THE

ONTARIO WATER RESOURCES

COMMISSION

INDUSTRIAL WASTES SURVEY

of the

STEEL COMPANY OF CANADA, LIMITED

HILTON WORKS

Hamilton, Ontario

1968

A

Report On

An Industrial Wastes Survey

of

THE STEEL COMPANY OF CANADA, LIMITED

HILTON WORKS

Hamilton, Ontario

September 9-13, 1968

Division of Industrial Wastes

ONTARIO WATER RESOURCES COMMISSION

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REPORT

Ontario Water Resources Commission

Municipality Hamilton, Ontario Date of Inspection Sept. 9-13, 1968.

Re: THE STEEL COMPANY OF CANADA, LIMITED - HILTON WORKS

Field Inspection by P. Kresin, K. H. Eggers, Report by J. D. Luyt
J. D. Luyt

An industrial waste survey was conducted at the Hilton Works of The Steel Company of Canada, Limited, Hamilton, during September, 1968. The survey, carried out by the Division of Industrial Wastes, Ontario Water Resources Commission, was designed to:

a) evaluate existing waste control facilities and procedures,

b) locate those sources of water impairment within the plant still requiring corrective action, and

c) determine or estimate the waste loadings discharged to Burlington Bay.

Similar major industrial wastes surveys, the last conducted during March, 1966, have been undertaken in the past for primarily the same purposes. In addition to these major surveys, several sampling programmes have been conducted at the Hilton Works from time to time in the past for various reasons, including the estimation of waste loadings exerted on

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the Bay. No attempt was made during the 1968 survey to evaluate the existing sanitary waste treatment and disposal methods.

SUMMARY

The Hilton Works of The Steel Company of Canada, Limited, located on the south shore of Burlington Bay, is a fully integrated steel works producing some 3,800,000 ingot tons of steel per year. Positive steps have been taken by the Company to improve the quality of the waste effluents discharged. However, major problems still remain and are outlined in more detail in the body of this report. The largest single source of contaminating material was the 4-stand cold mill area discharging large quantities of emulsified oils to Burlington Bay. It is recommended that work on improving this and other unacceptable discharges be continued to develop and implement the appropriate waste control and treatment measures, and consequently, provide adequate protection to the receiving body of water. The Bay is in a severe state of impairment as shown by previous water analyses, sediment analyses and biological collections, and if the Commission's objectives are to be met, much tighter control and added waste control facilities and procedures must be instituted by the Company.

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DETAILS OF SURVEY

During the survey a great deal of assistance was given by personnel of The Steel Company of Canada, Limited including:

Mr. A. J. Lafreniere	-	Supervisor, Air and Water Quality Control Group
Mr. D. Andrews	-	Area Engineer
Mr. C. A. Perl	-	General Duties Engineer

Special acknowledgement is directed to Mr. Perl who contributed much time and effort to the survey.

OWRC personnel participating were:

Mr. P. Kresin	-	Student Engineer
Mr. K. H. Eggers	-	Technician
Mr. J. D. Luyt	-	Engineer,

all of the Division of Industrial Wastes.

Discussions with Company personnel were held prior to the sampling programme to familiarize OWRC personnel with the plant layout and to obtain up-to-date technical information regarding plant operations and waste control procedures. The sampling was carried out during the week of September 9, 1968.

For purposes of discussion, the Hilton Works may be conveniently divided into two parts, the "West Side" and the "East Side".

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DESCRIPTION OF PLANT AND PLANT OPERATIONS

The Hilton Works of The Steel Company of Canada, Limited is a fully integrated steelworks producing approximately 3,800,000 ignot tons of steel per year. The plant employs in the neighbourhood of 12,000 people and operates 24 hours/day, 7 days/week. Some areas of the plant operate considerably less than 21 shifts/week, depending on demand.

The basic raw materials in the production of steel are coal, limestone, iron ore and steel scrap. The following amounts of these materials were received (not necessarily used) during 1967:

Iron ore	-	7,300,000 tons
Coal	-	1,950,000 tons
Limestone	-	300,000 tons
Steel scrap	-	200,000 tons plus 1,300,000 tons generated internally.

Other materials used are zinc, tin, sulphuric and hydrochloric acids, dichromates, sodium carbonate, sodium hydroxide, calcium oxide, oils, greases and solvents.

The average volumes of water used during 1967 were:

City water	-	5.6 MIGPD
Bay water	-	277.7 MIGPD

For purposes of discussion, the Hilton Works may conveniently be divided into two parts, the "West Side, and the "East Side."

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West Side

Processing facilities on the west side included four batteries of coke ovens, a sintering plant, four blast furnaces, two by-products areas, and a phenol recovery plant.

The coke ovens produced coke by heating bituminous coal in the absence of air. The volatile material was driven off leaving a hardened residue or coke. The volatile materials were recovered and converted into by-products including sodium carbolate, ammonium sulphate, tars and light ends in the By-Product and Phenol Recovery Plants. Coking capacity was approximately 2,000,000 tons of metallurgical coke per year. The capacity of the new #6 battery was 800,000 tons per year.

Pig iron was produced in the blast furnaces. Iron ore, limestone and coke were charged into the tops of the furnaces and heated air blown into the bottoms. Combustion of the coke produced the carbon monoxide and the heat required to achieve the metallurgical reducing reactions of the iron oxides to iron. The limestone formed a fluid slag which carried off the impurities in the ore.

The molten iron and slag were periodically drawn off, the slag being discarded and the iron cast into blocks known as "pigs" for subsequent processing. In the production of one

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ton of pig iron, approximately 2 tons ore, 1 ton coke and 1/2 ton limestone are used and 1/2 ton slag and 5 tons of blast furnace gas are produced.

The Sinter Plant converted fine powdered ores, reclaimed flue dust from the blast furnaces, mill scale, and coke fines from the coke quenching operation into lump form by burning the mixture to a clinker under a forced draft.

The two By-Products Plants and single Phenol Recovery Plant recovered ammonium sulphate, napthalene, light ends containing benzene, sodium carbolate and tars from the coke oven gas. The gas was collected in mains flushed with ammonia liquor and cooled in the primary gas coolers also using ammonia liquor. The ammonia liquor was, in turn, cooled using bay water with no direct contact between the two liquids. The excess ammonia liquor was routed to the phenol recovery and ammonia distillation units before being sewered. The cooled gases after tar removal in tar decanters and precipitators were scrubbed with a 6% sulphuric acid solution to produce ammonium sulphate. The residual gases were passed through tar-bottomed final coolers where the napthalene was entrained in the tar. Water used in the final coolers was recirculated in a closed air-cooled cycle.

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The gas was then passed through the light oil scrubbers where it was scrubbed with a wash oil. The oil stream was steam-stripped to drive off the light fractions which were subsequently condensed in a tube condenser and stored for sale. The steam-stripper bottoms or debenzolized wash oil, after water decantation, cooling and settling, was stored for re-use.

In the phenol extraction plant, the phenol in the excess ammonia liquor was absorbed in a light oil and extracted using a 50% caustic solution to form the product, sodium carbolate. The light oil was directed to the ammonia distillation columns for ammonia recovery, and subsequent processing into ammonium sulphate. The excess waste liquor, after removal of the phenol and ammonia, was passed through a sump to settle out the lime solids added in the process, and was then discharged to the plant sewers and ultimately to the Bay.

East Side

Steel making at The Steel Company of Canada, Limited used both the conventional open-hearth furnaces and the newer electric-arc furnaces. The open hearth furnaces were essentially shallow rectangular basins or hearths enclosed by refractory brick walls and roof. The raw materials were pig

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iron, iron ore, limestone, scrap, hot metal, and various alloying substances. The purpose of the operation was to reduce the impurities present in the scrap and pig iron. The molten product was poured into molds and cooled. The solidified steel castings were called "ingots". Electric-arc furnaces generated the required heat by an electric arc passing from the electrodes to the furnace charge, otherwise the operation was similar to that of the open-hearth furnaces.

The next series of operations may be grouped together as "hot-rolling". The cooled ingots were reheated in "soaking pits" and reduced to blooms (square in cross-section) or slabs (rectangular in cross-section) by compression between the surfaces of two rotating rolls. In the billet mill, the blooms were passed through a series of roll stands, and were converted to billets. In the rod mill, billets were reduced to rods used in Stelco's finishing plants to produce nuts, bolts, nails and screws. The bar mills processed blooms, slabs and billets into merchant bar products. The plate mill converted slabs into plate steel of various sizes. The hot strip mill further reduced rolled plate to a thinner product. In each of the above mills, the raw material was passed through scale breakers where high pressure water jets removed surface scale.

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Prior to steel finishing, the steel surface must be cleaned. The Steel Company of Canada, Limited used both sulphuric acid and hydrochloric acid pickling lines to chemically remove surface oxides and scale. No. 1 pickling line used sulphuric acid but operated intermittently with demand, No. 2 line used sulphuric acid but was to be converted to hydrochloric acid by the end of 1968, (this was done), and No. 3 line employed hydrochloric acid which was regenerated for re-use. Sulphuric acid pickling was also employed in the hot-strip finishing mill.

Spent hydrochloric acid from the No. 3 pickling line was directed to the regeneration plant. The acid was fed to a roaster to convert the iron chloride to iron oxide (Fe_2O_3), a saleable product. A mixture of chlorine gas, water and small amounts of iron chloride and iron oxide were passed through a cyclone to an absorber. The cyclone removed the remaining iron compounds and the adsorber combined the chlorine gas and water to form liquid hydrochloric acid. The exhaust fumes were water-scrubbed and sewered. The over-all regeneration reaction of the plant can be summed as:

$$4FeCl_2 + O_2 + 4H_2O \rightarrow 2Fe_2O_3 + 8HCl$$

Steel finishing operations included cold rolling, continuous galvanizing and electrolytic tin-plating. The cold

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rolling mills, a 4-stand, a 5-stand, and a reversing mill further reduced thin steel strip and produced a smooth, dense surface. To dissipate the heat generated, an oil-water emulsion was directed in jets against the rolls and the steel surface during rolling.

Sources of Liquid Wastes, Treatment and Disposal

West Side

In the west side area, waste effluents were contributed by the water scrubbing of blast furnace gas and from the By-Products Plants.

Scrubbing water from furnaces "B", "C" and "D" were passed through the 105-foot diameter Walker thickener, the overflow going to waste and the underflow to a 30-foot thickener near the Sinter Plant. During the survey, "D" furnace, the largest of the three was down for repairs. Scrubbing water from "E" furnace, the newest and largest furnace, passed through a 75-foot thickener with the underflow also directed to the 30-foot thickener and the overflow sewered. The overflow from the 30-foot thickener was routed to the Walker thickener.

No liquid wastes originated at the coke quenching station as all water drained to the breeze basins and was re-circulated.

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In the By-Products area, liquid wastes were discharged from the lime sump after phenol and ammonia recovery, the naphthalene sump when in use (i.e. when the old final gas cooling system was in use), and the cooling water systems.

All liquid waste effluents from the west side were discharged to Burlington Bay by way of two outfalls, the south "open cut" and the north "trunk" sewer.

East Side

The open hearth furnaces used large volumes of relatively uncontaminated cooling water on a one-through basis. No. 2 open hearth discharged to the East Side Lagoon, while No. 3 open hearth discharged through a separate small lagoon to the Bay.

The hot-rolling mills used large volumes of water both as a roll coolant and for descaling of hot-rolled steel. Water from descaling, containing settleable iron solids and oils, was passed through scale pits to remove the mill scale. The individual overflows from these pits were directed to one of the two lagoon systems (East Side Lagoon and 148" plate mill lagoon) where oil removal devices have been installed. The lagoons also served to remove more settleable solids, although the calculated efficiency was poor. The scale pits were reportedly dredged as

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required and the sludge processed at the Sinter Plant.

In the cold mills, residual oils and greases on the steel were removed with bay water. Rolling oils were used as the coolant during the rolling operations. The final steel cleaning stages, after rolling, consisted of detergent and water washes.

In the 80" 4-stand cold mill area, all liquid wastes passed through two 40,000 gallon oil separators connected in parallel. These wastes, as described above, consisted of the continuous water washes containing oil, the continuous overflow from the detergent recycle tank and approximately 10,000 gallons of spent rolling oil discharged once per month. In each separator, surface skimmers removed the floating oils and greases to a central trough. Part of the aqueous decant was directed to a pressurized chamber where air was dissolved in the liquid. As the liquid re-entered the separator at atmospheric pressure, the dissolved air, coming out of solution, assisted in separating the soluble oil from the water.

The 5-stand and reversing cold mills did not have this oil-water separation system. Instead, the wastewater from these areas was discharged to the East Side Lagoon where settling and oil removal took place.

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Two pickling lines, one of which was operated only intermittently, used sulphuric acid. No. 2 pickling line operated at about 45,000 tons of steel per month using about 45 lbs of acid per ton. No. 1 pickling line operated at about 5,000 tons of steel per month. Spent pickle liquor from these two lines was directed to the plant sewers. No. 2 pickling line was to be converted to hydrochloric acid by the end of 1968 with the acid regenerated for re-use. No. 3 pickling line employed hydrochloric acid. Hydrochloric acid fumes released at the pickle line were vented to a scrubber where they were dissolved in water and discharged to the plant sewers. Liquid wastes from the acid regeneration plant originated from a scrubber following the absorber. This scrubber removed any excess gases and vapours not picked up in the absorption column.

At the Hot Strip Finishing Mill about 3,000 gallons per day of spent sulphuric acid pickling liquor were directed to a 15,000 gallon holding tank. The disposal system was designed to allow the acid to drain slowly to the Bay over a period of 10-15 hours, thus achieving dilution both before discharge, by the addition of cooling water and after discharge, in the Bay itself. No attempt at neutralization of the waste was made.

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Other waste streams originated from the galvanizing, electrolytic tinning and heavy gauge shear lines.

All liquid effluents from the East Side eventually found their way into Burlington Bay, either through the municipal Depew Street storm sewer or directly by means of a number of outfalls.

Sampling and Analysis

Several visits were made to the Hilton Works to obtain the technical information required in the preparation of this report, to select the sampling locations, and to conduct the sampling programme. All sampling points are shown in Figures 1 and 2. The sampling was carried out during the week of September 9, 1968.

"Triplicate" composite samples were taken at most sample stations. Grab samples of minor waste flows and of unusual flow conditions were also taken. On September 11, a sudden rainstorm occurred at approximately 2:30 p.m. Compositing of the samples was stopped and grab samples of certain key flows were taken.

All samples were returned on the day of collection to the OWRC laboratories for analyses. The analyses were carried

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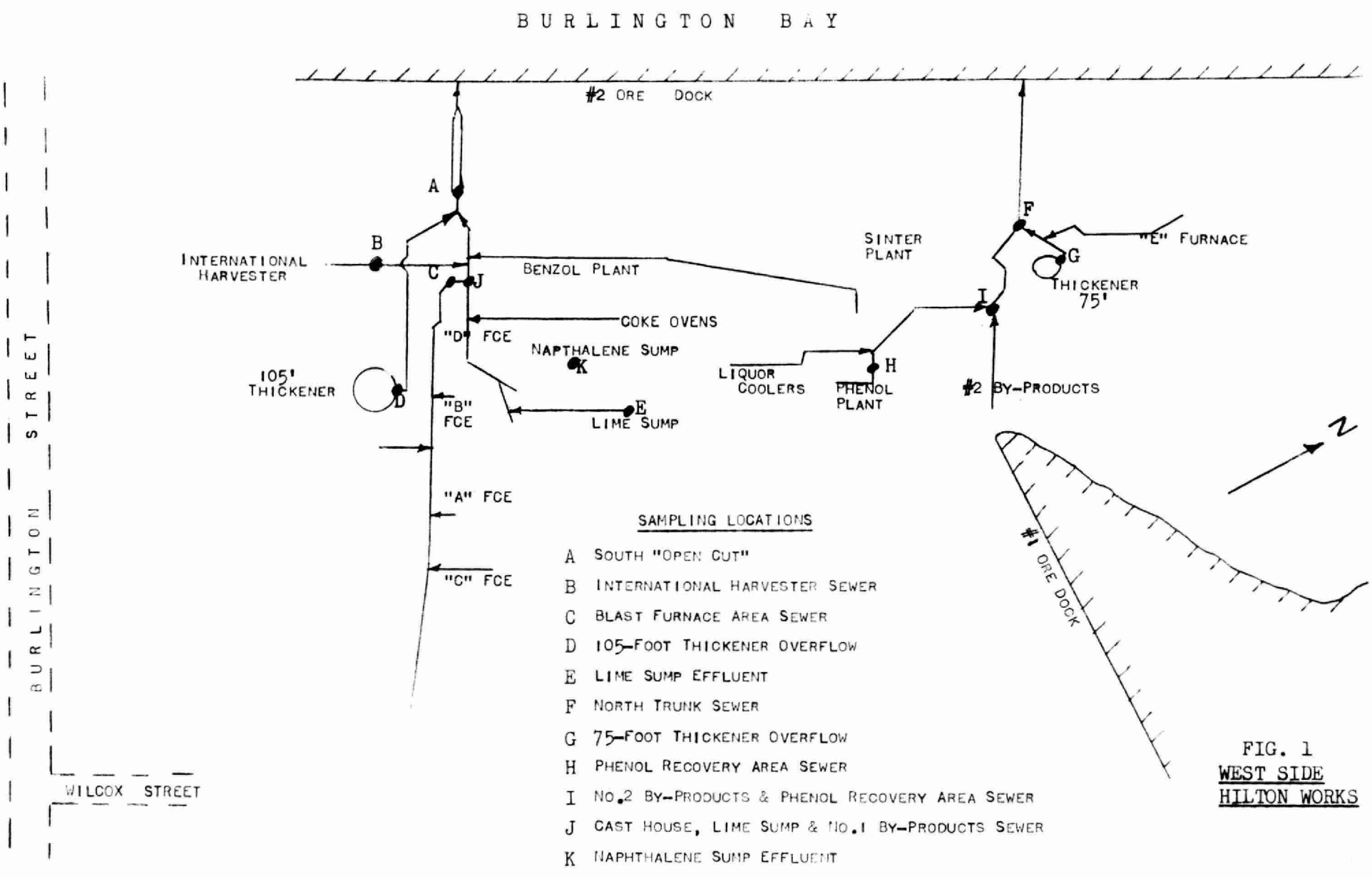


SAMPLING LOCATIONS

A SOUTH "OPEN CUT"

B INTERNATIONAL HARVESTER SEWER

C BLAST FURNACE AREA SEWER

D 105-FOOT THICKENER OVERFLOW

E LIME SUMP EFFLUENT

F NORTH TRUNK SEWER

G 75-FOOT THICKENER OVERFLOW

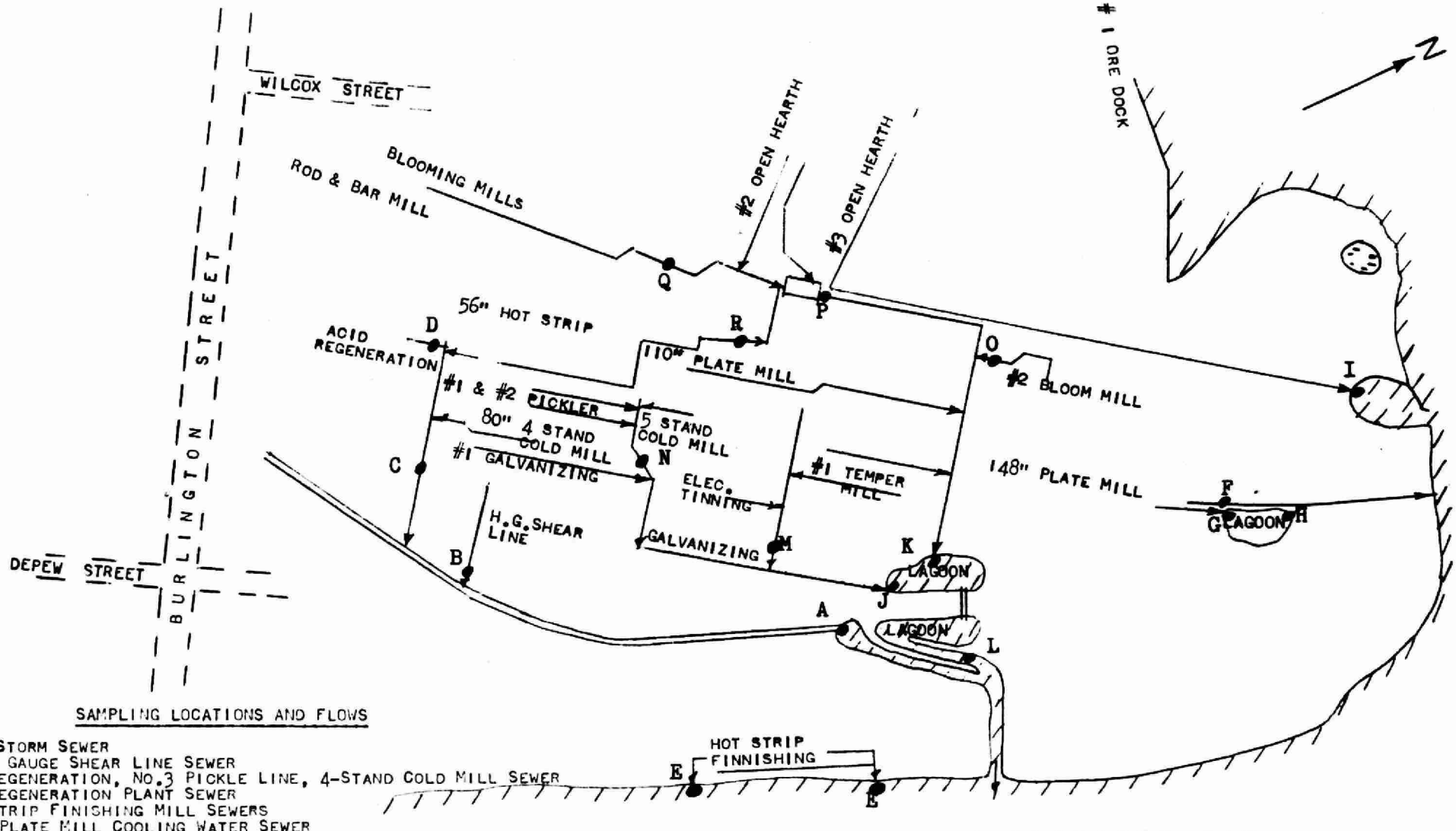
H PHENOL RECOVERY AREA SEWER

I NO.2 BY-PRODUCTS & PHENOL RECOVERY AREA SEWER

J CAST HOUSE, LIME SUMP & NO.1 BY-PRODUCTS SEWER

K NAPHTHALENE SUMP EFFLUENT

FIG. 1
WEST SIDE
HILTON WORKS



SAMPLING LOCATIONS AND FLOWS

A CITY STORM SEWER
B HEAVY GAUGE SHEAR LINE SEWER
C HCL REGENERATION, NO.3 PICKLE LINE, 4-STAND COLD MILL SEWER
D HCL REGENERATION PLANT SEWER
E HOT STRIP FINISHING MILL SEWERS
F 148" PLATE MILL COOLING WATER SEWER
G 148" PLATE MILL LAGOON INFLUENT
H 148" PLATE MILL LAGOON EFFLUENT
I NO.3 OPEN HEARTH SEWER
J SOUTH INFLUENT TO EAST SIDE LAGOON
K WEST INFLUENT TO EAST SIDE LAGOON
L EFFLUENT FROM EAST SIDE LAGOON
M ANNEALING AND ELECTROTINNING SEWER
N 5-STAND COLD MILL AND NO'S 1 AND 2 PICKLING LINES SEWER
O NO.2 BLOOM MILL SEWER
P LOW LIFT SUMP
Q ROD MILL, BAR MILL AND NO.1 BLOOM MILL SEWER
R 56" HOT STRIP MILL SEWER

FIG. 2

EAST SIDE HILTON WORKS

out for the most part in accordance with the procedures described in "Standard Methods for the Examination of Water and Wastewater". All analytical results are appended to this report.

Waste Volumes

Wastewater flows at most of the locations sampled were supplied by the Company's Utilities Department. The majority of the figures reported below were obtained by flow measurements made during or after the week of the survey.

Location*	Description	Volume (MIGPD)	
West Side			
A	South "Open Cut"	40.8	usually 50-58 MIGPD
B	International Harvester Sewer	1.3	
C	Blast Furnace Area Sewer	24.2	
D	105-foot diameter Thickener	14.9	
E	Lime Sump Effluent	1.6	
F	North Trunk Sewer	60.0	(approximate)
G	75-foot diameter Thickener	2.8	
H	Phenol Recovery Area Sewer	250	IGPD
I	No. 2 By-Products and Phenol Recovery Area Sewer	18.6	
J	Cast House, Lime Sump and No. 1 By-Products		not measured
K	Naphthalene Sump Effluent		not measured (1966 figure was 3.05)

* Refer to figures 1 and 2

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Location*	Description	Volume (MIGPD)	
East Side			
A	City Storm Sewer (Depew Ave.)		not measured
B	Heavy Gauge Shear Line Sewer	4.8	(est. and not measured)
C	HCl Regeneration Plant, No. 3 Pickle Line and 4-stand Cold Mill	9.2	
D	HCl Regeneration Plant	1.4	(approximate)
E	Hot Strip Finishing Mill		not measured
F	148" Plate Mill Cooling Water	23.5	
G	148" Plate Mill Lagoon Influent	14.5	
H	148" Plate Mill Lagoon Effluent	14.5	
I	No. 3 Open Hearth Cooling Water	40.0	
J	South Influent to East Side Lagoon	42.3	
K	West Influent to East Side Lagoon	126.5	
L	Effluent from East Side Lagoon	126.5	
M	Continuous Annealing and Electrotinning	18.9	
N	5-stand Cold Mill and No.'s 1 and 2 Pickling Lines	22.6	
O	No. 2 Bloom Mill	6.3	
P	Low Lift Sump Station	60.2	
Q	Rod, Bar and No. 1 Bloom Mill	21.6	
R	56" Hot Strip Mill	12.0	

* Refer to figures 1 and 2

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Estimated Waste Loadings

In calculating the waste loadings, the flow figures supplied by the Company and the average of the results obtained on the composite samples were used. Both the concentration and loading figures in the following tables have been corrected to show net figures (gross concentrations and loadings less service water concentrations and loadings). The following service water contaminant concentrations were used:

BOD_5	9	ppm	Chlorides	41	ppm
Susp. Solids	14	ppm	Phenolic Equivalents	1.3	ppb
Diss. Solids	318	ppm	Cyanide	-	
Ether Solubles	0.5	ppm	Total Iron	1.09	ppm
Ammonia	2.5	ppm	Diss. Iron	0.13	ppm
Kjeldahl N	7	ppm	Zinc	0.14	ppm
Phosphates	0.4	ppm	Tin	0	ppm
Sulphates	80	ppm	Chromium	0	ppm

The figures reported below each table in the following sections were calculated as total plant loadings from data for the following sample points: West Side - A, B, and F and East Side - B, C, F, H, I and L. These figures do not necessarily balance with the figure that would be obtained by summing the individual in-plant loading figures obtained and reported.

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It should be noted that Blast Furnace "D" was not operating during the West Side sampling programme and that Blast Furnace "E" was not yet operating at full capacity. Data for sample point West Side A have been corrected for the loading contributed by the International Harvester Company of Canada, Limited.

MAJOR SOURCES OF BOD_5

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)	1966 Results (lb/day)
West A-Open Cut	19	39.5	7,500	26,750
West E-Lime Sump	611	1.6	9,780	3,220
East C - 4-stand Cold Mill, etc.	143	9.2	13,100	(not sampled)

The total net BOD_5 loading from the Hilton Works was calculated to be 26,600 lbs/day.

MAJOR SOURCES OF SUSPENDED SOLIDS

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)	1966 Results (lb/day)
West A - Open Cut	32	39.5	12,200	23,950
West C - Blast Furnace Area	37	24.2	8,950	11,200
West D - 105' Thickener	36	14.9	5,360	8,475
West E - Lime Sump	750	1.6	12,000	-
East C - 4-stand Cold Mill, Etc.	116	9.2	10,700	(not sampled)
East L - East Side Lagoon Effluent	26	126.5	32,900	57,000
East M - 110" Plate Mill	41	18.9	7,750	2,015
East N - 5-stand Cold Mill	46	22.6	10,400	10,340
East O - No. 2 Bloom Mill	66	6.3	4,150	(not sampled)
East Q - Rod, Bar and Bloom Mills	31	21.6	6,700	37,350

The total net suspended solids loading from the plant was calculated to be 59,000 lbs/day.

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MAJOR SOURCES OF DISSOLVED SOLIDS

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)
East E-Lime Sump	10,260	1.6	164,000 (may not be representative)

The total net dissolved solids loading from the plant was calculated to be 154,000 lbs/day.

MAJOR SOURCES OF ETHER SOLUBLES

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)
East C - 4-stand Cold Mill, etc.	1,240	9.2	144,000

The total net ether solubles loading from the plant was calculated to be 128,000 lbs/day. These figures may not be realistic but certainly do show that large quantities of oil were being sewered.

MAJOR SOURCES OF AMMONIA NITROGEN

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)
West A - Open Cut	23.5	39.5	9,600
West E - Lime Sump	2,800	1.6	44,800*
West F - North Trunk	11.5	60.0	6,900

* Sample may not have been representative

The total net ammonia loading from the plant was calculated to be 16,800 lbs/day.

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MAJOR SOURCES OF KJELDAHL NITROGEN

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)
West A - Open Cut	26	39.5	10,000
West F - North Trunk	9	60.0	5,400

The total net Kjeldahl nitrogen loading from the plant was calculated to be 15,800 lbs/day.

MAJOR SOURCES OF PHOSPHATES

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)
East F - 148" Mill Cooling Water	2.4	23.5	564
East L - East Side Lagoon Outlet	1.2	126.5	1,520

The total net phosphate loading from the plant was calculated to be 2,344 lbs/day.

MAJOR SOURCES OF PHENOLICS

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)	1966 Results (lb/day)
West A - Open Cut	2,500	39.5	1,020	718
West E - Lime Sump	35,000	1.6	560	113
West I - #2 By-Products	100	18.6	19	-
East M - 110" Plate Mill	53.7	18.9	10	45.5

The total net phenolic equivalents loading from the plant was calculated to be 1,030 lbs/day.

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MAJOR SOURCES OF CYANIDE

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)	1966 Results (lb/day)
West A - Open Cut	1.45	39.5	590	2,750
West C - Blast Furnace Area	1.3	24.2	314	420
West E - Lime Sump	18	1.6	288	56

The total net cyanide loading from the plant was calculated to be 630 lbs/day.

MAJOR SOURCES OF SUSPENDED IRON

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)	1966 Results (lb/day)
West D - 105' Thickener	19.1	14.9	2,709	1,010*
East L - Lagoon Outlet	26.2	126.5	33,143	-
East N - 5-stand Cold Mill	28	22.6	6,100	52,100*
East O - #2 Bloom Mill	45.6	6.3	2,810	(not sample

* Total Iron

The total net suspended iron loading from the plant was calculated to be 39,070 lbs/day.

MAJOR SOURCES OF DISSOLVED IRON

Sample Location	Average Concentration (ppm)	Waste Volume (MIGPD)	Waste Loading (lb/day)
East L - Lagoon Outlet	7.7	126.5	9,740
East N - 5-stand Cold Mill	162	22.6	36,600

The total net dissolved iron loading from the plant was calculated to be 10,188 lbs/day.

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Batch or Periodic Discharges

Location	Material	Quantity
Hot Strip Finishing	spent pickling liquor	113,000 lbs H_2SO_4 117,000 lbs $FeSO_4$ 20,000 lbs HCl/mo.
No. 1 Pickle Line (used intermittently)	spent pickling liquor	131,000 lbs H_2SO_4 131,000 lbs $FeSO_4$/mo.
No.2 Continuous Annealling and Cleaning Line	caustic cleaning solution dumped to oil sludge pit	3% NaOH solution containing iron and dirt; 15,000 gal/4 mo.
5-stand Cold Mill	6% sheet oil and 10% tin oil dumped to oil sludge pit	4,500 gals twice/week and 5,000 gal/week respectively
	0.1% detergent solution	4,000 gal/week
4-stand Cold Mill	4-8% sheet oil to separator	10,000 gals/mo.
Reversing Mill	6% sheet oil and 9% tin oil	10,000 gals/mo.
Tinning Line	10% H_2SO_4 solution 1.5% caustic solution 2.5% sodium bichromate solution 1% chromic acid	100 tons/month 3,000 gals/week 1,600 gals/2 weeks 1,500 gals/2 weeks
Galvanizing Line	10% HCl 10^o - 13^o Bé $ZnNH_4Cl$ 1% $KCrO_3$ + 1% H_3PO_4	3,100 gals/4 weeks 750 gals/2 weeks 1,000 gals. periodically
Sheet Mill	4 - 5% H_2SO_4 and 12-15% $FeSO_4$	2,500 gals/month
12-10 Finishing Mill	5% H_2SO_4 and 11% $FeSO_4$	3,000 gals/month

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DISCUSSION OF RESULTS

West Side

A) Coke Ovens

The three coke quenching stations have been converted to total recirculation systems without blowdown and with makeup from the oil decanters. Therefore, there was no effluent discharge from the breeze settling basins. This has eliminated one former source of phenolics and suspended solids.

B) Blast Furnaces

Before and during the survey, the new "E" furnace had not reached full capacity. Also, two of the remaining four furnaces were down, "D" furnace temporarily and "A" furnace permanently. Therefore, the flows and loadings presented in this report could be expected to be lower than normal.

The overflow from the new 75-foot diameter thickener (2.8 MIGPD) contained high concentrations of suspended solids (33 ppm) and cyanide (0.5 - 1.1 ppm). Iron at 5.25 ppm was relatively low. At the control point (F), the cyanide concentration had dropped to less than 0.1 ppm but the suspended solids had increased to 50 ppm. Since "E" furnace had not reached full capacity, the thickener efficiency would be expected to decrease.

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The overflow from the 105-foot diameter thickener serving "B", "C" and "D" furnaces also contained high concentrations of suspended solids (50 ppm) and high suspended iron (19 ppm). The main sewer servicing the blast furnace area contained high concentrations of suspended solids (51 ppm) and cyanide (1.3 ppm). The control point (A) contained similar concentrations of these materials as well as other contaminants.

C) Sinter Plant

The 30-foot diameter thickener overflow was routed to the 105-foot diameter thickener thus eliminating a direct discharge to Burlington Bay.

D) By-Products and Phenol Recovery Plants

A number of waste control improvements had been made in the By-Products areas. The refining of light oils had been discontinued. Oil contaminated water from decanters in the light oil stripping section was routed to the coke quenching stations rather than being discharged to the sewers. In 1965, a closed water recirculation system was provided to eliminate the loss of phenols and cyanides from the final gas coolers. Blowdown was directed to the quenching stations. A Phenol Recovery Plant was in operation to recover phenols as sodium phenolate from the excess ammonia liquor.

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In By-Product area No. 1, the old final gas cooling system and naphthalene settling sump were in operation at the time of the survey. This system is used when the new final gas cooling system is not operating or not operating satisfactorily. A high strength waste in terms of BOD_5 (440 ppm) was generated here. Cyanides and phenols would also be expected to be present but these analyses were not performed on the sample. Also in No. 1 By-Product area, the lime sump used to settle lime solids from the effluent originating at the ammonia stills was not functioning efficiently. The settled solids in the sump had built up to such an extent as to reduce its settling capacity to almost nil. Either the sump is not cleaned as often as is required, or it is greatly undersized. The overflow contained high quantities of suspended solids (764 ppm), BOD_5 (620 ppm), phenols (35,000 ppb), cyanides (18 ppm) and ammonia (2,800 ppm). These contaminants, excepting the suspended solids, would probably not be removed by improved settling. They were also present in excessive amounts downstream in the sewerage system at points J and A (open cut).

In the phenol plant area a very small flow estimated at 250 GPD containing 20,000 ppb phenolics was found (point H).

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The origin of this waste was not known. Downstream at Point I, 100 ppb phenols was found.

East Side

E) No. 3 Open Hearth

The cooling water effluent from the No. 3 Open Hearth was satisfactory for direct discharge to a natural watercourse during the two sampling periods. However, visible evidence of severe impairment (red discolouration) was observed at another time during the plant survey. This was later reported to be the result of an annual equipment wash-down. This type of discharge must be eliminated or adequately treated before being allowed to gain access to the Bay.

F) 148" Plate Mill

The cooling water effluent from the 148" Plate Mill was satisfactory for direct discharge to a watercourse. The process wastewater was directed through a scale pit and a secondary settling lagoon equipped with a belt-type oil skimmer at the outlet. Visual examination of the facility indicated the scraper mechanism was not functioning efficiently, probably due to a worn-out scraping blade. The ether solubles concentration of the lagoon effluent was not extremely high but was approximately identical to the ether solubles content of the lagoon influent.

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The suspended solids concentration was reduced from 48-63 ppm to 26-29 ppm. Examination of the lagoon showed that it was in need of dredging.

G) Hot Strip Finishing

Spent pickle liquor containing 113,000 lbs H_2SO_4, 117,000 lbs $FeSO_4$ and 20,000 lbs HCl was discharged to the Ottawa Street slip monthly. The discharge of spent pickle liquor at this location was observed and sampled during the evening of September 12, 1968. Disposal facilities consisted of a tank located below the pickling floor. Reportedly, the acid was dumped from the pickling tanks to the disposal tank and allowed to drain to the slip over a period of 8-10 hours (about 3,000 gallons/day). At 10.00 p.m., September 12, the disposal tank was 75% full before receiving the daily batch of spent liquor. The additional spent liquor then caused an overflow directly to the slip.

It was reported that no attempts at neutralization before discharge was carried out.

The discharge of spent pickle liquor at full strength is capable of causing severe impairment of the receiving body of water. Complaints describing periodic low pH water in the slip have been received from non-Stelco personnel in the past.

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The practice of discharging spent pickle liquor at a slow rate is also not acceptable, particularly in a relatively quiescent body of water.

H) Acid Regeneration Plant

The liquid waste effluent from the acid regeneration plant was characterized by a reddish-brown discolouration indicative of fine particles of suspended iron. Low pH values were also obtained on one grab sample (3.1-3.5). It was reported that a part of the high solids and iron content could have been caused by a plant wash-down. Further downstream in the discharge sewer (point C), the acidity had been effectively neutralized but the suspended solids and iron concentrations had increased.

I) 4-stand Cold Mill

At Point C high concentrations of suspended solids, iron and oil were present. Wastes from the 4-stand cold rolling area were passed through an oil separator using dissolved air flotation but, based on the ether solubles results, the separator was not effective in removing the oil. In addition to continuous oil losses from the rolling area, there were certain batch discharges which would certainly not be effectively treated by the existing facilities. The 4-stand cold rolling mill area was not serviced by the East Side Lagoon. Instead, it discharged directly to the

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municipal storm sewer with no additional treatment before discharge to the Bay.

J) Heavy Gauge Shear Line Area (Sample Point B)

The samples collected from the sewer servicing the Heavy Gauge Shear Line which also discharged to the City storm sewer, indicated the waste effluent at the times of sampling was satisfactory for discharge to a storm sewer or watercourse.

K) East Side Lagoon System

The East Side Lagoon had two influents, termed the south inlet and the west inlet. The south inlet served a large part of the rolling and finishing operations, and was characterized by high suspended solids (largely iron), high ether solubles and phenol concentrations and by intermittent low pH's. The pH of the lagoon outlet, although still acidic, was not seriously affected.

The west inlet contained quantities of suspended solids and, at times, oil.

The lagoon was equipped with a baffle at the outlet to collect floating oil and debris. The oil was pumped from the lagoon to an oil sludge pit located on high ground on the bank of the channel flowing into Burlington Bay. Water was allowed to drain back to the lagoon. The location of the

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sludge pit was poor. Evidence of overflows of oil from the pit to the water channel downstream of the lagoon outlet was observed.

The efficiency of the lagoon was calculated to be:

Suspended solids	:	-5%
Iron (total)	:	26%
Ether solubles	:	70%

These efficiencies were calculated based on the two sets of composite samples collected on September 10 and 11. At approximately 2.30 p.m., September 11, a rainstorm occurred which would have altered the characteristics of the wastewater and therefore, sampling was stopped. The efficiencies for September 12, the day after the rainstorm were:

Suspended solids	:	-25%
Iron (total)	:	31%
Ether solubles	:	trace of oil reported in lagoon outlet

At the time of the survey, the first half of the lagoon was being dredged. The second half was in need of dredging as "islands" of solid material were present above the surface of the water.

Although the ether solubles content of the samples collected at the lagoon outlet were relatively low, ranging from

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traces to 19 ppm, oily patches were seen on the surface of the water channel downstream of the outlet at all times of observation.

L) Accidental Spillages and Emergency Discharges

Accidental spillages must be reported to the Commission through the Division of Industrial Wastes as soon as they are discovered. According to the Ontario Water Resources Commission Act, Section 27(1), the discharge of any material, whether deliberate or accidental, which has the ability and potential to impair water quality is an offence. A critical examination of the processing facilities at Stelco's Hilton Works, as at any other industrial plant, would contribute towards minimizing impairment of the receiving body of water resulting from accidents, errors or negligence. The aim of such a survey should be the development and implementation of measures for containing spills and eliminating operating errors.

In a large industrial complex such as the Hilton Works, there are procedures that are carried out intermittently and which result in the discharge of contaminating material. Examples include equipment wash-downs and de-scaling of cooling jackets in blast furnaces. These are planned events and therefore sufficient time to develop procedures to adequately handle the

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waste effluents should be available. Prior to the event, the Commission should be informed of the nature of the discharge expected and the procedures planned to prevent water impairment. Since the characteristics of the waste waters would vary widely, it is recommended that the Division of Industrial Wastes be consulted during the planning stages to determine the objectives to be achieved in each instance.

M) Oils and Greases

In the Hamilton Harbour area, impairment of the water by oil is a major cause for concern. Oil is not only aesthetically objectionable when seen floating on water or along shorelines, but it is also harmful to aquatic life and imparts tastes and odours to the water. It is felt that emphasis should be placed on the control of oil from all sources in the area. Of particular importance in this respect was the discharge from the 4-stand Cold Mill building containing 1,240 ppm ether solubles. This concentration may or may not be representative but it does show that greatly improved control was required.

N) Iron

The 1964-65 OWRC biological survey of Burlington Bay revealed that there was an area of several hundred acres near the steel mills devoid of aquatic life, including sludgeworms.

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The report stated the area of absence of sludgeworms in the Bay coincided very closely with the area where the iron content of the sediments exceeded 25% and suggested the iron had a toxic effect on the worms. Therefore, the need to prevent further accumulations of iron is apparent and if a balanced biological habitat is to be achieved, the iron already in the Bay must be removed.

The east side lagoon outflow contained unacceptable quantities of iron in terms of both concentration and loading. A concentration of 26.2 ppm suspended iron and 7.7 ppm dissolved iron in a flow of 126.5 MIGPD represents a loss of some 42,800 lbs. of iron per day.

CONCLUSIONS

Although positive steps have been taken by Stelco to reduce the discharge of contaminants to Burlington Bay from its Hilton Works, the implementation of additional waste control procedures are necessary.

The tables included in this report indicate the areas that were the major sources of the individual contaminants. Suspended solids, phenolics, cyanide, ammonia, iron and oil are the waste components of concern.

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A comparison of waste loadings calculated during this latest survey and those reported after previous surveys is made below:

	1964	1966	1968
Production	less than 3,000,000 ingot tons	-	3,800,000 ingot tons
Waste Flow (MIGPD)	173	217.4	280
BOD_5 (lbs/day)	31,000	38,000	26,600
Susp. Solids (lbs/day)	107,000	98,000	59,000
Iron (lbs/day)	80,000	-	49,200
Phenol (lbs/day)	1,050	-	1,030
Cyanide (lbs/day)	3,250	2,750	630
Ether Solubles (lbs/day)	-	-	128,000*
Ammonia Nitrogen (lbs/day)	-	-	16,800
Phosphates (lbs/day)	-	-	2,344

* Accuracy questionable

RECOMMENDATIONS

Items considered to require immediate attention to improve existing equipment or to develop and install adequate waste control procedures and facilities are listed in an

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approximate order of priority as follows:

1) The waste effluent discharge from the 4-stand Cold Mill area. Greatly improved control of the oil-bearing wastes was required. The average ether solubles concentration found was 1,240 ppm in a flow of 9.2 MIGPD. This flow was discharged directly to a municipal storm sewer with no additional treatment.

2) The existing methods of treating and disposing of spent pickling liquor. At the time of the survey, No. 3 pickling line was on hydrochloric acid and acid regeneration. At the 1968 year-end, No. 2 line was also on hydrochloric acid and acid regeneration. Conversion to hydrochloric acid and acid regeneration or alternate adequate treatment and disposal methods should be found for No. 1 pickling line and the Hot Strip Finishing pickling line.

3) The operation of the final coolers at the coke plant. The use of these coolers was intended to eliminate the direct contact cooling of ammonia liquor. During the survey, direct cooling of the liquor was being carried out, at least partially, resulting in the loss of quantities of cyanide, phenols and organic material through the naphthalene sump. This situation should be corrected.

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4) The settling efficiency of the East Side lagoon.

The efficiencies calculated for its settling characteristics showed it had almost no function as a settling basin. The lagoon has been constructed in such a way as to generate strong currents with the practical absence of quiescence to promote good settling. The lagoon was being dredged at the time of the survey. However, the lagoon has consistently been in excess of OWRC objectives for many years with respect to both suspended solids and iron.

During 1966, the lagoon was divided into two compartments to enable new trackwork to be constructed. At that time it was understood that the existing lagoon would be relocated within a few years. It is recommended that this relocation to provide a new and larger terminal settling and oil removal basin now be undertaken. This would not only act as a final polishing unit following the primary treatment units within the plant, but would also act as a device capable of providing emergency treatment in the event of acid spillages, oil losses or similar discharges due to equipment failure or other causes. As an example, acid losses could be discharged over a period of time to the lagoon while simultaneously manually adding neutralizing agents. The solids of neutralization, including suspended iron, would then be contained in the lagoon.

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Studies into the following problem areas should be continued or initiated and the appropriate treatment methods developed:

5) The reduction or elimination of the phenolics, cyanides and ammonia in the waste stream discharged from the lime sump.

6) The reduction or elimination of the cyanide in the waste flow from the blast furnace area.

7) Improvement of the settling efficiencies of the thickeners, particularly the 105-foot thickener.

8) The treatment or containment of slag quench water. Although this aspect of the Company's operations was not examined, it is expected that an unacceptable waste discharge could originate at this source.

The following items are those requiring improved maintenance procedures or modifications to existing operating procedures:

9) Regular and more frequent dredging of the East Side lagoon be instituted.

10) Improved maintenance of the lime sump at the ammonia plant to improve its operation. More frequent dredging or

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providing increased settling capacity is required.

11) Discharges of contaminated waste water through the No. 3 Open Hearth cooling water sewer be discontinued or adequately treated before discharge to the Bay.

12) Regular maintenance of the belt-type oil skimmer at the 148" mill lagoon be provided.

Contingency plans should be developed to adequately handle accidental oil losses to Burlington Bay. It is felt that the availability of a portable floating oil boom would be of value in minimizing the effects of any possible accidental oil loss to the Bay.

Periodic reports giving the results of the Company's waste effluent sampling programme should be submitted from time to time. Details of the sampling programme have already been discussed with Company personnel.

The Steel Company of Canada, Limited should submit a report to the Commission outlining the Company's future waste control programme. The report should include both short and long-term projects designed to provide the required protection of the receiving waters as outlined in the Commission's "Objectives for Water Quality Control".

GENERAL COMMENTS

One of the purposes of this survey was to point out unsatisfactory areas in the plant's existing waste disposal

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methods. The nature of the survey does not allow the formulation of a complete set of recommendations to rectify all objectionable situations. The tables included in this report indicate the more serious sources of water impairment.

Some rather difficult problems have presented themselves, some of which are:

- the elimination of cyanides from the Blast furnace and coke plant wastes
- the very efficient oil removal system required to comply with the Commission's objective that not more than a faint irridescence result in the receiving water
- the removal of the dissolved iron, and
- the removal of the nutrients, nitrogen, and phosphorus from the waste discharges.

However, it is believed that an intensive effort on the part of the Company would result in a major improvement in the quality of the waste water discharged to Burlington Bay.

Prepared by:

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Approved by:

R. C. Stewart

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District Engineer,
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JDL/maf

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab. *

Source: Stelco K.H. Eggers

Date Sampled: Sept. 9/68 by: J.Luyt (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	Phenols in ppb	IRON AS Fe		Zinc as Zn	Free Ammonia as N	Tin as Sn	Phosphorus as PO_4
		Total	Susp.	Diss.				Tot.	Diss.				
T-2906	75	474	59	415	330	6.9	30	4.33	0.90	0.25	5.9	Tr	7.0
T-2907	14	518	10	508	49	7.2	0	0.80	0.10	0.12	—	Tr	—
T-2908	3.6	412	34	378	11	6.8	20	12.40	0.39	0.17	—	Tr	—
T-2909	3.6	402	33	369	11	6.5	15	12.78	0.40	0.12	—	Tr	—
T-2910	2.4	450	7	443	16	3.1	20	1.06	**	0.04	—	0.0	—
T-2911	7.6	228	7	221	22	7.5	3	0.44	0.10	0.08	3.1	0.0	2.5
T-2912	5.0	534	1	533	36	2.7	4	**	**	0.01	1.5	0.0	0.3
T-2913	2.0	202	2	200	16	7.6	3	0.66	0.45	0.05	0.49	0.0	0.1

Tr = less than 0.1

** Sample exhausted, Test could not be performed.

T-2906	A1	City Storm Sewer	Composite 10.30 AM - 4.30 PM
T-2907	B1	Heavy Gage Line	" "
T-2908	C1	HCL Regeneration Plant	" 10.30 AM - 12.00
T-2909	D2	"	1.00 PM - 4.30 PM
T-2910	D3	No. 3 Pickle Line - Rinse Water	Grab 10.30 AM
T-2911	E1	Hot Strip Finishing Mill - North Sewer	Grab 9.30 AM
T-2912	E2	South Sewer No. 1	Grab 2.00 PM
T-2913	E3	" " "	2 Grab 2.00 PM

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The Steel Company of Canada, Limited - Hilton Works

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Layt * c.c. Chem. Lab. *

Source: Stelco

Date Sampled: Sept. 9/68 by: J. Layt
K.H. Beers

(r.)

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles	Chloride as Cl	Chromium as Cr						
		Total	Susp.	Diss.									
T-2906					45	76	0.00						
T-2907					5	91	0.00						
T-2908					---	70	0.00						
T-2909					---	74	0.00						
T-2910					---	169	0.00						
T-2911					5	35	0.00						
T-2912					**	76	0.00						
T-2913					**	34	0.00						

** Sample exhausted, Test could not be performed.

SEE OTHER PAGE FOR DESCRIPTION.....

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Lupt * c.c. Chem. Lab. *

Source: Steel

Date Sampled: Sept. 9/68 by: P.F (FJ)

Lab. No.	5-Day B.O.D.	Solids			COD	Phenols in ppb	IRON as Fe		Tin as Sn	Tot. Calcium as Ca	Other Chlorides as Cl		Free Ammonia as N
		Total	Susp.	Diss.			TOT.	DISS.			Solubles		
T-2914	4.4	362	48	314	36	0	2.45	0.26	0.30	—	6	—	—
T-2915	4.8	312	9	303	16	6	1.06	0.10	0.00	0.00	5	44	3.2
T-2916	3.6	326	29	297	11	0	1.19	0.26	0.00	0.00	7	43	1.9
T-2917	4.0	324	15	309	16	3	2.30	0.14	0.00	0.00	3	45	3.1

Lab. No.	pH at Lab.	Total Kjeldahl as N	Phosphorus as PO_4	Zinc as Zn
T-2914	7.7	—	—	—
T-2915	7.5	3.6	2.8	0.12
T-2916	7.8	2.4	0.8	0.08
T-2917	7.7	0.6	0.2	0.09

T-2914	G1	Lagoon Influent (140" Plant Mill Lagoon) Composite 9.40 AM - 4.40 PM
T-2915	F1	140" Mill Cooling Water Composite 9.40 - 4.40 PM
T-2916	L1	Lagoon Outlet (140" Plant Mill Lagoon) Composite 9.40 AM - 4.40 PM
T-2917	I1	#3 Open Hearth Cooling Water - at outfall into bay Composite 9.30 AM - 4.30 PM

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The Steel Company of Canada, Limited - Hilton Works

Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.

Source: Stelco

Date Sampled: Sept. 10.68 by: K.H. Egger (rj)

Lab. No.	5-Day B.O.D.	Solids			COD	pH at Lab.	Phenols in ppb	Ether Solubles	Iron as Fe		Zinc as Zn.	Tin as Sn	Chromium as Cr
		Total	Susp.	Diss.					Tot.	Diss.			
T-2922	85	464	78	386	270	6.8	12	68	5.75	1.35	0.35	0.00	0.00
T-2923	26	424	23	401	40	7.1	12	5	1.00	0.20	0.08	0.10	0.00

Lab. No.	Free Ammonia as NH_3	Phosphate as PO_4	Chloride as Cl	Total Kjeldahl as N
T-2922	4.2	5.5	82	4.7
T-2923	2.3	0.9	46	---

T-2922	A2	City Storm Sewer	Comp. 9.00 AM - 4.30 PM
T-2923	B2	Heavy Gauge Line	" " "

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * Chem. Lab. c.c.

Source: Stelco

Date Sampled: Sept. 10/68 by: K.F. P.K. J.L.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	COD	Phenols in ppb	Iron as Fe		Ether Solubles	Zinc as Zn	Tin as Sn	Chromium as Cr
		Total	Susp.	Diss.				TOT.	DISS.				
T-2924	8.8	314	9	305	7.2	16	10	1.38	0.10	2	0.11	0.00	0.00
T-2925	12.	368	63	305	7.3	31	0	16.50	0.20	22	---	---	---
T-2926	11.	330	36	294	7.3	23	3	12.3	0.11	43	---	---	---
T-2927	17.	516	76	440	5.7	36	10	80.0	30.0	67	---	---	---

T-2924	F2	148' Plate Mill Cooling Water (Comp. 9.00 AM - 4.30 PM
T-2925	G2	148' Plate Mill Lagoon Influent " " "
T-2926	K1	East Side Lagoon - West Inlet " 10.30 - 4.30
T-2927	J-1	" " " South Inlet " " "

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(rj)

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.

Source: Stelco

Date Sampled: Sept. 10/68 by: P.K. K.L. & J.L. (rj)

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	COD	Phenols in ppb	Iron as Fe		Zinc as Zn	Tin as Sn	Chromium as Cr	
		Total	Susp.	Diss.				TOT.	DISS.				
T-2930	13	384	59	325	6.7	36	12	27.5	1.60	0.11	0.6	0.00	

Lab. No.	Phosphorus as PO_4	Free Ammonia as NH_3	Chloride as Cl	Total Kjeldahl as N	Ether Solubles
T-2930	1.9	2.0	43	8.0	19

T-2930 L-1 East Side Lagoon Effluent Comp. 10.30 0 4.30

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton — Report to: J. Luyt * — c.c. Chem. Lab.

Source: Stelco

Date Sampled: Sept. 10/68 — by: P.K. K.E. J.L.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	COD	Phenols in ppb	Iron as Fe		Zinc as Zn	Tin as Sn	Chromium as Cr
		Total	Susp.	Diss.				Tot.	Diss.			
T-2931	6.0	306	11	295	7.2	16	0	2.50	0.20	0.20	0.00	0.00
T-2932	3.0	326	9	317	7.5	9	0	0.95	0.08	0.04	0.00	0.00

Lab. No.	Phosphorus as PO_4	Free Ammonia as NH_3	Chloride as Cl	Total Kjeldahl as N
T-2931	0.6	4.0	45	6.0
T-2932	0.3	1.9	45	8.0

T-2931	1	West Bay Water Intake (Pumphouse at No. 2 Dock)	Comp. 1.00 - 4.30 PM
T-2932	2	East Bay Water Intake " No. 1 "	" " "

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.

Source: Stelco

Date Sampled: Sept./8/68 by: P.K. (rj)

Lab. No.	5-Day B.O.D.	Solids			pH at Lab	COD	Phenols in ppb	IRON		Zinc as Zn.	Tin as Sn	Ether Solubles	
		Total	Susp.	Diss.				TOT.	DISS.				
T-2933	9.6	344	26	318	7.5	31	0	10.5	0.15	0.09	0.00	20	
T-2934	7.6	332	15	317	7.1	16	0	3.40	0.15	0.12	0.00	18	

Lab. No.	Chromium as Cr	Phosphorus as PO_4	Free Ammonia as NH_3	Chloride as Cl
T-2933	0.00	0.2	1.7	45
T-2934	0.00	0.3	1.8	48

T-2933	H2	148' Plate Mill Lagoon Effluent Comp. 9.30 AM - 4.30 PM
T-2934	I2	NO. 3 Open Hearth Cooling Water " " "

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The Steel Company of Canada, Limited - Hilton Works Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality:

Report to:

c.c.

Source:

Date Sampled:

by:

Lab. No.	5-Day B.O.D.	Solids			IRON AS FE	
		Total	Susp.	Diss.	Tot.	Diss
T 2943					9,38	0.10
T 2944					115	94
T 2945					31.5	2.00
T 2946					21.4	0.30
T 2947					2.30	0.25
T 2948					19.0	0.24
T 2949					6.05	0.13
T 2950					113.	64.8
T 2951					27.8	0.32
T 2952					20.5	0.35
T 2953					206.	122.5
T 2954					128.	0.60
T 2955					14.6	0.62
T 2956					17.0	1.20
T 2957					1.05	0.25
T 2958					9,50	2.15
T 2959					160.	130
T 2960					72.0	1.25
T 2961					0.50	0.08
T 2962					0.50	0.06

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The Steel Company of Canada, Limited - Hilton Works

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J.Luyt c.c. Chem.Lab.

Source: Stelco

Date Sampled: Sept. 11/68 by: R.vanS. & P.Kresin

Lab. No.	5-Day B.O.D.	Solids			Chlorides as Cl	Ammonia as N	Chromium as Cr	COD	Phenols in ppb	pH at Lab	Zinc as Zn	Tin as Sn	Ether Solubles
		Total	Susp.	Diss.									
T 2943	11.	338	23	315	—	—	—	43	30	7.2	—	—	7
T 2944	34	766	67	699	—	—	—	122	50	3.2	—	—	22
T 2945	10	422	32	390	42	2.6	0.45	20	3	5.8	0.18	0.00	trace*
T 2946	6.4	376	52	324	—	—	—	20	0	6.6	—	—	2
T 2947	6.4	310	12	298	—	—	—	20	4	7.1	—	—	trace

	Phosphates as PO_4
T 2945	0.5

Trace = less than 2 ppm

T 2943	K-2	West Influent to East Side Lagoon	Comp.	9:00 - 2:30
T 2944	J-2	South Influent to East Side Lagoon	Comp.	9:00 - 2:30
T 2945	L-2	East Side Lagoon Effluent	Comp.	9:00 - 2:30
T 2946	Q-1	Rod, Bar, & Blooming Mills	Comp.	10:00 - 2:30
T 2947	R-1	56" Hot Strip Mill	Comp.	10:00 - 2:30

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The Steel Company of Canada, Limited - Hilton Works

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: **Hamilton** Report to: **J.Luyt** c.c. **Chem.Lab.***

Source: **Stelco**

Date Sampled: **Sept. 11/68** by: **P.K./R.S./J.L./**

Lab. No.	5-Day B.O.D.	Solids			COD	Phenols in ppb	Ether Solubles	Chromium as Cr	pH at Lab	Zinc as Zn	Tin as Sn	Chlorides as Cl
		Total	Susp.	Diss.								
T 2948	—	436	79	357	31	0	—	—	7.8	—	—	—
T 2949	—	394	52	342	23	6	—	—	7.6	—	—	—
T 2950	—	892	130	762	62	80	—	—	3.5	—	—	—
T 2951	—	398	45	353	40	15	—	—	6.4	—	—	—
T 2952	—	526	124	402	71	12	—	—	7.0	—	—	—
T 2953	—	1126	86	1040	56	35	—	—	2.7	—	—	—
T 2954	—	586	238	348	51	0	—	—	6.4	—	—	66
T 2955	84	464	58	406	420	20	—	0.00	6.6	0.27	0.00	89
T 2956	8.0	388	33	355	36	6	6	—	7.4	—	—	—
T 2957	6.4	340	29	311	20	3	3	—	7.4	—	—	—

T 2948	P-2	Low Lift Sump	Grab 3:30 PM
T 2949	K-3	West Influent to East Side Lagoon	Grab 3:30 PM
T 2950	J-3	South " " " "	" "
T 2951	L-3	Effluent from " " "	Grab 3:45 PM
T 2952	M-2	110"Plate Mill Continuous Annealling Electrotiming	Grab 3:30 PM
T 2953	N-2	5-stand Cold Mill # 1 & 2 pickler reversing cold mill	" "
T 2954	C-2	4-stand Cold Mill Acid Regeneration, # 3 pickler	Grab 4:00 PM
T 2955	Col	4-stand Cold Mill Acid Regeneration, # 3 pickler	Comp. 10:30 - 2:30
T 2956	O-1	# 2 Blooming Mill	Comp. 9:30 AM-3:30 PM
T 2957	P-1	Low Lift sump station	Comp. 9:30 Am-2:30 Pm

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton

Report to: J.Lugt

c.c. Chem. Lab.

Source: Stelco

Date Sampled: Sept. 11/68 by: R.van S.

Lab. No.	5-Day B.O.D.	Solids			Chromium as Cr	Sulphate as SO_4	Ether Solubles	Zinc as Zn	Tin as Sn	pH at Lab	COD	Phenols in ppb
		Total	Susp.	Diss.								
T 2958	18	366	77	279	2.5	81	4	0.61	0.60	7.1	43	100
T 2959	26	1542	78	1464	0.17	480	10	0.04	0.00	2.9	83	12
T 2960	—	592	158	434	—	—	—	—	—	—	—	—
T 2961	12.	328	17	311	—	91	2	0.25	0.00	7.2	31	0
T 2962	11.	390	26	364	—	70	0	0.09	0.00	7.4	11	2

	Phosphates as PO_4	Ammonia as N	Chlorides as Cl
T 2961	0.2	3.2	40
T 2962	0.3	2.1	40

T 2958	M-1	110 " Plate Mill, Continuous Annealling, Electrotiming (Comp. 9:00 - 2:30)
T 2959	M-1	5-stand cold mill, # 1 & # 2 pickler reversing cold mill " " "
T 2960	1	Hess - Von-Bullow Effluent to East Lagoon Comp. 10:30 - 2:30
T 2961	1	# 1 Baywater Pumphouse (westerly) Comp 10:30 - 2:30 -
T 2962	2	# 2 Baywater Pumphouse (easterly) Comp 10:30 - 2:30

The Steel Company of Canada, Limited - Hilton Works Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton **Report to:** J. Luyt * **c.c.** Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 **by:** J.L.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Phenols in ppb	Iron as Fe.		Phos-phates as PO_4	Ammonia as N.	Chlorides as Cl.	Ether Solubles
		Total	Susp.	Diss.				Tot.	Diss.				
T-2965	16	328	16	312	7.6	32	2	1.59	0.17	0.6	2.5	39	tr.
T-2966	5.0	314	7	307	7.8	11	4	0.49	0.16	0.20	1.5	38	tr.

T-2965 1. [illegible]. 1 Daywater Pumphouse - Comp. 10:30 - 12:00 noon. (triplicate)

T-2966 [illegible] No. 2 - Daywater Pumphouse - Comp. 10:30 - 12:00 noon (triplicate)

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

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Municipality: Hamilton **Report to:** J. Luyt * **c.c.** Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 **by:** J.L. P.K.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Phenols in ppb	Iron as Fe.		Ether Solubles	Zinc as Zn.	Tin as Sn.	
		Total	Susp.	Diss.				Tot.	Diss.				
T-2967	220	470	203	267	7.0	15,000	20	9.3	3.5	1240.	0.15	0.00	
T-2967	C-3	HCl regeneration plant, #3 pickler, 4 - stand cold mill - Comp. 9:00 - 4:30 (triplicate)											

The Steel Company of Canada, Limited - Hilton Works

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

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Municipality: Hamilton **Report to:** J. Luyt * **c.c.** Chem. Lab.-*
P. Diosady *
H. Vanesche *

Source: Stelco

Date Sampled: Sept. 12/68 **by:** J.L.

br

Lab. No.	5-Day B.O.D.	Solids			Ether Solubles								
		Total	Susp.	Diss.									
T 2968					1360								

The ether solubles consisted of a light brown oil having a fatty odour. Infrared spectroscopic examination of this oil gave a spectrogram suggesting a mixture of petroleum oils and natural fats. A chromatographic separation of the extracts yielded an approximately 50:50 mixture of an oil and semi grease. These two materials were characterized by infrared spectroscopy as (1) a light bunker fuel oil and (2) tallow or a similar animal fat.

T 2968 C-4. H Cl regeneration plant, #3 pickles, 4 - stand cold mill - Grab 10:40 a.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

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Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 by: J. Luyt

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Iron as Fe.		Chloride as Cl.	Acidity as $CaCO_3$				
		Total	Susp.	Diss.		Tot.	Diss.						
T-2969		462	89	373	3.5	21.5	2.00	116	100.0				
T-2969	/ D-3	Acid Regeneration Plant - Comp. 10:30 - 2:00 p.m. (duplicate)											

The Steel Company of Canada, Limited - Hilton Works

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 by: J.L.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Phenol in ppb	Iron as Fe.		Zinc as Zn.	Tin as Sn.	Ether Solubles	
		Total	Susp.	Diss.				Tot.	Diss.				
T-2970	30	1030	22	1008	3.1	68	70	173	159	0.19	0.4	20	
T-2971	13	356	25	331	7.2	28	2	9.10	0.13	0.10	0.1	2	
T-2972	18	488	30	458	5.9	337	2	426	19.4	0.15	0.00	tr.	

Lab. No.	Chlorine Free as Cl.	Ammonia as N.	Total Kjeldahl as N.	Phosphorus as PO_4
T-2970	---	---	---	---
T-2971	---	---	---	---
T-2972	44	3.2	5.4	2.4

T-2970 J - 4 South Influent to East ide Lagoon - Comp. 9:30 - 4:30 (triplicate)

T-2971 K - 4 West Influent to East Side Lagoon - Comp. 9:30 - 4:30 (triplicate)

T-2972 L - 4 Effluent from East Side Lagoon - Comp. 9:30 - 4:30 (triplicate)

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The Steel Company of Canada, Limited - Hilton Works

Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J.Luyt * c.c. Chem. Lab.* /ni

Source: Steleo

Date Sampled: Sept. 12/68 by: D.V.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Phenols in ppb	Iron as Fe.		Zinc as Zn.	Tin as Sn.	Ether Solubles	Chromium as Cr.
		Total	Susp.	Diss.				Tot.	Diss.				
T-2973	14	360	32	336	7.0	40	10	8.95	0.90	0.11	1.2	tr.	0.6
T-2974	20	1236	43	1193	2.9	80	15	220	194	0.19	0.00	9	0.0

T-2973 M-3 Continicus Annealling & Electrotuning Comp. 9:30 - 4:30 (triplicate)

T-2974 M-3 5 Stand Cold Mill, Pl[illegible] Pickler - Comp. 9:30 - 4:30 (triplicate)

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The Steel Company of Canada, Limited - Hilton Works

Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 by: K.H. Eggers

Lab. No.	5-Day B.O.D.	Solids			C.O.D.	pH at Lab.	Iron as Fe.		Phenols in ppb	Ether Solubles	Zinc as Zn.	Tin as Sn.	
		Total	Susp.	Diss.			Tot.	Diss.					
T-2975	18	412	127	285	112	7.7	75.8	0.35	0	12	0.10	0.00	
T-2976	10	372	29	343	23	7.7	9.38	0.05	6	24	0.11	0.00	

T-2975	02	#2 Blooming Mill	Composite 9:30 a.m. - 4:30 p.m. (triplicate)
T-2976	P3	Low lift sump station	Composite 9:30 a.m. - 4:30 p.m. (triplicate)

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 by: K.H. Eggers

Lab. No.	5-Day B.O.D.	Solids			C.O.D.	pH at Lab.	Iron as Fe.		Phenols in ppb.	Ether Solubles		Tin as Sn.	Zinc as Zn.
		Total	Susp.	Diss.			Tot.	Diss.					
T-2977	12	390	38	352	32	7.7	18.1	0.30	0	34		0.00	0.11
T-2978	16	356	16	340	40	7.7	2.85	0.15	0	40		0.00	0.12

T-2977	42	Rod, Bar, #1 Bloom Mill	Composite 9:30 a.m. - 4:30 p.m.
T-2978	R2	56" Hot Strip Mill	Composite 9:30 a.m. - 4:30 p.m.

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The Steel Company of Canada, Limited - Hilton Works

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

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Municipality: Hamilton **Report to:** J. Luyt * **c.c.** Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 12/68 **by:** R.V.S.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	Acidity as $CaCO_3$	Sulphates as SO_4	Iron	
		Total	Susp.	Diss.				Tot.	Diss.
T-3042		140,608	**	**	0.5	156,800	134,000	3,460	3,460
T-3043		90,704	**	**	0.8	75,200	59,000	1,540	1,540

** Very acidic samples attack filter paper.

T-3042 ✓ E-2 Hot Strip Finishing Mill - South Outfall - Grab 10:30 p.m.

T-3043 ✓ E-3 Hot Strip Finishing Mill - South Outfall - Grab 11:15 p.m.

(both samples taken during disposal of spent sulphuric acid pickling solution.)

The Steel Company of Canada, Limited - Hilton Works

Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

Industrial Wastes

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab. * /rd

Source: Stelco

Date Sampled: Sept. 13/68 by: J.L.

Lab. No.	5 Day B.O.D.	SOLIDS Tot.	SOLIDS Susp.	SOLIDS Diss.	pH at Lab.	C.O.D.	Phenols in ppb	Cyanide as HCN	Free Ammonia as N.				
T-3011	620	11342	764	10578	10.1	3025	35,000	18.0	2800.				
T-3012	---	---	---	---	---	---	40,000*	---	---				
T-3013	---	---	---	---	---	---	---	10.2*	---				

* Test performed on preserved sample.

T-3011	E-1	Lime Sump Effluent	Grab	10:45 a.m.
T-3012	E-2	Lime Sump Effluent	Grab	2:00 p.m.
T-3013	E-3	Lime Sump Effluent	Grab	2:00 p.m.

The Steel Company of Canada, Limited - Hilton Works

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5M-60-12969

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

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Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.*

Source: Stelco /rd

Date Sampled: Sept. 13/68 by:

Lab. No.	B.O.D.	SOLIDS Tot.	SOLIDS Susp.	SOLIDS Diss.	pH at Lab.	C.O.D.	Fluoride as F.	Phenols in ppb	Iron Tot.	Iron as Fe. Diss.	Ether Sol.
T-3014	29	492	46	446	7.4	81	2.0	2500	6.45	0.38	2
T-3015	---	---	---	---	---	---	---	---	---	---	---
T-3016	---	---	---	---	---	---	---	2500*	---	---	---
T-3017	1.8	354	15	339	7.4	43	0.9	4	4.20	0.40	Tr.

* Test performed on preserved sample.

Lab. No.	Cyanide as HCN	Free Ammonia as N.	Phosphates as PO_4	Kjeldahl Nitrogen as N.
T-3014	1.45	26	1.0	33.
T-3015	1.20*	---	---	---
T-3016	---	---	---	---
T-3017	0.06	14.	0.4	16.

T-3014	A-1	West Side Main South Outfall - Comp. 9:30 - 4:30
T-3015	A-2	West Side Main South Outfall - Comp. 1:00 - 4:30
T-3016	A-3	West Side Main South Outfall - Comp. 1.00 - 4:30
T-3017	F-1	Main Outfall of "E" Furnace Area Comp. 9:30 - 4:30

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Sept. 9-13, 1968.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 13/68 by: J.L. P.K. K.E. R.P.

Lab. No.	Cyanide as HCN	Phenols in ppb
T-3018	0.50	---
T-3019	---	50

Test performed on preserved sample.

T-3018	F-2	Main Outfall of "E" Furnace Area Comp. 1:30 - 4:30
T-3019	F-3	Main Outfall of "E" Furnace Area - Comp. 1:30 - 4:30

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Hamilton Report to: J.Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 13/68 by: R.P.

Lab. No.	5 Day B.O.D.	S O Tot.	L I Susp.	D S Diss.	pH at Lab.	C.O.D.	Phenol in ppb	Iron as Fe. Tot.	Iron as Fe. Diss.	Ether Solubles	Cyanide as HCN	Free Ammonia as N.	Phosphates as PO_4	Kjeldahl as N.
T-3020	19	562	68	494	6.5	121	20	10.5	0.15	0	0.05	1.9	2.0	6.0
T-3021	--	---	---	---	---	---	---	---	---	---	0.01*	---	---	---
T-3022	--	---	---	---	---	---	20*	---	---	---	---	---	---	---

* Test performed on preserved sample.

T-3020 B-1 International Harvester Sewer - Comp. 9:30 - 4:30

T-3021 B-2 International Harvester Sewer - Comp. 1:00 - 4:30

T-3022 B-3 Comp. 1:00 - 4:30

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The Steel Company of Canada, Limited - Hilton Works Sept. 9-13, 1968

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Hamilton

Report to: J. Luyt * c.c. Chem. Lab.*

/rd

Source: Stelco

Date Sampled: Sept. 13/68 by: J.L.

Lab. No.	pH at Lab.	Acidity as $CaCO_3$	Sulphates as SO_4	Chlorides as Cl.	Total Iron as Fe.	Diss. Iron as Fe.							
T-3023	2.5	376	27	336	9.00	8.60							
T-3024	1.8	340	1570	264	495.	491.							

T-3023	E-5	Hot Strip Finishing Mill - South Large Outlet - Grab 9:45 a.m.
T-3024	E-6	Hot Strip Finishing Mill - South Small Outlet - Grab 9:45 a.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Hamilton

Report to: J. Luyt *

c.c. Chem. Lab.*

/rd

Source: Stelco

Date Sampled: Sept. 13/68 by: J.L.

Lab. No.	5 Day B.O.D.	S O L I D S Tot.	Susp.	Diss.	pH at Lab.	C.O.D.	Phenol in ppb	Iron as Fe. Tot.	Diss.	Ether Sol.	Cyanide as HCN		
T-3025	49	468	38	430	8.1	140	5000	3.30	0.30	2	4.90		
T-3026	4.0	444	51	393	7.3	40	4	2.28	0.17	tr.	1.30		

trace = less than 2 ppm

T-3025	J - 1	Cast hose, Lime Sump and By-Product #1 - Comp. 9:30 - 4:30.
T-3026	C - 1	Blast furnace area - Comp. 9:30 - 4:30.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 13/68 by:

Lab. No.	5 Day B.O.D.	S O Tot.	L I Susp.	D S Diss.	pH at Lab.	C.O.D.	Phenols in ppb	Iron as Fe. Tot.	Iron as Fe. Diss.	Ether Sol.	Cyanide as HCN	Fluoride as F.
T-3027	1.6	478	33	445	7.3	20	60	5.25	1.25	tr.	0.50	4.0
T-3028	---	---	---	---	---	---	---	---	---	---	1.10*	---

* Test performed on preserved sample.

T-3027 G-1 75' thickener overflow - Composite - 9:30 - 4:30.

T-3028 G-2 75' thickener overflow - Composite - 1:30 - 4:30.

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CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Stelco - Hamilton Report to: J. Luyt * c.c. Chem. Lab. * /rd

Source:

Date Sampled: Sept. 13/68 by: J.L.

Lab. No.	5 Day B.O.D.	S O Tot.	L I Susp.	D S Diss.	pH at Lab.	C.O.D.	Phenols in ppb	Free Ammonia as N.	Total Kjeldahl Nitrogen as N				
T-3029	440	356	10	346	6.8	810	---	3.0	6.0				
T-3030	---	---	---	---	---	---	20,000	---	---				
T-3031	---	---	---	---	---	---	20,000*	---	---				

* Test performed on preserved sample.

T-3029	K-1	Napthalene Sump Overflow Grab 10:30 a.m.
T-3030	H-1	Phenol Recovery Area - Grab 11:30 a.m.
T-3031	H-2	Phenol Recovery Area - Grab - 11:30 a.m.

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

All analyses except pH reported in p.p.m. unless otherwise indicated

INDUSTRIAL WASTES

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: 13/9/68 by: P.K. & K.E.

Lab. No.	5 Day BOD	SOLIDS Tot.	SOLIDS Susp.	SOLIDS Diss.	pH at Lab.	C.O.D.	Phenols in ppb	Iron Tot.	Iron Diss.	Ether Sol.	Cyanide as HCN	Fluorides as F.	
T-3032	5.0	334	12	322	7.4	28	---	3.38	1.13	tr.	---	0.6	
T-3033	---	---	---	---	---	---	---	---	---	---	0.09 *	---	
T-3034	---	---	---	---	---	---	100*	---	---	---	---	---	

T-3032	I 1	#2 By-Products & Phenol Plant Area - (Composite 9:30 a.m. - 4:30 p.m.)
T-3033	I 2	#2 By-Products & Phenol Plant Area (Composite 1:30 a.m. - 4:30 p.m.
T-3034	I 3	#2 By-Products & Phenol Plant Area - (Composite 1:30 p.m. - 4:30 p.m.)

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ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

INDUSTRIAL WASTE ANALYSIS

All analyses except pH reported in p.p.m. unless otherwise indicated

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

Municipality: Hamilton Report to: J. Luyt * c.c. Chem. Lab.* /rd

Source: Stelco

Date Sampled: Sept. 13/68 by: R.P.

Lab. No.	5-Day B.O.D.	Solids			pH at Lab.	C.O.D.	Phenol in ppb	Iron as Fe.		Cyanide as HCN	Fluorides as F.		
		Total	Susp.	Diss.				Tot.	Diss.				
T-3035		456	50	406	7.3	32	12	21.0	1.88	0.03	5.0		
T-3036		---	---	---	---	---	---	---	---	0.01*	---		

* Test performed on preserved sample.

T-3035	D-1	105' thickener overflow	Comp. 9:30 - 4:30
T-3036	D-2	105' thickener overflow	Comp. 1:00 - 4:30

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