinse after each operation, - five rinses in all. The rinses before and after the nickel plating took place in the same rinse tank.

After the caustic solution was exhausted in the electro-cleaning tank, it was pumped for use in the caustic cleaner tank. In this tank the caustic was used to clean the parts and also to strip off old or defective chrome plating. The solution following these uses would then be discharged to the sewer. Three hundred gallons of this solution were dumped every 3 or 4 months.

All the plant wastes discharged to the combined city sewer on Glengarry St.

Sampling:

Two grab samples of the total plant effluent from a plant sump

were taken. One was preserved with sodium hydroxide for the determination of cyanide. The caustic stripping and degreasing solution was also sampled.

Summary:

The following table contains the analytical results of the analyses performed and are reported in parts per million (except pH). The estimated sewer loading of contaminants from this plant in pounds per day is also included.

Component	Continuous Waste	Dump each 3 to 4 months
Volume	8,500 GPD	300 gallons
Suspended solids		
concentration	52 ppm	2,370 ppm
loading	4.4 pounds per day	7.1 pounds
Hexavalent chromium		
concentration	5 ppm	175 ppm
loading	0.4 pounds per day	0.5 pounds
Copper		
concentration	0.6 ppm	7.0 ppm
loading	0.05 pounds per day	0.02 pounds
Nickel		
concentration	10 ppm	0
loading	0.8 pounds per day	0
Cyanide		
concentration	2.5 ppm	-
loading	0.2 pounds per day	-
pH	7.4	13.2

The concentrations of chromium, nickel, and cyanide were slightly excessive for discharge to municipal sewers discharging to a sewage treatment plant. While sampling did not show a higher copper concentration this component may also at times become excessive. Such metallic and cyanide wastes often prove to be a problem at sewage treatment plants by inhibiting the biological principles of sewage purification. Efforts should be made to reduce or liminate the amount of such contaminants reaching municipal sewers.

WINDSOR PACKING CO. LTD
Tecumseh Blvd. & Wellington Avenue

Personnel Interviewed: Mr. Sam Cohen, Manager

General:

The plant operated 5 days per week with 138 employees. The main operations took place from 7 a.m. to 3.30 p.m. There was a wash-up period from 3.30 to 7 p.m. Cooking in the inedible processing operations continued 24 hours per day.

The consumption of municipal water was 69,000 gallons per day from the records of the Sandwich West Water Board, averaged over a seven month period between Dec. 1959 and June 1960. In addition water was pumped from a private well at the rate of between 500 and 800 gallons per hour for use in the inedible product departments.

The plant processed from 75 to 80 beef and 300 hogs per day, in the mornings and afternoons respectively.

Operations:

Processes at this packing house included slaughtering, meat-cutting, sausage-making, lard-rendering and inedibles processing. Wastes from the slaughtering floors included general sanitation and washing operations which functioned in part at a constant level during processing. The main proportion of the blood waste however was not sewered, but retained and dried in the inedibles processing section after which it was sold as a dry powder. Fat trimmings derived from meat-cutting operations were rendered up with hot saline solution for the production of edible lard. The brine

solution from the rendering process was discharged to the plant sewer system. Solids collected in the plant, such as bones, hooves, heads, stomach linings and other inedible organs were broken up in crushers and cooked in rotary steam cookers to be pressed into fertilizer cakes. This inedibles section used a limited amount of well water and the wastes were derived mainly from the drainage from the cooked solids.

Grease was recovered from sumps wherever possible. Moreover, rotating screens were located in the plant to reclaim paunch manure and other solids which were hauled away as fertilizer compost. Wastes from the small sausage department were confined to cleaning and wash-up water.

Most of the wastes from the plant processes were discharged to a boarded retainer on the basement floor where some of the excess solid materials in the wastes was collected. The liquid components of the wastes then flowed to a pump sump from where it was pumped up into a sewer box seven feet above the basement floor where the company's plant sewer began. The arrangement was necessitated by the shallowness of the sewers in that area of the municipality. The sewer linked into the combined sewer on Tecumseh Blvd.

Sampling:

An eight hour composite sample of the combined plant effluent was collected from the plant sewer on the north-west side of the plant.

Results of Analyses:

The following table contains the analytical results of the analyses performed on the eight hour sample. For comparative purposes

the strength of strong sanitary wastes are also listed for the same analyses. The results are listed in ppm except for pH.

	BOD	Susp. Solids	Ether Solubles	pH
Windsor Packing Co. Ltd.	2,750	2,458	650	5.8
Strong sanitary wastes	300	500	40	7 to 8

Waste Loading:

Estimating from a use of city water of approximately 69,000 gallons per day from the township, and a maximum of 15,000 gallons per day from the well, this company may be discharging the following quantities of contaminants per day.

5-day BOD	1,909 pounds
suspended solids	1,689 pounds
ether solubles	451 pounds

The company was planning for expansion of refrigerated storage facilities immediately east of the present plant. The use of water in such a new section will likely be limited to refrigeration purposes only and be relatively uncontaminated after use. At that time, the sewer facilities of the plant were proposed to be revised with a large efficient settling basin installed.

Summary:

The wastes from the Windsor Packing Co. constituted a very heavy industrial waste loading from the stand-point of sewage treatment because of the high strength of the wastes and the large volume of flow. The proposed larger settling tank facilities should help minimize the strength of the wastes. Because of the expansion of stroage facilities at this company, however, it may be expected that the reduction of contaminants by settling may be somewhat offset by an accompanying increase in general business by this company. Any further measures to remove contaminants from the wastes should be carefully investigated as a small improvement in such a large quantity of waste would have significant benefits.

WINDSOR TEXTILES LTD.
635 Tecumseh West.

Personnel Interviewed: Mrs. Shulgan, Secretary to the President

This was a small tailoring establishment producing workmen's cotton gloves from cotton cloth. There was no process waste from this plant. The sanitary waste in addition was fully treated in conjunction with that from a bowling alley next door in a 100 population unit called a Septirobic Sewage Treatment Plant. The treated effluent from this unit appeared to reach combined municipal sewers on Tecumseh Street.

WONDER BAKERIES LTD.
337 Salter Ave.

Personnel Interviewed: Mr. J. L. Winfield, Manager
Mr. G. L. Smith, Plant Engineer

This bakery produced mainly bread and leaven buns. The company employed 60 people most of them truck drivers on a forty-two hour week, five day a week scheudle. The plant used approximately 9,500 gallons of water per day. Most of this was used to wash down the delivery trucks each day. Smaller amounts replenished the fire system and was used for boiler make-up. About 500 gallons went in the 25 batches of dough used to produce 17,000 loaves each day. These wastes discharged along with domestic sewage to the combined sewer on Salter Ave. This was basically a dry industry.

JOHN WYETH AND BROTHER LTD.
2109 Ottawa St.

Personnel Interviewed: Mr. R. Renaud, Maintenance Foreman
Mr. D. Tweedell, In-charge-of-Manufacturing
Mr. H. Rae, Process Foreman

General:

This company employing approximately two hundred persons manufactured general pharmaceuticals and baby foods. Plant operations on baby food products were continuous twenty-four hours per day, five days per week, while the rest of the processes were usually carried on during the day shift. Average water consumption was 32,900 gallons per day.

Operational Wastes:

The baby food processing had wastes very similar to dairy wash-up water in that they resulted when equipment was rinsed free of waste processed food largely formulated from dairy products. Volume of the wash-up was about 1,000 gallons. About 10 gallons of sterilizing solution was also used in cleaning out the apparatus and was then discharged to the drain. Further wastes were derived from the washing of Amphojel, a stomach acid remedy. The wash out process lasts from 8 to 16 hours per vat and the number of vats draining may vary from one to nine. The washings of this product, at a rate of 4 gallons per minute per vat contained mainly soluble chlorides and the resultant saline waste was clear and colourless after prolonged percolation through the product and draining through a filtercloth. Other uses of water were limited to make-up water for boilers and the recirculating cooling water

systems employed to produce refrigeration, and for other domestic uses.

Sampling:

Grab samples of the wash-up water and sterilizing solution used in cleaning equipment employed in manufacturing baby food were taken. In addition, the company forwarded a grab sample of the sewered waste water from the Amphojel process. The samples were analysed for the suspected contaminants.

Results:

The three samples on analyses gave the following analytical results:

Key

1. Sterilizing wash-up of centrifuge mixer
2. Wash-up water - baby food process
3. Amphojel washing waste water

Code	BOD	SOLIDS			pH	Alkalinity as $CaCO_3$	Acidity as $CaCO_3$	Sodium as Na	Chloride as Cl
		Total	Susp.	Diss.					
1	72,000	233,890	19,020	214,870	6.4	-	1068	-	-
2	1,100	3,624	144	3,480	10.4	1900	-	-	-
3	2.0	25,680	-	-	8.4	130	-	13,600	17,996

From the analytical results and the volumes the waste loading produced by each dump discharge was calculated in pounds.

	Volume	BOD	Susp. Solids	Acidity as $CaCO_3$	Alkalinity as $CaCO_3$
sterilizing solution	10 gal.	7.2	1.9	0.1	-
baby food process	1000 gal.	11.0	1.4	-	19.0

The volume of Amphojel washing seeped slowly to the plant sewers and was not a batch discharge.

Summary:

The wastes from this plant do not appear to be sufficiently high in contaminants that would adversely affect a sewage treatment plant to warrant the need for special consideration.