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RESULTS OF INVESTIGATIONS

T. E. MAXSON WTP AND SIGNIFICANT INDUSTRIAL CONTRIBUTORS

MEMPHIS, TENNESSEE

MARCH 1977
ENVIRONMENTAL PROTECTION AGENCY
SURVEILLANCE AND ANALYSIS DIVISION
ATHENS, GEORGIA

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March 1977
Environmental Protection Agency
Surveillance and Analysis Division
Athens, Georgia

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INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Region IV Surveillance and Analysis Division, Water Surveillance and Ecology branches, conducted a case preparation study of the T. E. Maxson Wastewater Treatment Plant (WTP) and its contiguous sewerage system in Memphis, Tennessee during October 1976. The study included an operation and maintenance investigation of the plant, bioassay toxicity studies of the plant influent and effluent, and waste characterization studies of significant industrial wastewater contributors to the collection system. The study was specifically requested by the EPA Region IV Enforcement Division. The main objectives of the study were to:

- Determine the capability of the WTP to treat present and projected waste loads within the limits imposed by the current NPDES permit,
- Characterize significant waste sources currently discharging into the collection system, and
- Verify data to be provided by the City's consultant, resulting from a Show Cause Hearing.

The cooperation of the Tennessee Department of Public Health, the Memphis-Shelby County Health Department, and the City of Memphis is gratefully acknowledged.

STUDY FINDINGS

The T. E. Maxson Wastewater Treatment Plant (WTP) was designed as an 80 mgd contact stabilization activated sludge system, and was placed into substantial operation in June, 1975. The WTP was designed for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) removal efficiencies of 85 and 90 percent, respectively. During the study, the plant was receiving wastewater only from the Nonconnah Creek Basin interceptor. Interceptors serving the Presidents Island area of Memphis (Presidents Island Interceptor) and a portion of Mississippi (Horn Lake Interceptor) will be connected to the WTP in the near future.

Study data show that the WTP was not meeting NPDES effluent limits. Average daily reductions in BOD_5, chemical oxygen demand (COD), and TSS were 69, 54, and 45 percent, respectively. The weekly average effluent concentrations for BOD_5 and TSS of 165 and 210 mg/l, respectively, exceeded the weekly average NPDES permit limitations of 45 mg/l. Wastewater flow into the WTP averaged 39 mgd (49 percent of design), and the organic loading (BOD_5) averaged 173,400 lbs/day (104 percent of the design loading of 166,000 lbs/day). For the 24-hour period October 21 through 22, 1976, the BOD_5 loading was 232,400 lbs/day (140 percent of the design loading). For short periods, such as on the morning of October 21, 1976, the design organic loading was exceeded to the extent that proper operation of the contact stabilization process was severely impeded. The organic (BOD_5) overloading problem will be significantly increased when the Presidents Island and Horn Lake interceptors are connected to the WTP.

Significant amounts of chlordane, chloroform, ramrod, and terpineol isomer were detected in the WTP influent. Approximate influent loadings of these four compounds were 846, 58.5, 86.2, and 58.5 lbs/day, respectively. Significant amounts of chlordane (976 lbs/day), chloroform (68.3 lbs/day), and ramrod (49.1 lbs/day) were also discharged from the WTP. Chlordane and chloroform are on EPA's Consent Decree, "65 Toxic Chemicals List".

Toxicity studies indicated that the influent and effluent wastewaters were toxic to waterfleas and bluegill sunfish. These tests showed that influent toxicity varied due to batch discharges and that toxicity was substantially reduced by the WTP process. Because of the complex makeup of the wastewater, it is difficult to determine the exact compound, or group of compounds causing this toxicity. However, compounds such as chlordane and atrazine, which were detected in the wastewater, have been documented as causative agents in acute toxicity by other investigators.

Major WTP operational problems detected during the study are as follows:

1. The air supply was insufficient for proper operation of both the contact stabilization process and digesters. Normally, two, and occasionally three, of the five air compressors (maximum output 42,000 cfm each) were operated. The average influent BOD_5 loading of 173,400 lbs/day required an air supply of 102,300 cfm for the operation of the contact stabilization process (assuming 85 percent removal and 1,000 cfm/lb BOD_5).
2. The 13 acre sludge lagoon is an emergency type sludge holding facility, and cannot function as the sole sludge disposal mechanism.

3. The WTP receives untreated wastewaters from unregulated industrial discharges which produce shock loadings and keep the process continually upset. Batch discharges were common, as evidenced by wide variation in the influent pH and the extremely high organic loadings.
4. The WTP was understaffed. One operator per shift cannot adequately control a WTP of this size and complexity, especially when automated equipment is not fully operational.
5. Flow was restricted between the reaeration and contact basins. The maximum return sludge rate attained under typical operating conditions has been approximately 20 mgd (25 percent of design). The treatment system was designed for a 60 mgd (75 percent of design) return sludge rate. Under these restricted hydraulic conditions, the WTP cannot be properly operated at design flow.
6. Numerous mechanical problems with items such as the blowers, influent pumps, clarifier sludge removal equipment, etc., have resulted in an excessively long shakedown period.
7. Electrical power failures have caused severe operational problems. During the survey, a defective area light caused a power failure which shut down the central control computer and caused the subsequent loss of control power to the blowers, pumps, etc., totally shutting down the WTP. The WTP was without power for approximately one and one-half hours. The computer was down for over six hours.
8. Observation of the clarifiers indicated that the magnetic flowmeters were producing erroneous readings. Proper operation of the numerous flowmeters in the WTP is vital to optimum efficiency and automatic operation of the facility.

9. Only five of the eight final clarifiers were in service. A subcontractor was stripping and repainting all of the metal work in each clarifier, and a new grout bottom had just been completed in one of them.
10. Maximum aeration basin utilization was only 60 percent of the total available capacity. The number of basins utilized were selected to match hydraulic loading rather than organic loading conditions.
11. Maximum utilization of the sludge thickeners is essential to conserve digester space.
12. The chlorine supply was depleted on October 14, 1976, and the effluent stream was not disinfected during the duration of the study.
13. Effluent weirs on four of the five clarifiers were out of level.

The industrial wastewater dischargers investigated during this study were selected from a list of 162 which were discharging into the T. E. Maxson WTP from the Nonconnah Creek Basin Interceptor. From this list, 73 sources were selected for on-site reconnaissance inspections by study personnel. Those sources not inspected discharged only cooling water, sanitary wastewater, or insignificant volumes of process wastewater. As a direct result of the on-site inspections, thirty-six industrial sources were selected for investigation.

A reconnaissance inspection was also made of the industries located on and adjacent to Presidents Island during the week of October 25, 1976. As a result of these inspections, ten sources were selected for investigation. These industries discharged wastewaters into the Presidents Island Interceptor which presently discharges into the Mississippi River without treatment. This interceptor will be connected to the WTP in the near future.

The Horn Lake Interceptor, which, when completed, will transport wastewaters from northern Mississippi, will not serve any significant industrial sources, and was not investigated.

The thirty-six Nonconnah Creek Basin industries were sampled for two or more days during October 18 through 23, 1976. Seventeen of the thirty-six sources contributed more than one percent of the influent load of at least one measured pollutant discharged into the WTP during the study. These sources contributed 48 percent of the BOD_5 (99,100 lbs/day), 48 percent of the COD (178,000 lbs/day), and 36 percent of the TSS (42,500 lbs/day) loads discharged into the WTP during the study. Those sources responsible for the bulk of the influent industrial waste load included: BOD_5 (41 percent) - Schlitz Brewing Company, Ralston Purina, Valley Products, and Hunt Wesson Foods; COD (43 percent) - Schlitz Brewing Company, Ralston Purina, and Valley Products; TSS (34 percent) - Schlitz Brewing Company, Ralston Purina, Valley Products, Hunt Wesson Foods, Frito-Lay, and Kellogg. The Nonconnah Creek Basin sources accounted for the following percentages of the indicated heavy metals that were discharged into the treatment plant: chromium and cadmium (100 percent), zinc (52 percent), nickel (22 percent), lead (11 percent), and copper (8 percent). Seven industries discharged organic compounds included in EPA's Consent Decree, "65 Toxic Chemicals List" as follows:

DISCHARGER	ORGANIC COMPOUND
Pro-Serv	chloroform trichloroethylene, toluene, ethyl benzene, methylene chloride

DISCHARGER	ORGANIC COMPOUND
National Starch and Chemical Company	trichloroethylene, methylene chloride, butyl benzyl phthalate, phenol
Chapman Chemical Company	benzene, methylene chloride
Delta Refining Company	phenol
Delta Foremost Chemical Co.	phenol
Hunt Wesson Foods, Inc.	phenol
Shulton, Inc.	diethyl phthalate

The only industrial source that deliberately "batch" discharged wastewater was the Pro-Serv Company. However, results of the operation and maintenance and toxicity studies conducted at the WTP indicated that many other sources were probably "batch" discharging wastewater.

Several industrial dischargers relied on septic tank cleaning services to maintain their discharge sumps. In most cases, company personnel did not know how or where the collected wastes were discharged. If these wastes are discharged into the WTP sewer system, this could represent a significant pollutant load.

The ten Presidents Island Basin industrial sources were sampled during October 25 through 28, 1976. The waste loads of BOD_5 (15,000 lbs/day), COD (82,000 lbs/day), and TSS (21,000 lbs/day) discharged by these sources represented approximately 20 percent of the total load currently discharged into the WTP. Of the ten sources sampled, the Cargill Corn Syrup plant and the Armour Company accounted for 94 percent of the BOD_5, COD, and total Kjeldahl nitrogen (TKN), plus 92 percent of the TSS discharged. The chromium discharged from these sources exceeded the amount currently discharged

to the WTP. The zinc discharged was approximately one-third of the current WTP influent loading. When this interceptor is connected to the WTP, it will significantly increase the current organic (BOD_5) loading on the plant and add to the existing WTP operational problems.

PAGE NOT

AVAILABLE

DIGITALLY

FIGURE 1-A

INDUSTRY MAP KEY
MEMPHIS, TENNESSEE

October, 1976

INDUSTRY NO.	NAME	MAP COORDINATES
1.	Delta Refining Corp.	L-13
2.	Kimco Auto Products, Inc.	N-15
3.	Refined Metals Corp.	L-14
5.	Shulton, Inc.	N-16
6.	United Paint Co., Inc.	L-17
11.	Dixie Litho Plating, Inc.	J-22
12.	Alco-Gravure, Inc.	B-18
14.	Quality Industrial Uniform Service	F-26
15.	Valley Products Co.	I-16
16.	Champman Chemical Co.	I-17
17.	Illinois Central RR	J-14
19.	Rainbo Photo Service, Inc	I-22
20.	Richards Mfg. Company	I-21
21.	National Starch & Chemical Corp.	F-30
22.	Utrex Incorporated	F-32
26.	Cleo Wrap Corp.	G-31
27.	D&W Plating Co.	G-27
28.	Delta Foremost Chemical Corp.	F-31
29.	J. M. Smucker Co.	G-34
32.	Ralston Purina Co.	E-37
33.	Jos. Schlitz Brewing Co.	F-36
38.	Frito-Lay, Inc.	M-24
39.	General Cable Corp.	O-20
40.	Gould, Inc.	N-24
41.	High's Ice Cream Novelties, Inc	P-20
42.	Hunter Fan & Ventillating Company	L-25
43.	Hunt Wesson Foods, Inc.	P-20
44.	Kellogg Company	M-24
45.	The Kroger Co.	L-25
46.	Memphis Furniture Co.	L-25
47.	Midwest Farms	P-20
51.	Crown Zellerback Corp.	H-18
56.	Klinke Bros. Ice Cream Co.	K-26
67.	Keathleys	P-24
71.	J. Strickland & Co.	N-71
73.	Pro-Serve, Inc.	J-17
80.	Cargill, Inc.	M-10
81.	Cargill, Inc.	K-7
82.	Mid-South Plating Co., Inc.	M-10
83.	Armour Corp.	O-14
84.	Memphis Butchers	O-14

INDUSTRY NO.	NAME	MAP COORDINATES
85.	Unarco Industries, Inc	P-15
86.	Buring Food Group, Inc	N-11
87.	Faith-Memphis Plating Co.	L-7
88.	Miller Transporters, Inc	L-9
89.	CBI Nuclear Corp.	L-6

RESULTS AND DISCUSSION

Results in the following areas are presented and discussed in this portion of the report: (1) operation and maintenance investigations; (2) toxic bioassay studies of influent and effluent wastewater streams, and (3) waste characterization studies of significant industrial contributors.

T.E. MAXSON WASTEWATER TREATMENT PLANT

This section deals with findings of operation and maintenance investigations conducted at the WTP October 18 through 25, 1976. Methods employed during this study included extensive sampling, physical measurements, and daily observation of WTP operations. The specific objectives were to:

(1) Evaluate wastewater treatment through control testing and examination of operational practices;

(2) Determine influent and effluent wastewater characteristics, and

(3) Compare design and current wastewater loadings.

Detailed findings are discussed in the following subsections.

Treatment Facility

Treatment Processes--

The 80 mgd T.E. Maxson WTP was designed as a contact stabilization activated sludge system. Its purpose was to serve a population of approximately 480,000 plus an equivalent industrial population of 495,000. A schematic diagram is presented in Figure 2, and Table I enumerates the design data of the system.

FIGURE 2
T. E. MAXSON WTP
MEMPHIS, TENNESSEE

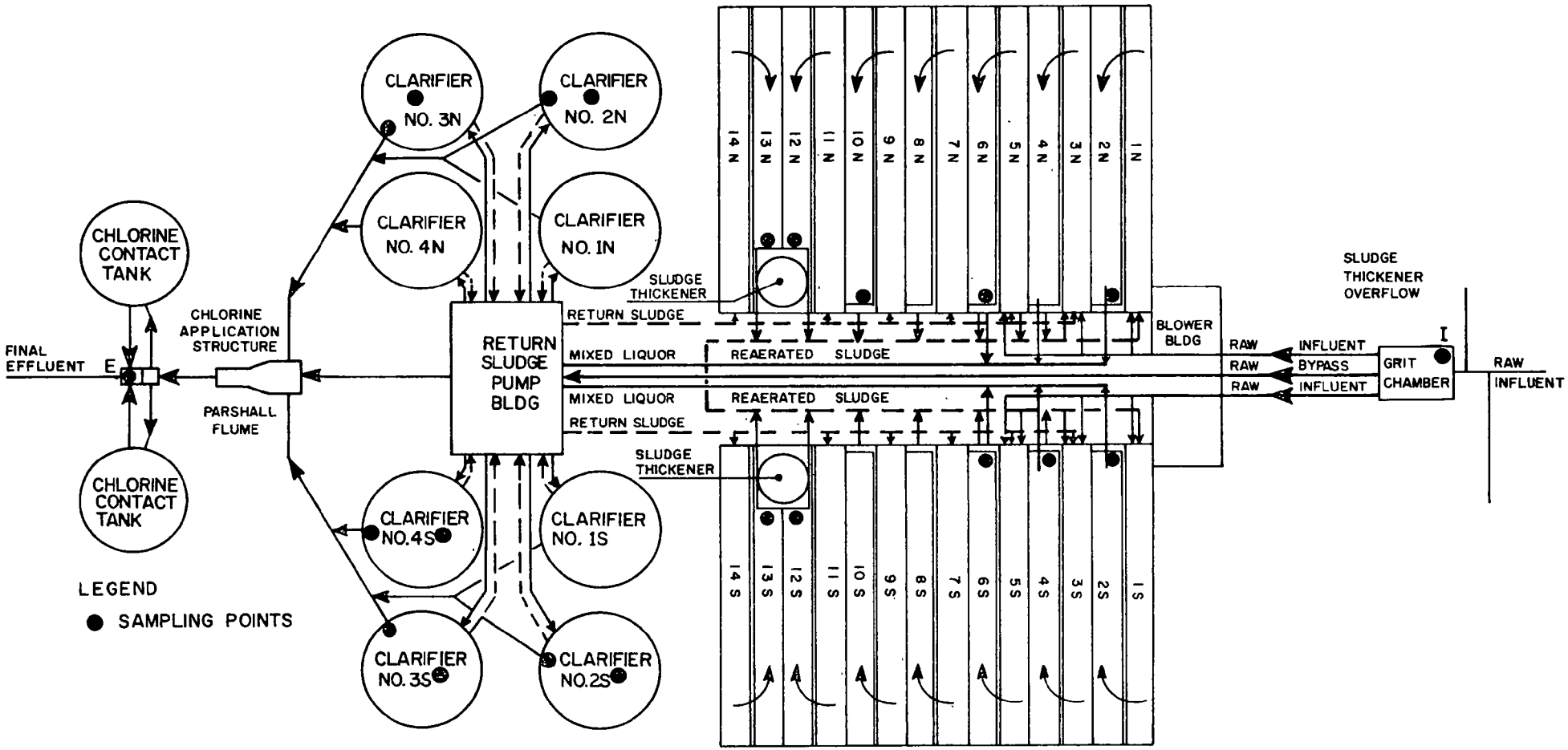


TABLE I

DESIGN DATA*

T. E. MAXSON WASTEWATER TREATMENT PLANT

MEMPHIS, TENNESSEE

I. General Design

Design year	1985
Population	480,000
Industrial Equivalent Population	495,000
Total Equivalent Population	975,000
Average Flow	80 mgd
Peak Flow	150 mgd
BOD	166,000 lbs/day
Suspended Solids	195,000 lbs/day

II. Flow Measurements

Influent	Magnetic meter, recorder, totalizer
Effluent	Parshall flume, indicator, totalizer
Return Sludge	Magnetic meter
Waste Sludge	Magnetic meter
Digester recycle	Magnetic meter
Waste Sludge (thickener)	Magnetic meter

III. Preliminary Treatment

Bar Screens	Mechanically Cleaned
Comminutors (3)	
Capacity (each)	72 mgd
Grit Chambers (4)	
Surface Area (each)	800 sq.ft.
Surface Loading	25,000 gpd/sq.ft.
Detention Time	4.8 minutes

IV. Contact Basins

Number	4 sets**
Volume (per set)	179,000 cu.ft. 1,339,000 gals
Aeration (diffused air)	
Number diffuser (per set)	20 "Z shaped"
Air Requirements	722,000 cu.ft./hr.
Average Flows (plus RS)	35 mgd
Detention Time	0.86 hrs.

V. Reaeration Basins

Number	6 sets**
Volume (set)	179,000 cu.ft.
	1,339,000 gals.
Average Flow	7.5 mgd
Detention Time	4.0 hrs.

VI. Final Clarifiers

Number	8
Diameter	135 ft.
Area	14,300 sq.ft.
Volume	214,500 cu.ft.
	1,604,500 gals.
Surface Loading	700 gpd/sq.ft.
Overflow Rate	13,500 gpd/lin.ft.
Detention Time	3.85 hrs.
Depth	15 ft.
Weir Length	756.72 ft.

VII. Chlorination

Chlorine Contact Chambers (2)

Diameter	120 ft.
Surface Area	11,300 sq.ft.
Detention Time	0.5 hrs.
Volume	113,000 cu.ft.
Chlorinators	3
Evaporator	2

VIII. Aerobic Digestion

Number	4 sets
Volume	159,100 cu.ft.
	1,190,000 gals.
Aeration	diffused air
Detention Time	16 - 18 days

IX. Sludge Thickener

Number	2
Area	2,400 sq.ft.
Depth	8 ft.
Solids Loading	6 lbs/sq.ft./day
Surface Loading	750 gals/sq.ft.
Volume	143,626 gals.

X. Sludge Lagoon

Area***	13 acres 653,400 sq.ft.
Depth	20 ft.
Volume	9,296,400 cu.ft. 69,537,000 gals.

XI. Pumping Facility

Raw Sewage	700 H.P.
3 variable speed	35,000 gpm @ 63 ft. TDH @ 417 rpm
1 constant speed	35,000 gpm @ 63 ft. TDH @ 440 rpm
Return Sludge	125 H.P.
6 variable speed	12,000 gpm @ 85 ft. TDH 3,000 gpm @ 6 ft. TDH
Digested Sludge	50 H.P.
4 variable speed	500 gpm @ 85 ft. TDH 300 gpm @ 31 ft. TDH
Air Lift	
4 constant speed	500 gpm @ 3.75 ft. TDH
Scum	7.5 H.P.
4 constant speed	100 gpm @ 85 ft. TDH

XII. Aeration Equipment

Air Compressors	5
Capacity	42,000 cfm each

* Design data reprint from the Memphis Public Relation Brochure, T. E. Maxson WTP, and engineering design drawings.

** Four sets of basins can be used interchangeably for either contact or reaeration basins.

*** Data calculated using dimensions on construction plans.

Influent wastewater passed through mechanically cleaned bar screens. It was then pumped to three comminutors and four aerated grit chambers. Wastewater flowed from the grit chambers by gravity into the contact basins, the clarifiers, and the chlorine contact chambers. Chlorine was added at the Parshall flume prior to discharge into the two contact chambers. Effluent from each chamber combined and discharged into the Mississippi River via the cooling water channel at the TVA power plant.

Return sludge from the clarifiers was pumped into the reaeration basins and flowed by gravity into the contact basins. Waste sludge was pumped from the clarifiers into the aerobic digesters. Sludge flowed from the digesters into sludge thickeners and was pumped into a 13 acre sludge lagoon. Sludge thickener supernatant can be pumped (air lift) into the aerobic digester or into the WTP head works. Aeration basin utilization was 60 percent, and only five of eight clarifiers were in operation during the study.

Personnel--

The WTP was staffed by 42 persons. According to an O&M report by the Tennessee Department of Public Health, these employees represent 65 percent of the total work force recommended for its operation(1). If all the automated equipment were operating properly, manpower requirements could be reduced from recommended levels. The current staff breakdown represents the following recommended staffing:

POSITION	NO. EMPLOYED	RECOMMENDED STAFFING
Operators	5	10
Laboratory technicians	4	5
Clerks	1	3

POSITION	NO. EMPLOYED	RECOMMENDED STAFFING
Maintenance personnel	27	38
Management Supervisor	1	4
Laborers	4	-
Others	-	5
TOTAL	42	65

Study Results and Observations

A complete listing of all analytical data and general study methods are presented in the Appendices.

Numerous mechanical and electrical problems have interfered with plant operations since its start-up. According to City officials, the City has had difficulty in working with the contractor and suppliers on matters regarding equipment and construction deficiencies. Examples of major WTP components which have caused problems in the past and are currently causing problems are discussed below:

(1) The central control system was not fully operational. In addition, there was a shortage of operators. The combination of these two factors made it difficult to balance and properly control WTP processes.

(2) All three of the variable speed raw sewage pumps have presented problems. The malfunction of any two of these units prevents proper regulation of influent wastewater flow.

(3) Several of the blowers have been temporarily out of service

due to improper alignment, excessive vibration, and deterioration of electrical insulation.

(4) The cooling system on the return sludge pumps prevented low speed operation of these variable speed pumps.

(5) Electrical wiring problems existed within the WTP. In one instance, a shorted light fixture caused complete WTP shutdown, since controls for equipment such as pumps, blower, computer, etc. were all wired to the same electrical bus.

Other results and observations are discussed in the following subsections.

Flow--

Influent flow was measured by magnetic flowmeters installed in the influent lines. These average flows are illustrated in Figure 3. Effluent wastewater flowed through a 10 foot Parshall flume located just prior to the chlorine contact chamber. This flume, however, was not used to measure effluent flow since the effluent was deliberately backed up in the flume to prevent cavitation of pumps immediately following the flume. These pumps are used to recycle effluent for cooling and other inplant uses where potable water is not required. The raw wastewater flow averaged 39 mgd; the minimum flow was 8.0 mgd, and the maximum flow was 87.6 mgd.

The daily rainfall in the Memphis area is detailed in Table II. Data presented in Figure 3 seemingly indicates a fairly uniform daily hydraulic load on the WTP. The heavy rainfall on October 23 through 25, however, increased the weekend flow. The increased flow, due to rainfall, was also apparent during the weekdays of October 19 through 20.

TABLE II

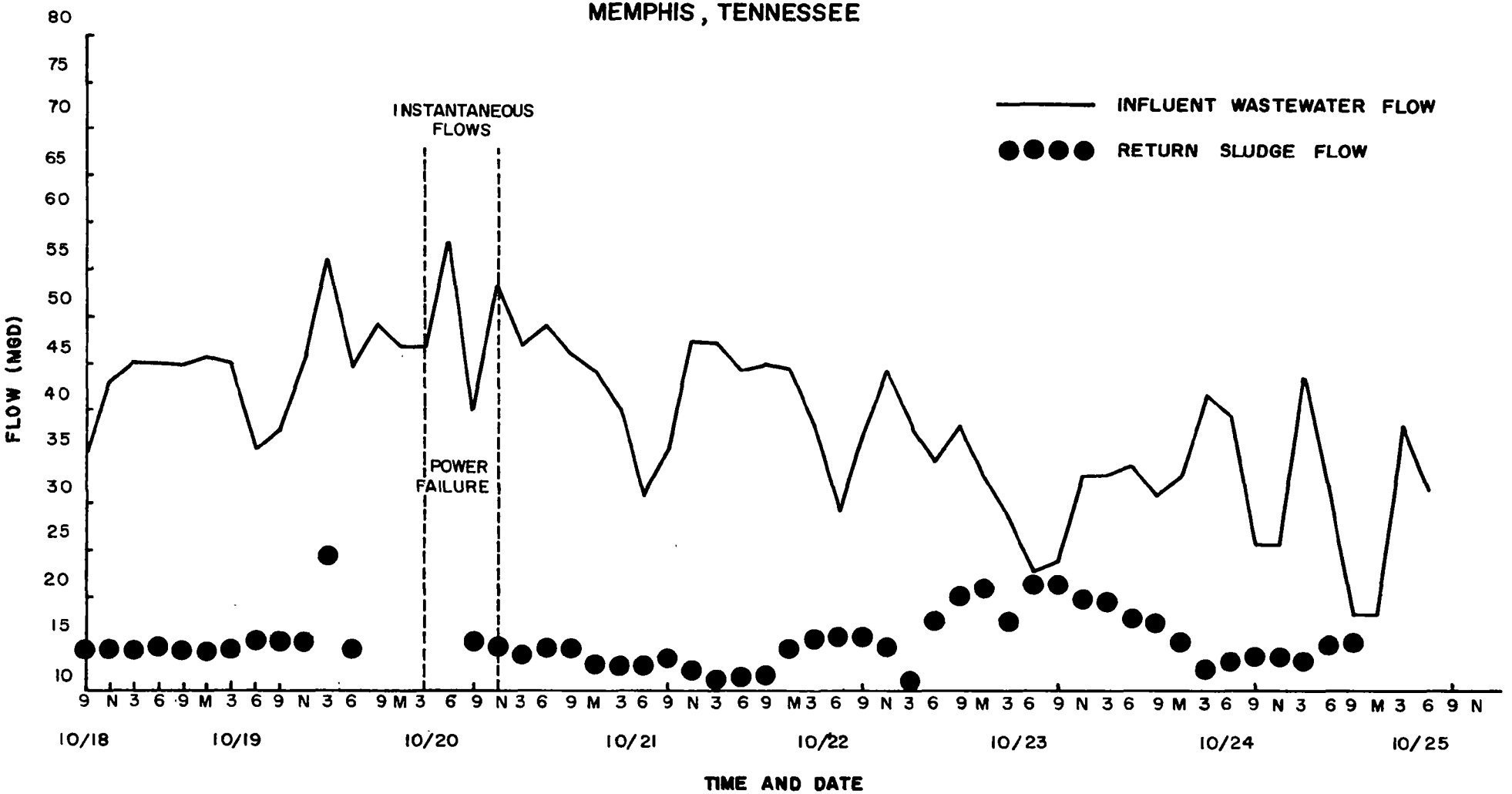
DAILY RAINFALL DATA *

MEMPHIS, TENNESSEE

October 1976	Rainfall (Inches)
19	0.49
20	0.08
21	0.00
22	0.00
23	0.79
24	1.20
25	1.53

*Data from the U.S. Weather Service, Memphis, Tennessee.

FIGURE 3
PLANT FLOW
T. E. MAXSON WTP
MEMPHIS, TENNESSEE



Return sludge flow rates were also measured with magnetic flowmeters. An average of 15.2 mgd of sludge was returned daily, which was approximately 30 percent of the raw wastewater flow. A total of 0.88 million gallons of sludge was wasted to the aerobic digesters from October 18 through 19. No additional sludge was intentionally wasted during the study.

All WTP flow measurements are recorded by computer. These measurements are averaged and can be readily retrieved on a screen or in tabulated computer printout form at the WTP.

Wastewater Characteristics and Removal Efficiencies--

Removal efficiencies were calculated using averaged data from seven consecutive 24-hour flow proportional composite samples. Turbidity, oil and grease, and phenols were collected on a grab sample basis. Influent oil and grease and phenol results of 606 mg/l and <10 mg/l, respectively, were not included in the calculations since they represented a batch discharge and were based on a single grab sample. Table III presents a chemical description of the influent and effluent wastewater with calculated removal efficiencies.

The average composite influent BOD_5 (533 mg/l) and total suspended solids (384 mg/l) concentrations represented a strong waste, indicating the large quantity of industrial wastewaters discharged into the system. The organic wastewater loading (173,400 lbs BOD_5/day), based on the average composite BOD_5 and the average flow of 39 mgd, was greater than the design loading of 166,000 lbs BOD_5/day. The suspended solids loading of 124,900 lbs/day was less than the design loading of 195,000 lbs/day. The average 24-hour BOD_5 loading for October 21 through 22 was 232,400 lbs/day

TABLE III

WEEKLY AVERAGE WASTEWATER CHARACTERISTICS AND REMOVAL EFFICIENCIES

T. E. MAXSON WTP, OCTOBER 18-25, 1976

PARAMETER	INFLUENT (mg/l)	EFFLUENT (mg/l)	REDUCTION (%)
BOD_5	533	165	69
COD	984	449	54
Total Solids	884	612	31
Total Volatile Solids	428	238	44
Total Suspended Solids	384	210	45
Volatile Suspended Solids	254	143	44
TKN-N	31.9	25.2	21
NH_3-N	11.8	14.2	--
NO_3-NO_2-N	<0.02	<0.01	--
Total Phosphorus	15.5	12.8	17
Lead	0.147	<0.104	>29
Chromium	<0.065	<0.053	--
Copper	0.110	0.074	33
Cadmium	<0.010	<0.010	--
Zinc	0.258	0.163	37
Oil and Grease	29(606)	<10	>65
Turbidity*	--	36	--
Phenols	513(<10)	<10	>98

* Result reported in NTU

() Result not used in the removal efficiency calculation

or 140 percent of the design loading. The influent organic load is presently exceeding the organic design load at half of the design flow. Two additional interceptors, Presidents Island and Horn Lakes, are planned. When connected, they will grossly overload the WTP.

The NPDES permit issued in June, 1975 limits the average weekly BOD_5 and TSS concentration in the effluent to 45 mg/l each(2). During the study, the average weekly BOD_5 and TSS effluent concentration was 165 and 210 mg/l, respectively. The average weekly reduction of BOD_5, COD, and total suspended solids was 69, 54, and 45 percent, respectively. Table III shows that treatment of the waste was not compatible with secondary treatment standards as required by the NPDES permit.

The ratio of BOD_5 to nitrogen and phosphorus was calculated at 100/6/3 by weight. As compared to the recommended ratio of 100/6/1, the raw waste was not considered to be limited in either nitrogen or phosphorus(3).

Analyses for organic compounds were conducted on influent and effluent grab samples which were composited over a seven day period from October 19 through October 25. Eighteen compounds were detected and the results are presented in Table IV. Four compounds (ramrod, chlorodane, prometon, and atrazine) are pesticides. Eight compounds (chloroform, trichloroethylene, tetrachloroethylene, toluene, ethyl benzene, chlorodane, naphthalene, and diethyl phthalate) are on EPA's Consent Decree, "65 Toxic Chemicals List"(4). Chlorodane, chloroform, ramrod, and terpineol isomer were detected in the influent at concentrations of 2.6, 0.18, 0.265, and 0.18 mg/l, respectively. These concentrations were significantly higher than those for the other compounds. Based on the average influent flow of 39 mgd, the loadings for the four compounds were 846, 58.5, 86.2, and 58.5 lbs/day, respectively.

TABLE IV

ORGANIC COMPOUNDS DETECTED IN T. E. MAXSON WTP
INFLUENT AND EFFLUENT WASTEWATERS
OCTOBER 18-25, 1976

PARAMETER	INFLUENT (mg/l)	EFFLUENT (mg/l)
Chloroform **	0.180	0.210
Dimethyldisulfide	0.012	0.038
Trichloroethylene **	0.039	ND *
Tetrachloroethylene **	0.013	ND
Toluene **	0.060	ND
Ethyl Benzene **	0.015	ND
Two Isomers of Xylene	0.026	ND
Ramrod	0.265	0.151
Chlorodane **	2.6	3.0
Prometon	0.0029	ND
Atrazine	0.00097	ND
Indole	0.077	0.002
Naphthalene **	0.022	ND
Terpineol Isomer	0.18	ND
Dimethyl Naphthalene Isomers	0.030	ND
Methyl Indole	0.0042	ND
Diethyl Phthalate **	0.060	ND

* ND = None Detected

** On EPA's Consent Decree, "65 Toxic Chemicals List" (4)

These are only approximate values since they are based on grab samples and average study flows. Significant quantities of chlorodane, chloroform, and ramrod (976, 68.3, and 49.1 lbs/day, respectively) were discharged from the WTP.

On October 21, a distinct influent condition was observed from 8 a.m. to 12 noon. Characteristic of an emulsion, its appearance was milky white and it smelled of oil. An influent grab sample was taken and a series of analyses were conducted. Results are presented in Appendix A as sample O&M #1318. The BOD_5 (>1,200 mg/l), COD (2,440 mg/l), and total suspended solids (803 mg/l) concentrations were high, producing an organic overload at the WTP. The oil and grease concentration in this particular sample was 606 mg/l. Information covered in the Industrial Discharge section indicates that Hunt Wesson Foods, Inc. was the most probable contributor to this condition.

During the study, influent pH was monitored continuously. Results are indicated in Figure 4. pH values ranged from 5.0 to 11.2 and were frequently below 6.0. Wastewaters having pH values below 6.0, or greater than 9.0 for extended periods of time are not conducive to optimum treatment in a biological process. Rapid and substantial pH changes observed on October 19, 20, and 23 indicate large volumes of strong alkaline waste discharged into the waste collection system.

Hourly influent samples were collected for COD analysis during three separate 24-hour periods (October 18 through 19, 20 through 21, and 22 through 23). The results are presented in Figure 5 and in Appendix A. These concentrations ranged from 310 mg/l (82,690 lbs/day) to 2,480 mg/l (657,700 lbs/day). Based on the average COD/BOD_5 ratio for the study

FIGURE 4
CONTINUOUS INFLUENT pH RECORDING
T. E. MAXSON WTP
MEMPHIS, TENNESSEE

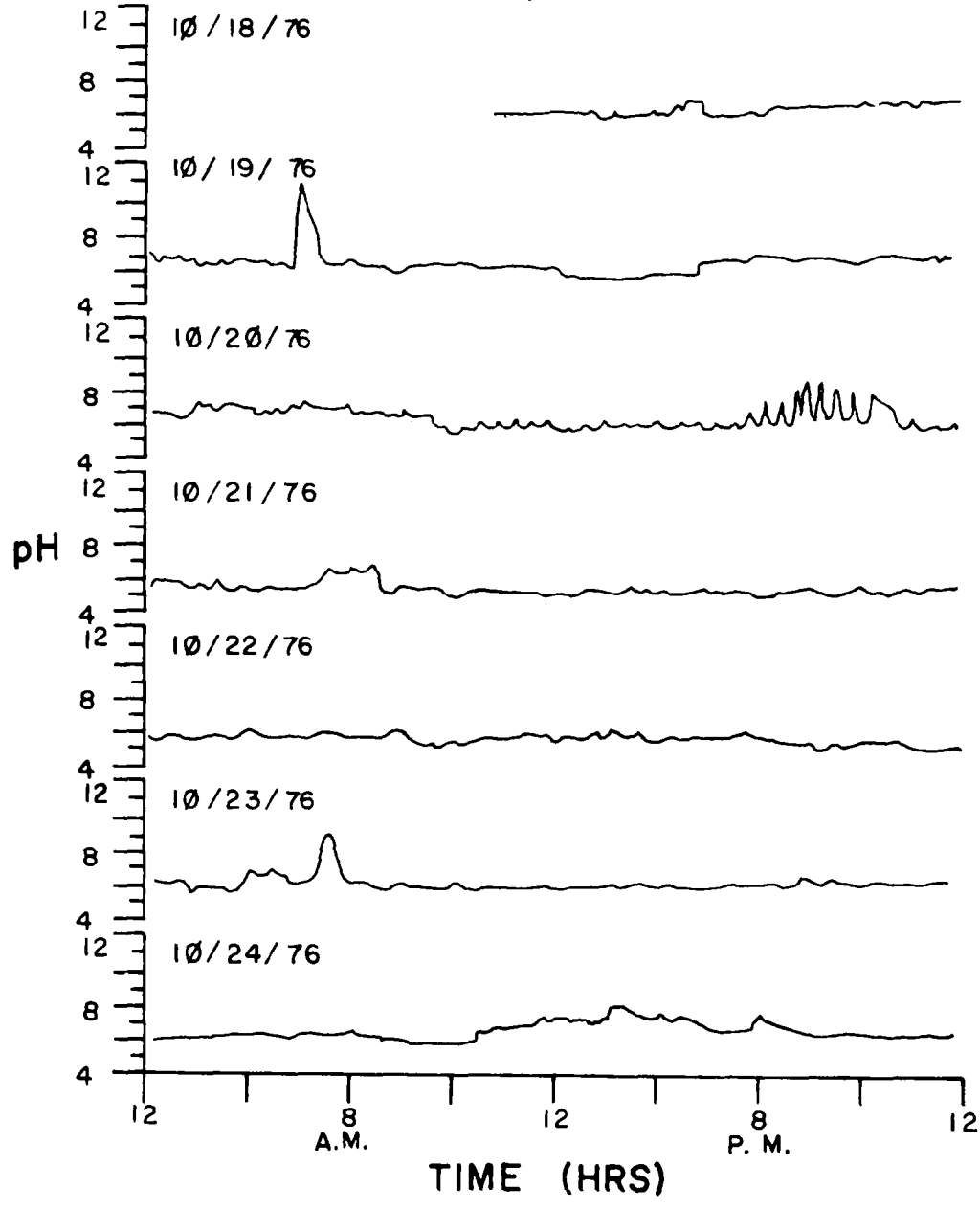
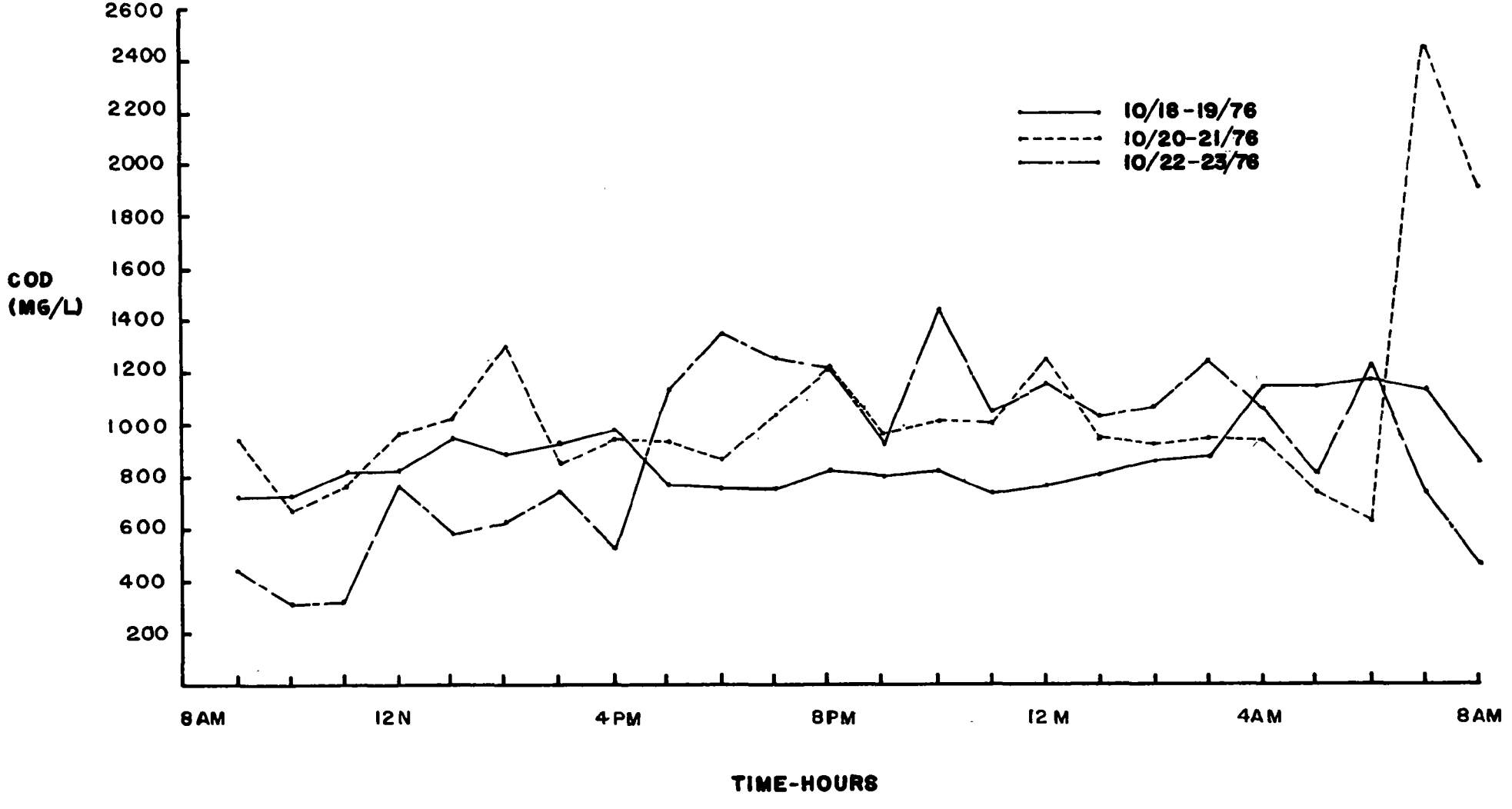


FIGURE 5
INFLUENT COD
T. E. MAXSON WTP
MEMPHIS, TENNESSEE



period of 1.85, the 657,700 lbs COD/day converts to 356,300 lbs BOD_5/day. This is greater than twice the WTP design organic loading rate of 166,000 lbs BOD_5/day. This high loading occurred on the same morning that the distinct batch discharge was observed.

Aeration Basins--

The aeration process involved the use of contact basins, reaeration basins, and aerobic digesters. Contact and reaeration basins will be discussed here, and aerobic digesters will be discussed in the subsection dealing with sludge handling.

On October 18, fifty percent of the available aeration basin capacity was being utilized. Basins 1N, 2N, 1S, and 2S were employed as contact basins; basins 5N, 6N, 9N, 10N, 5S, and 6S were employed as reaeration basins (Figure 6). On the afternoon of October 19, basins 3S and 4S were included for reaeration use. This increased utilization to sixty percent of basin capacity.

Grab samples were collected daily from each contact and reaeration basin effluent area. These samples were analyzed for total suspended solids (TSS), volatile suspended solids (VSS), percent solids by centrifuge, and settleability (contact basins only) as determined by the settlometer. Presented in Table V are various calculated activated sludge operational parameters and recommended design values from the literature.

Dissolved oxygen (DO) was measured throughout the aeration basins and the results are presented in Appendix B. These data show critically low oxygen concentrations in the contact basins and some areas of the reaeration basins. Low DO conditions were detrimental to the microorganisms in the activated sludge and encouraged the growth of filaments. The re-

FIGURE 6
T. E. MAXSON WTP
MEMPHIS, TENNESSEE

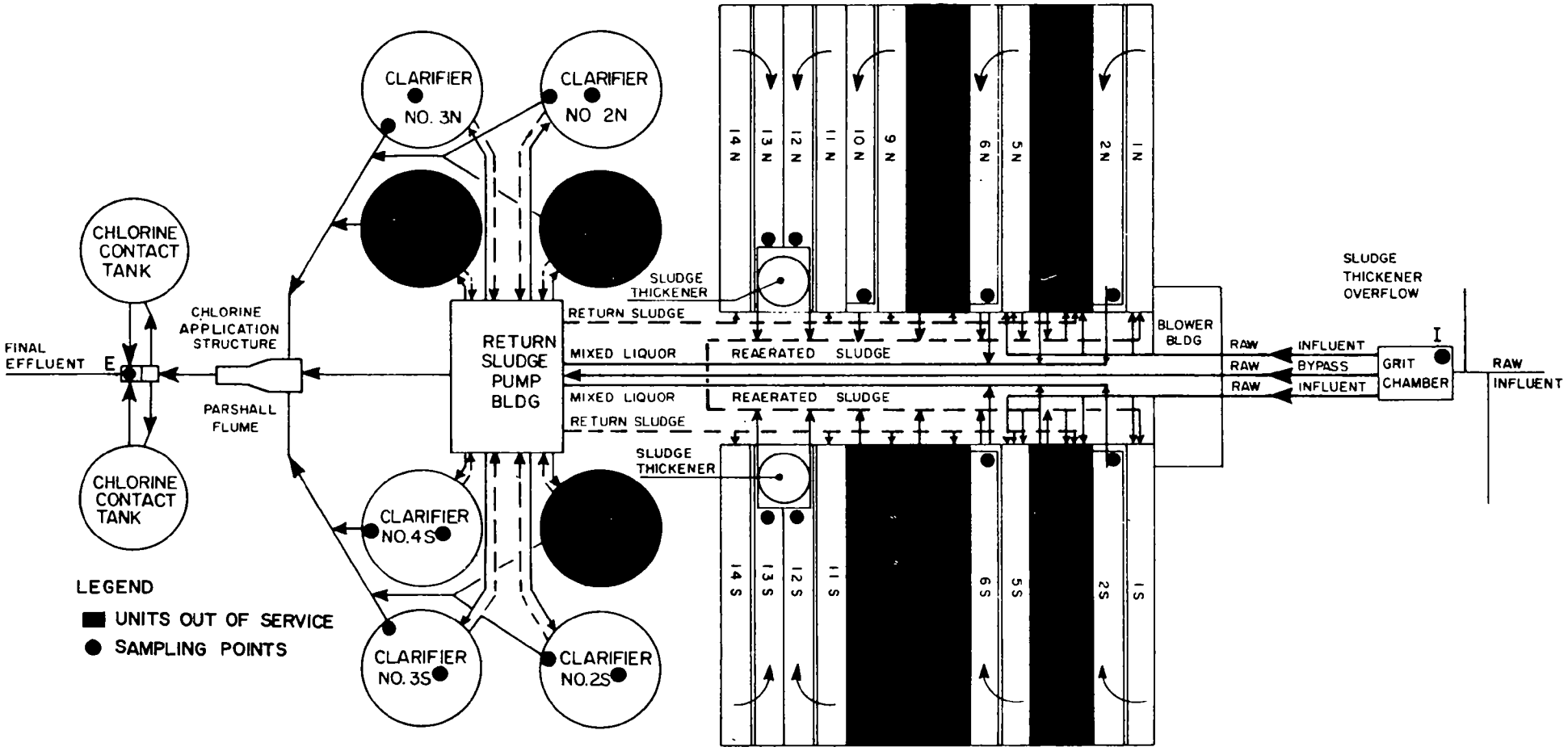


TABLE V

ACTIVATED SLUDGE OPERATIONAL PARAMETERS

T. E. MAXSON WTP

		Measured	Recommended (5,6,7)	Design
MLSS (mg/l)	(contact)	2,060	1,000 - 3,000	
	(reaeration)	6,060	4,000 - 10,000	
MLVSS (mg/l)	(contact)	1,500		
	(reaeration)	4,560		
Hydraulic detention time (hrs)	(contact)	1.15	0.5 - 1.5	0.86
	(reaeration)	2.3 *	3 - 6	4.0
Mean Cell Residence Time (days)		7.7	5 - 15	
Sludge age (days)		2.3	3.5 - 7.0	
Lbs BOD/day/lb MLVSS (F/M)		0.80	0.2 - 0.6	
Lbs COD/day/lb MLVSS		1.48	0.5 - 1.0	
Lbs BOD_5/day/1,000 cu. ft. of aeration basin		168 *	60 - 75	
Return sludge rate (% of average plant flow)		39	25 - 100	75

*Using the number of basins in service at the start of the study (Figure 5)

sult was poor sludge settleability, foul odors, and excessive oxygen uptake at the head of the aeration basins. The regulation of air flow rates to maintain 1.0 to 2.0 mg/l of DO in the basins would alleviate these problems. These DO levels can be reached by a close regulation of the air and waste flow rates into each basin.

During the study, either two or three air compressors (maximum output 42,000 cfm each) were operated. When balanced against the average influent BOD_5 loading of 173,400 lbs/day, the air supply was inadequate. Assuming a removal percentage of 85 percent and 1,000 cfm/lb BOD_5, the required air supply should be 102,300 cfm for oxidation of the incoming BOD_5. This supply does not include air required for the digesters and aerated grit chamber. These figures indicate a minimum of three compressors are required for average flow conditions. A fourth compressor would be required under peak loading conditions. Occasionally, as observed on the morning of October 21, air could not be supplied in sufficient volume to maintain recommended DO concentrations.

The loading parameters calculated in Table V indicate that the system was organically overloaded, particularly since only a portion of the WTP was in service. The number of basins in service was selected to match the hydraulic loading rather than the organic loading. Mean cell residence time (MCRT) and sludge age were at the low end of the recommended range. Due to the large volume of solids lost in the effluent plus the small number of aeration basins in service, there was not enough activated sludge to handle the incoming waste load. Subsequently, the organic loading (BOD_5/day/1,000 cu. ft.) exceeded approximately twice its recommended levels.

Although these observations suggest that the problem could be partially solved by placing the other aeration basins into service and operating the third and fourth air compressors, this approach poses some problems. The flow rates were restricted between the reaeration and contact basins, which according to WTP personnel allows a 20 mgd maximum reaerated sludge return. The system was designed to return 60 mgd (75 percent) of design flow. The facility is not capable of attaining designed removal efficiencies with a 25 percent (20 mgd/80 mgd) reaerated sludge flow rate. An analysis of the return sludge piping system, where the problem apparently exists, was beyond the scope of this study. There are a number of possibilities that could cause unanticipated head losses through the system. Some of these possibilities include:

(1) Undersized piping due to design or construction error;

(2) Excessive solids deposition in the rectangular channel, which could reduce the effective cross-sectional area;

(3) Air entrainment, which could also reduce the effective cross-sectional area;

(4) Increased head losses, due to debris trapped on the motorized butterfly valves;

(5) Unanticipated influent and effluent head losses into and out of the rectangular channel;

(6) Physical obstructions left during construction; and

(7) Excessively high solids which could contribute to higher head loss.

Many of these possibilities have been investigated unsuccessfully. Currently, a trial test is being made by WTP personnel which involves the removal of the butterfly valves. Initial indications show that the valves may be significantly reducing the flow. Similar problems have been observed in other plants (particularly in those without primary clarifiers) where butterfly valves have created problems by trapping debris.

The activity of sludge is a valuable indicator of effluent quality. Two methods of determining sludge activity are oxygen uptake rates and microscopic examinations. The oxygen uptake rate or load ratio is the measure of oxygen depletion before and after the introduction of raw waste.

$$\text{Load ratio} = \frac{\text{DO/min fed Sludge}}{\text{DO/min Unfed Sludge}}$$

The oxygen uptake procedure is presented in Appendix C. Calculated load ratios are listed in Table VI.

These ratios indicate a very active sludge and an acceptable raw waste which does not inhibit the biological treatment process. Load ratios of four or more are generally associated with high rate wastewater treatment plants. The table does not note the rapid depletion of oxygen from the fed samples. On both days of testing, 6.2 to 7.9 mg/l of oxygen was depleted within two minutes. This rapid oxygen uptake shows possible DO stress in the contact basins.

Before and during the study, a microscopic examination of the activated sludge mixed liquor solids showed a vast growth of filamentous

TABLE VI

OXYGEN UPTAKE RATES

T. E. MAXSON WTP

OCTOBER 19-20, 1976

Date	Time	RS %	URS * mg/l/min	AVERAGE O_2 - UPTAKE FRS ** mg/l/min	FRS/URS
10/19/76	1:45	40	0.70	3.00	4.28
10/20/76	10:30	40	0.73	3.02	4.14

* URS - Unfed return sludge using clarifier effluent

** FRS - Fed return sludge using raw influent

organisms. Photographs made by the WTP microbiologist showed that the filaments included sphaerotilus and actinomycete organisms. Filamentous growths settle slowly, resulting in large carryover from the final clarifier.

Protozoan indicators were present. Stalk ciliates, along with rotifer, were also in abundance. This abundance of organisms, coupled with the normal unfed DO uptake rates, definitely indicate a stable sludge which is capable of producing good quality effluent. Quality can be improved by removing conditions causing excessive filamentous growth. Increased DO concentrations throughout the total system would aid in eliminating such conditions.

Clarifiers--

The eight clarifiers have a center feed rim take-off flow configuration, with the sludge lifted by pick-up tubes to the center well. The effluent launder was placed seven feet from the wall of the clarifier. A subcontractor was stripping and repainting all of the metal work in each clarifier. This required drainage of the clarifiers, but presented no operational problems, since the WTP was only receiving approximately 50 percent of the hydraulic design loading. A new grout bottom had just been completed in one clarifier. This was necessary to level the rough bottom and facilitate smooth operation of the sludge removal equipment.

The depth of sludge blanket (DOB) below the water surface varied from zero to full depth of the clarifier. The measurements revealed a significant imbalance of flow into the five clarifiers in operation, as well as a sludge withdrawal from these clarifiers. This imbalance

caused a buildup of sludge and produced a number of operational problems. The imbalance also indicated problems with the accuracy of the magnetic flowmeters used to regulate flow into the respective clarifiers. Even though the central control panel indicated balanced flows, significant differences in flow rates over the clarifier weirs were observed. The sludge became rapidly septic, killing many of the microorganisms. This resulted in a large volume of solids being lost over the weir.

The following visual observations were made on October 20:

(1) Clarifier 2S - The outside weir of the effluent launder was lower than the inside weir; the weir was about one inch out of level, and heavy solids losses occurred at 2 p.m.

(2) Clarifier 3S - No solids were being lost and the weir level was acceptable.

(3) Clarifier 4S - The effluent launder dipped to the outside; more flow was noticed over the outside weir, and it was about 3/4 inch out of level.

(4) Clarifier 2N - The weirs were about 3/4 inch out of level in two places; less flow than in the south clarifiers was noticed, even though the magnetic flowmeters indicated the same flow rates.

(5) Clarifier 3N - The weirs were about two inches out of level; this clarifier was performing very poorly with heavy solids losses at 2:35 p.m., and less flow than in the south clarifiers was also noticed.

The clarifier overflow rates were drastically different. Appearance of these differences occurred at a time when the magnetic flowmeters indicated that the overflow and underflow rates from the five clarifiers were essentially balanced. These observations, along with DOB measurements, indicate that proper equipment adjustment and additional operational controls are needed. Elimination of these two problems would significantly improve clarifier operations and effluent quality.

The measured, recommended, and designed operating parameters for secondary clarifiers following the contact stabilization activated sludge process are presented in Table VII.

The settleability of activated sludge as determined by the settlometer test is presented in Figure 7. These curves demonstrated acceptable clarifier conditions. On October 19, 21, and 23, however, the curves indicated a deteriorating condition. The poor settling curve for October 19 was caused by septic conditions created by a power outage the night before. Poor settling was primarily caused by excessive filamentous growths in the sludge. These growths were probably encouraged by low DO and pH conditions.

Chlorine Contact Chambers--

The disinfection facility consisted of two parallel circular clarifiers employed as contact chambers. Chlorine gas was automatically fed into the wastewater stream immediately upstream from the Parshall flume and is supplied from railroad tank cars.

FIGURE 7
DAILY AVERAGE OF SETTLOMETER RESULTS
T E MAXSON WTP
MEMPHIS, TENNESSEE

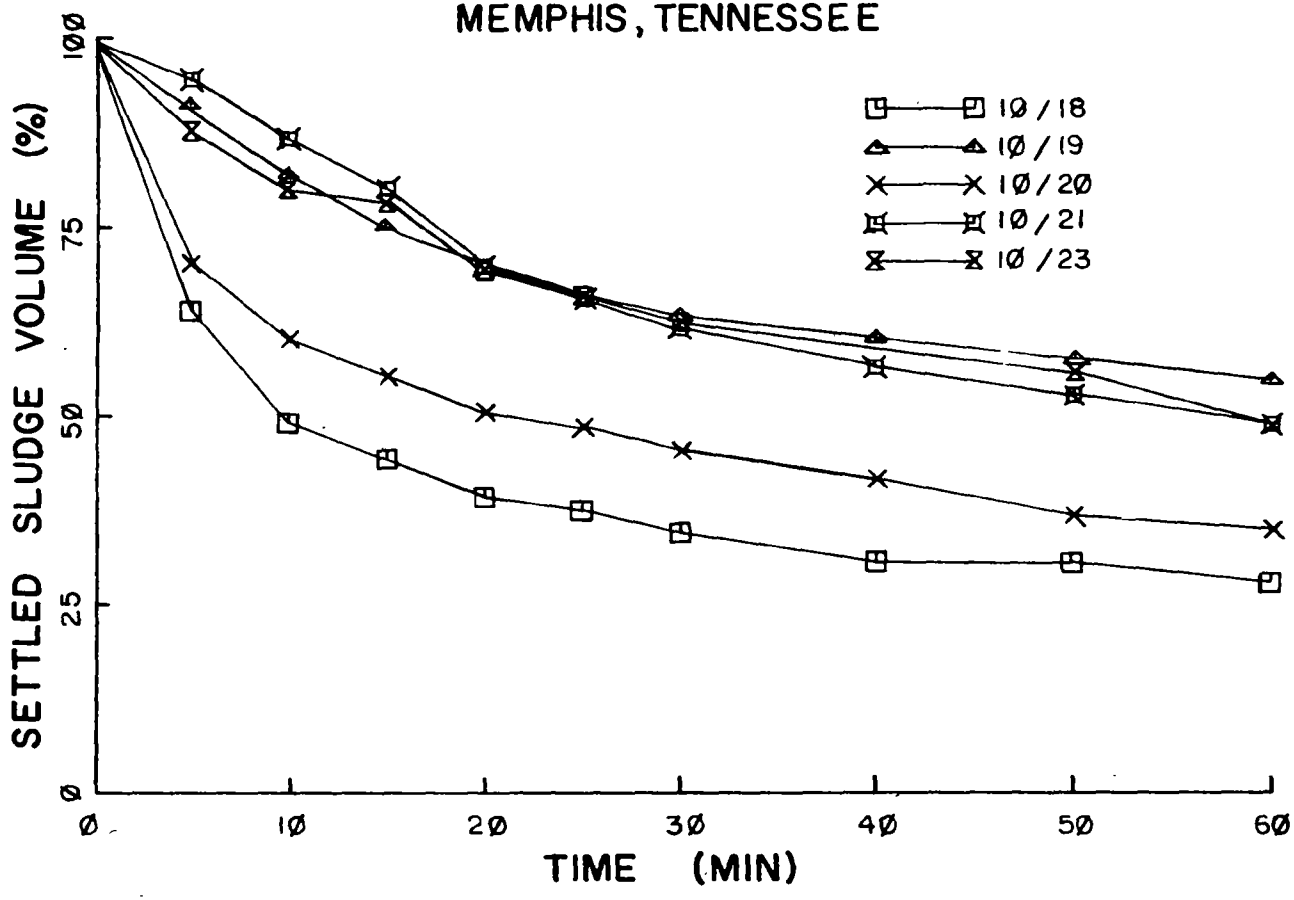


TABLE VII

SECONDARY CLARIFIER OPERATIONAL PARAMETERS

T. E. MAXSON WTP

	Measured	Recommended (7,8,9)	Design
Hydraulic loading (gpd/sq. ft.)	545	400 - 800	700
Solids loading (lbs/day/sq.ft.)	19.6	20 - 30	
Hydraulic detention (hrs)	3.55	2 - 2.5	3.85
Weir overflow rate (gpd/lin. ft.)	10,300	15,000	13,500

Wastewater treatment plant laboratory records indicate that during the six month period prior to the study, average chlorine dosage rates ranged from 1,800 to 2,700 lbs/day. However, the chlorine supply was depleted on October 14, 1976 and the effluent was not disinfected during the study.

Because of heavy solids losses from the final clarifier, the chlorine contact chamber contained excessive solids. Solids were observed throughout the chambers, and there was one foot of solids measured on the bottom. Detention time in the chambers was calculated at 1.1 hours, as compared to a design of 0.5 hours.

Sludge Handling--

Sludge digestion and holding facilities consisted of four aerobic digesters, two gravity sludge thickeners and a 13-acre sludge holding lagoon. These facilities are inadequate to properly handle the large volume of sludge generated at this facility. Except for air supply, the capacity of the four aerobic digesters is probably sufficient, if the waste sludge is thickened to at least three to four percent solids. Effective use of the gravity sludge thickeners is necessary to maximize the digester efficiency. The suspended solids concentration in the digesters during the study was 0.4 to 0.7 percent, which indicated poor utilization of the thickeners.

Sufficient air capacity was not available to operate both the activated sludge system and the digesters. Under current loading conditions, all five blowers would be required to be in service.

The sludge lagoon has a volume of approximately 70 million gallons and a surface area of 13 acres. The discharge of undigested sludge to such a facility produces foul odors, which creates severe nuisance problems. The capacity of the lagoon is not sufficient to provide sludge storage for an extended period of time.

Laboratory--

The laboratory was clean, well equipped, and adequate in size. It was staffed by a chemist, an assistant chemist, and two chemical analysts who conduct all analyses for the WTP, plus routine sampling and analyses for four other treatment facilities. These chemical analyses include BOD_5, settleable solids, TSS, VSS, DO, pH, temperature, and fecal coliform for all five facilities, plus oil and grease, chromium, copper, lead, mercury, nickel, zinc, cyanide, phenols, and NH_3-N for the T.E. Maxson WTP. At present, the laboratory appears to be understaffed for the required workload.

The WTP control testing program included aeration basin TSS, VSS, and DO (at one depth). The following tests are not currently performed and should be included in the testing program: (1) settlometer; (2) clarifier sludge blanket depth; (3) aeration basin DO at various depths, and (4) percent solids by centrifuge. The centrifuge is not absolutely essential, but permits a rapid comparison of TSS concentrations between the various basins. Trend charts should be established and maintained. Useful parameters for plotting include MLSS, sludge settleability, significant influent and effluent waste characteristics, flow (WTP, return sludge, waste sludge), depth of clarifier sludge blanket, MCRT, and F/M

ratios. Experience will dictate which of these parameters are necessary for successful WTP operations. These suggested parameters serve only as a guide, and are intended to establish trends so that gradual changes in WTP conditions can be detected prior to deterioration in effluent quality. It is advisable that WTP changes be made one at a time, and maintained for approximately two weeks to allow the WTP to reach equilibrium.

TOXICITY STUDY

Introduction

During October 15 through 22, 1976, toxicity studies were conducted on influent and effluent wastewaters of the T.E. Maxson WTP. These studies were carried out in conjunction and simultaneously with the operation and maintenance investigations discussed in the previous section. Bioassay techniques approved by EPA were utilized. The results are presented in this section of the report.

T.E. Maxson WTP Operations

(See T.E. Maxson Wastewater Treatment Plant section of this report).

Bioassay Methods and Test Organisms

"Methods for Acute Toxicity Test for Fish, Macroinvertebrates, and Amphibians" was used as a guide in conducting the toxicity study (12). Results are reported as an LC50 value. This value is defined as the lethal concentration of waste at which 50 percent of the test organisms die.

Water fleas (Daphnia magna) were approximately 96 hours old when used in 48-hour acute static bioassays. Bluegill sunfish (Lepomis macrochirus), referred to as sunfish, approximately 7 months old, 47 mm in length and 1.6 grams in weight, were used in flow-through and static bioassays. The cycling time of the flow-through diluter system was 10 minutes. This time provided a complete volume change in the test aquaria every two hours and twenty minutes.

In addition to the on-site flow-through bioassay, an algal bioassay study was conducted at the Athens laboratory. Selenastrum capricornutum

were used in this test. Guidelines developed by EPA, "Algal Assay Procedure: Bottle Test," were followed during this procedure (13).

Sampling

Except from the period 8:00 p.m. until 8:00 a.m., approximately 25-50 gallons of influent and effluent wastewater were collected at four-hour intervals. The influent sample was pumped from the grit chamber through a #30 sieve to remove large solids which could clog the flow-through diluter. Effluent wastewater was collected from the final clarifier before chlorination. The waste samples were contained in 55 gallon drums, located adjacent to the mobile bioassay trailer, and were pumped continually through the diluter systems.

Dissolved oxygen, temperature, pH, and other parameters were recorded. Grab samples for chemical analyses were taken periodically from the influent, effluent, and dilution water during the flow-through bioassays, and at the start of static bioassays. These samples were in addition to those collected during the operation and maintenance phase of the study.

Influent and effluent wastewater samples were collected on October 22, 1976, refrigerated, and returned to the Athens laboratory for algal assays. The dilution water used was collected from wells located at Davis Station Water Plant on Shelby Drive in Memphis.

Results

The LC50 value in this study is reported as percent by volume of the WTP's influent and effluent wastewater, which was diluted by well water. A total of six toxicity studies yielded the following results:

		LC50
INFLUENT	Test 1 - Sunfish, flow-through (24 hr.)	<5.6%
	Test 2 - Sunfish, flow-through (72 hr.)	>20%
	Test 3 - Waterflea, static (48 hr.)	12%
	Test 4 - Sunfish, static (24 hr.)	37.5%
EFFLUENT	Test 5 - Fish, flow-through (96 hr.)	82.5%
	Test 6 - Waterflea, static (48 hr.)	38.7%

Test 1 (Sunfish Test) was begun on October 18, 1976. During the afternoon, a slug of toxic wastewater caused mortality to occur through the lowest (5.6 percent) wastewater volume (Table VIII).

Test 2 (Sunfish Test) was begun on October 19, 1976 with the diluter system being recalibrated for a lower wastewater percent volume (1.1 to 20.0 percent) to compensate for expected slug discharges. During the 72-hour exposure period, however, significant mortality did not occur in the highest percent volume (Table IX). The sampling technique allowed the fish short exposure to grab samples of influent wastewater. The fish were in stress quite often, but would revive when exposed to a newly collected wastewater sample. This indicates the addition of a less toxic waste sample. Mortality would probably have occurred if the fish remained exposed to the more toxic waste for a longer period of time. At the end of 72 hours exposure, the fish in 20.0, 11.2, and 6.4 percent of the diluted wastewater were covered with a visible bacterial growth.

Results of Tests 3-6 are listed in Tables X-XIII from which the LC50 values were derived.

The effluent and influent samples collected for algal bioassay were not toxic to algae. In fact, the wastewater stimulated increased algal growth. There was no significant difference in the increased growth between the influent or effluent.

Chemical analyses of influent and effluent wastewater samples revealed a very complex mixture of chemicals (Table XIV and XV). A single chemical, acting alone or in combination, could have been causing the toxic conditions. Influent chemical concentrations were generally reduced during passage through the wastewater treatment plant with a concomitant reduction in toxicity.

Organic compounds combine with chlorine to form various organic complexes which may be, in some cases, more highly toxic than the original organic compound. At the time of study, the WTP was not chlorinating the effluent, therefore, an additional toxicity study should be conducted under normal disinfection processes to assess the potential production of toxic organochlorine compounds.

It should be noted some of the chemicals on the "List of 65 Toxic Compounds", contained in the EPA consent decree (4), present in the WTP influent were still present in detectable concentrations in the effluent (Table XIV).

TABLE VIII

TEST 1 - INFLUENT
24-HOUR ACUTE FLOW-THROUGH TOXICITY STUDY (SUNFISH)
T.E. MAXSON WTP
OCTOBER 18-19, 1976

% WASTE VOLUME	NUMBER OF LIVE ORGANISM 0-HR	NUMBER OF LIVE ORGANISM 24-HR	DISSOLVED OXYGEN MG/L 0-HR	DISSOLVED OXYGEN MG/L 24-HR	PH 0-HR	PH 24-HR	TOTAL ALKALINITY (MG/L AS CACO3) 0-HR	TOTAL ALKALINITY (MG/L AS CACO3) 24-HR	TOTAL HARDNESS (MG/L AS CACO3) 0-HR	TOTAL HARDNESS (MG/L AS CACO3) 24-HR
0.0	10	10	11.3	9.9	6.5	7.0	102	102	90	88
0.0	10	10	11.3	10.1						
5.6	10	0	11.4		6.7		98		88	
5.6	10	0	11.2	8.8						
10.0	10	10*	9.3	6.2						
10.0	10	10*	9.6							
18.0	10	10*	7.6	8.7						
18.0	10	10*	7.9							
32.0	10	0	5.7							
32.0	10	0	6.2							
56.0	10	0	9.8							
56.0	10	0	9.3							
100.0	10	0	6.4		6.8			137	74	
100.0	10	0	4.3							

* DUE TO A MALFUNCTION IN THE 10 AND 18 PERCENT DILUTIONS, WASTE WATER WAS PREVENTED FROM ENTERING THESE TEST CHAMBERS AND ENABLED THE SUNFISH TO SURVIVE.

TABLE IX

TEST 2 - INFLUENT
72-HOUR ACUTE FLOW-THROUGH TOXICITY STUDY (SUNFISH)
T.E. MAXSON WTP
OCTOBER 19-22, 1976

% WASTE VOLUME	NUMBER OF LIVE ORGANISMS				DISSOLVED OXYGEN MG/L				PH				TOTAL ALKALINITY (MG/L AS CACO3)				TOTAL HARDNESS (MG/L AS CACO3)			
	0-HR	24-HR	48-HR	72-HR	0-HR	24-HR	48-HR	72-HR	0-HR	24-HR	48-HR	72-HR	0-HR	24-HR	48-HR	72-HR	0-HR	24-HR	48-HR	72-HR
0.0	10	10	10	10	10.6	9.3	9.8	10.6	7.0	6.9	6.7	6.8	102	102	101	103	88	86	88	88
0.0	10	10	10	10	10.8	9.5	9.9	10.6												
1.1	10	10	10	10	10.6	8.8	8.4	9.4		7.0	6.7	6.8		101	101	100		84	84	90
1.1	10	10	10	10	10.6	8.8	8.8	9.5												
2.0	10	10	10	10	10.4	7.5	7.6	8.7												
2.0	10	10	10	10	10.4	7.1	7.8	8.6												
3.6	10	10	10	10	10.4	7.0	6.5	7.9												
3.6	10	10	10	10	10.4	7.0	6.2	7.9												
6.4	10	10	10	10	10.4*	8.3	6.6	7.7												
6.4	10	10	10	10	10.4*	8.3	7.2	8.2												
11.2	10	10	10	10	9.6*	7.5	5.4	7.7												
11.2	10	10	10	10	9.6*	8.0	5.2	7.8												
20.0	10	10	10	10	9.8*	7.9	4.6	8.4		6.9	6.7	6.7		102	107			84	82	88
20.0	10	10	10	9	9.4*	8.8	6.6	8.4												

* AERATION ADDED

TABLE X

TEST 3 - INFLUENT
48-HOUR ACUTE STATIC TOXICITY STUDY (WATER FLEAS)
T.E. MAXSON WTP
OCTOBER 20-22, 1976

% WASTE VOLUME	NUMBER OF LIVE ORGANISM 0-HR	24-HR	48-HR	DISSOLVED OXYGEN MG/L 0-HR	48-HR	PH 0-HR	TOTAL ALKALINITY (MG/L AS CACO3) 0-HR	TOTAL HARDNESS (MG/L AS CACO3) 0-HR
0	20	20	20	9.3	10.1	6.9	102	86
0	20	20	20					
1.1	20	20	20	8.8	10.0	7.0	101	84
1.1	20	20	20					
2.0	20	20	20	7.5	9.7			
2.0	20	20	20					
3.6	20	20	20	7.0	9.3			
3.6	20	20	20					
6.4	20	20	20	8.3	8.0			
6.4	20	20	20					
11.2	20	13	12	7.5	7.6			
11.2	20	11	10					
20.0	20	0	0	7.9		6.9	102	84
20.0	20	1	1	8.8	6.5			

TABLE XI

TEST 4 - INFLUENT
24-HOUR ACUTE STATIC TOXICITY STUDY (SUNFISH)
T.E. MAXSON WTP
OCTOBER 21-22, 1976

% WASTE VOLUME	NUMBER OF LIVE ORGANISMS 0-HR	24-HR	DISSOLVED OXYGEN MG/L * 0-HR	24-HR	PH 0-HR	TOTAL ALKALINITY (MG/L AS CACO3) 0-HR	TOTAL HARDNESS (MG/L AS CACO3) 0-HR
0	10	10	8.9		6.7	101	90
5.6	10	10	7.8				
10.0	10	10	7.5				
18.0	10	10	5.8				
32.0	10	7	5.9	8.2			
56.0	10	0	5.8	6.6			
100.0					6.3	133	92

* ALL CONCENTRATIONS AEREATED.

TABLE XII

TEST 5 - EFFLUENT
96-HOUR ACUTE FLOW-THROUGH TOXICITY STUDY (SUNFISH)
T.E. MAXSON WTP
OCTOBER 18-22, 1976

% WASTE VOLUME	NUMBER OF LIVE ORGANISMS					DISSOLVED OXYGEN MG/L					PH					TOTAL ALKALINITY (MG/L AS CACO3)					TOTAL HARDNESS (MG/L AS CACO3)				
	0-HR	24-HR	48-HR	72-HR	96-HR	0-HR	24-HR	48-HR	72-HR	96-HR	0-HR	24-HR	48-HR	72-HR	96-HR	0-HR	24-HR	48-HR	72-HR	96-HR	0-HR	24-HR	48-HR	72-HR	96-HR
0.0	10	10	10	10	10	10.8	9.9	9.2	9.8	10.6	6.5	7.0	6.9	6.7	6.8	102	102	102	101	103	90	88	86	88	88
0.0	10	10	10	10	10	10.8	10.1	9.3	9.9	10.6	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--
5.6	10	10	10	10	10	10.8	9.7	8.6	9.8	10.2	6.2	6.6	6.4	6.3	6.2	98	99	97	---	98	90	86	86	88	90
5.6	10	10	10	10	10	10.7	9.8	8.9	9.5	10.2	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--
10.0	10	10	10	10	10	10.3	9.2	8.3	9.3	9.8	6.5	---	---	---	---	102	---	---	---	---	90	--	--	--	--
10.0	10	10	10	10	10	10.2	9.0	8.3	9.1	10.0	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--
18.0	10	10	10	10	10	9.4	7.6	6.8	8.3	9.2	6.7	---	---	---	---	105	---	---	---	---	84	--	--	--	--
18.0	10	10	10	10	10	9.5	7.5	7.0	8.2	9.6	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--
32.0	10	10	10	10	10	8.6	5.7	9.3	8.7	8.3	6.7	---	7.1	6.8	---	114	---	114	112	---	86	--	84	84	--
32.0	10	10	10	10	10	8.5	5.2	9.1	8.5	8.6	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--
56.0	10	10	10	10	10	8.8	6.9*	8.8	8.3	9.6	7.0	---	7.3	---	---	126	---	132	---	---	84	--	--	--	--
56.0	10	10	10	10	10	8.8	6.0*	9.2	8.5	9.8	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--
100.0	10	10	10	5	4	5.6	5.1*	8.9	7.3	8.2	7.1	7.6	7.3	7.2	7.5	156	165	185	160	175	84	84	84	74	88
100.0	10	10	10	1	1	6.9	2.5*	9.3	7.9	8.8	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--

* AERATION ADDED

TABLE XIII

TEST 6 - EFFLUENT
48-HOUR ACUTE STATIC TOXICITY STUDY (WATER FLEAS)
T.E. MAXSON WTP
OCTOBER 19-21, 1976

% WASTE VOLUME	NUMBER OF LIVE ORGANISMS			DISSOLVED OXYGEN MG/L			PH	TOTAL ALKALINITY (MG/L AS CACO3)	TOTAL HARDNESS (MG-L AS CACO3)
	0-HR	24-HR	48-HR	0-HR	24-HR	48-HR	0-HR	0-HR	0-HR
0.0	20	20	20	9.9	---	---	7.0	102	88
5.6	20	20	20	9.7	---	---	---	99	86
10.0	20	20	20	9.2	---	---	---	---	--
18.0	20	20	20	7.6	---	---	---	---	--
32.0	20	19	15	5.7	---	---	---	---	--
56.0	20	7	0	6.9	---	6.6	---	---	--
100.0	20	0	0	5.1	3.8	---	7.6	165	84

TABLE XIV

ORGANIC COMPOUNDS DETECTED (MG/L)
TOXICITY STUDIES
T.E. MAXSON WTP
OCTOBER 15-22, 1976

SAMPLE DATE TIME	TEST III INFLUENT 10/20 1115	TEST II EFFLUENT 10/20 1035	DILUTION WATER 10/20 1040	TEST IV INFLUENT 10/21 1045	INFLUENT* (UNFILTERED) 10/22 0820	INFLUENT (FILTERED) 10-22 0820	EFFLUENT* (UNFILTERED) 10/22 0930	EFFLUENT (FILTERED) 10/22 0930
ORGANIC								
TOC	180	57	6	250	210	--	37	--
RAMROD 5/	2.80	1.60	0.0007	0.120	0.014	0.014	0.050	0.076
CHLORDANE 6/**	0.073	0.0023	0.0001	0.0026	0.0031	0.0024	0.0008	0.0032
PROMETON 7/	0.0104	0.011	ND	0.0026	ND	ND	ND	ND
ATRAZINE 8/	0.0013	ND	ND	ND	ND	ND	ND	ND
BUTYL BENZYL PHTHALATE 9/17/**	ND	ND	ND	ND	ND	ND	0.10	0.097
NAPHTHALENE 1/**	0.0042	0.003	ND	0.006	0.018	0.035	ND	ND
ISOMERS OF TERPINEOL 1/	0.055	0.064	ND	0.059	0.087	0.087	ND	ND
ISOMERS OF DIMETHYL NAPHTHALENE 1/	0.0044	0.0014	ND	0.0063	0.0044	0.018	ND	ND
ISOMERS OF METHYL NAPHTHALENE 1/	0.049	ND	ND	0.035	0.0047	0.002	ND	ND
INDOLE 1/	0.031	0.0096	ND	ND	0.19	0.16	ND	ND
DIETHYL PHTHALATE 1/**	ND	ND	ND	ND	0.11	ND	ND	ND
METHYLENE CHLORIDE 3/**	0.032	ND	--	ND	ND	--	ND	--
DIMETHYL SULFIDE 3/17/	0.064	ND	--	0.097	0.031	--	ND	--
ISOMERS OF DICHLOROETHYLENE 3/**	0.012	ND	--	0.015	ND	--	ND	--
ISOMERS OF TRICHLOROETHANE 3/**	0.038	ND	--	ND	ND	--	ND	--
DIMETHYLDISULFIDE 4/	0.260	ND	--	0.070	0.0087	--	ND	--
TRICHLOROETHYLENE 4/**	0.340	0.019	--	0.210	0.033	--	0.0058	--
TETRACHLOROETHYLENE 4/**	0.024	0.0036	--	0.015	0.011	--	ND	--
TOLUENE 3/**	0.870	0.0091	--	0.900	0.940	--	ND	--
ETHYL BENZENE 3/**	0.052	ND	--	0.026	0.0075	--	ND	--
2 ISOMERS OF XYLENE	0.083	0.0054	--	0.075	0.022	--	--	--
PHENOL + ISOMER OF CRESOL 1/	0.122	0.025	ND	0.028	0.280	0.084	ND	ND
PHENYL ETHANOL 1/17/	0.044	0.007	ND	0.010	0.100	0.040	ND	ND
ISOMERS OF CRESOL 1/	0.110	0.029	ND	0.015	0.190	0.013	ND	ND
ISOMERS OF ETHYL PHENOL 1/	0.018	0.015	ND	0.013	0.022	0.005	ND	ND

1/ ESTIMATED CONCENTRATIONS, FLAME IONIZATION DETECTOR

3/ ESTIMATED CONCENTRATIONS, MASS SPECTROMETER

4/ TRUE VALUE, MASS SPECTROMETER

5/ QUALIFIED VALUE, HALL ELECTROLYTIC CONDUCTIVITY DETECTOR

6/ TRUE VALUE, ELECTRON CAPTURE DETECTOR

7/ TRUE VALUE, HALL ELECTROLYTIC CONDUCTIVITY DETECTOR

8/ LOW RECOVERY, HALL ELECTROLYTIC CONDUCTIVITY DETECTOR

9/ QUALIFIED VALUE, FLAME IONIZATION DETECTOR

17/ TENTATIVE IDENTIFICATION

* ALGAL BIOASSAY SAMPLE

** THIS COMPOUND IS LISTED ON THE CONSENT DECREE, "LIST OF 65 TOXIC COMPOUNDS".

ND NONE DETECTED

TABLE XV

METAL CONCENTRATIONS DETECTED (UG/L)
TOXICITY STUDY
T.E. MAXSON WTP
OCTOBER 15-22, 1976

SAMPLING DATE	SAMPLING TIME	TYPE OF SAMPLE	CD	CR	CU	PB	ZN	FE
10/18	0755	INFLUENT	<10	<50	52	<50	93	168
10/18	1330	EFFLUENT	<10	<50	13	<50	41	278
10/20	1115	INFLUENT	<10	50	87	50	169	1705
10/20	1035	EFFLUENT	<10	<50	23	<50	50	831
10/20	1040	DILUTION WATER	<10	<50	< 10	<50	24	578
10/21	1045	INFLUENT	<10	<50	74	<50	158	1230
10/22	0820	INFLUENT	<10	59	125	72	240	2310
10/22	0930	EFFLUENT	<10	<50	< 10	<50	17	417

INDUSTRIAL DISCHARGES

Introduction

This section summarizes the industrial monitoring portion of the study, presents data for each source sampled, and describes the procedures which were used.

Wastewater samples were collected for two or more days between October 18 and 23, 1976, from thirty-six industries in the Nonconnah Creek Basin which were discharging into the WTP sewerage system. Additionally, ten industries that were discharging without treatment into the Mississippi River via the Presidents Island interceptor were sampled during October 25 through 28. This interceptor will discharge into the WTP upon its completion. Figure 1 shows the locations of all industrial sources sampled.

Summary of Industrial Contributions

Industrial wastewater loadings discharged into the WTP from the Nonconnah Creek Basin are summarized in Table XVI. These industries contributed 48 percent of the BOD_5 and COD, and 36 percent of the TSS loads discharged into the WTP during the study. Those dischargers that contributed one percent or more of the total influent load of at least one of the measured pollutants into the WTP are listed in Table XVII. The few sources which were responsible for the bulk of the influent industrial waste loads were: BOD_5 (41%) - Schlitz Brewing Company, Ralston Purina, Valley Products, Hunt Wesson Foods; COD (43%) - Schlitz Brewing

Company, Ralston Purina, Valley Products; TSS (34%) - Schlitz Brewing Company, Ralston Purina, Valley Products, Hunt Wesson Foods, Frito-Lay, Kellogg. Table XVIII shows those sources that discharged toxic organic compounds included in EPA's Consent Decree, "65 Toxic Chemicals List" (4).

Table XIX summarizes the data collected during the industrial monitoring investigation in the Presidents Island Basin. Upon completion of its interceptor, significant increases in both biologically treatable and non-treatable pollutant loads will be discharged into the WTP.

The BOD_5, COD and TSS loadings discharged from the ten Presidents Island industries sampled represent approximately 20 percent of the current total influent load of these parameters which were discharged into the WTP. The chromium discharged from these industries exceeded the total chromium discharged into the WTP for the same period. Discharges of zinc were approximately one-third of the current zinc inflow.

General Study Procedures

Sampling Program--

Sampling programs were individually developed for each industrial discharge based on wastewater characteristics, continuity of flow, and the production or process schedule. Use of grab or composite wastewater samples was based upon flow continuity or wastewater strength for each discharger. Where wastewater flow was continuous, an ISCO model 1392 or 1580 automatic sampler was employed. The samplers were programmed to pump, at specified intervals, aliquots of wastewater into a refrigerated 2.5 or 3 gallon glass bottle. A minimum of two consecutive composites were collected, unless otherwise specified.

Grab sampling was conducted at industries where automatic sampling was neither feasible nor warranted. At least two grab samples were collected and composited daily for a minimum of two days, unless otherwise specified. In addition, grab samples were collected from each industry for in situ determinations of pH and temperature.

Samples for oil and grease, organics, phenols, and cyanide analyses were collected on a grab basis into special containers. These samples were preserved where required.

Samples were delivered daily to the US-EPA mobile laboratory located at the T. E. Maxson WTP. From acquisition until delivery, the samples were refrigerated and chain of custody was maintained.

Wastewater Flow Determinations--

Wastewater flow measurements for each industrial source were made using one or more of the following methods: (1) US-EPA and/or company-installed level recorders and weirs; (2) daily readings of Memphis Light Gas and Water (MLG&W) meters, or (3) flow estimates supplied by company personnel.

The most frequently used mode of flow measurement was the MLG&W water meters. The total wastewater discharge was determined from the total water usage by subtracting consumptive losses (usually based on company estimates) and/or separate cooling and sanitary wastewaters. Discharge of sanitary wastewaters from industrial sources was based on 30 gallons per day per person (6).

Unless otherwise specified, a 5-day work week was assumed to be 21.5 work days per month; a 7-day work week was 30.4 work days per month.

Industries Investigated

The 36 Nonconnah Creek Basin industries were selected for sampling during a reconnaissance survey conducted by Surveillance and Analysis and Enforcement Division personnel during October 4 through 7, 1976. A list of 162 industries, supplied by the Deputy City Engineer, was reviewed by Memphis-Shelby County Health Department and Tennessee Department of Public Health Personnel. Their comments were noted and industrial dischargers not on the original list were added. The revised list was then evaluated as to the significance of the sources, based on the BOD_5, COD, presence of toxic substances or high wastewater flow volumes discharged into the collection system. From the original list of 162 industries, 73 were selected for on-site inspections. Thirty-six of the industries were subsequently sampled between October 18 and 23, 1976. The rejected sources discharged only cooling water, sanitary wastewater, or insignificant volumes of process wastewater. Industrial dischargers on or directly adjacent to Presidents Island were reviewed the week of October 25. Appendix E lists all industries which were considered and sampled.

Discussions follow for each industry sampled. Immediately following each discussion is the wastewater discharge data for each industry. (Note: Zeros shown in the loadings section of the tables are caused by computer rounding of loads calculated at less than one pound or kilogram.)

TABLE XVI (CONTINUED)

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

INDUSTRY	SAMPLE LOCATION NO	OPERATING SCHEDULE	CHROMIUM	COPPER	CADMIUM	IRON	ZINC	LEAD	NICKEL	ALUMINUM	MERCURY	SILVER	ANTIMONY
KIMCO AUTO PRODUCTS	M-2A	5 DAYS/WK	15.2	0.66	0.05	2.55	4.84	0.11	< .01	--	--	--	--
REFINED METALS	M-3	5 DAYS/WK	< 0.01	0.09	.02	0.36	0.09	0.35	0.02	--	--	< .01	0.26
DIXIE LITHO PLATE	M-11	5 DAYS/WK	4.69	0.89	< 0.01	--	29.1	0.02	0.01	--	--	<0.01	--
ALCO GRAVURE	M-12	5 DAYS/WK	0.26	0.59	< 0.01	9.68	0.06	0.03	<0.02	--	--	--	--
CHAPMAN CHEMICAL	M-16	5 DAYS/WK	< 0.01	< 0.01	< 0.01	--	0.01	0.02	< .01	--	< .01	--	--
RAINBO PHOTO SERVICE	M-19	5.5DAYS/WK	< 0.01	0.01	< 0.01	--	0.01	0.01	< .01	--	--	0.17	--
RICHARDS MFG	M-20	5 DAYS/WK	0.06	0.13	< 0.01	--	0.05	0.03	0.03	--	--	--	--
CLEO WRAP	M-26	5 DAYS/WK	2.10	0.02	< 0.01	--	0.50	0.05	< .01	--	--	--	--
D & W PLATING	M-27	5 DAYS/WK	3.54	0.14	0.86	--	12.6	--	0.72	--	--	--	--
GENERAL CABLE	M-39	5 DAYS/WK	< 0.02	0.01	< 0.01	--	0.06	<0.04	<0.01	0.04	--	--	--
GOULD	M-40	5 DAYS/WK	< 0.02	0.06	< 0.01	--	0.06	7.7	0.02	--	--	--	--
HUNT WESSON	M-43	7 DAYS/WK	< 0.06	0.4	< 0.1	--	0.06	<1	0.8	--	--	--	--
MEMPHIS FURNITURE	M-46	5 DAYS/WK	< 0.01	< 0.01	< 0.01	--	< .01	< .01	< .01	--	--	--	--
TOTAL LOAD			25.9	3.00	0.93	12.6	47.4	8.31	1.6	0.04	< .01	0.17	0.26

TABLE XVI

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

INDUSTRY	SAMPLE LOCATION NO	OPERATING SCHEDULE	BOD5	COD	TSS	TKN	NH3	TOTAL P	SO4	CYANIDE
DELTA REFINING	M-1	7 DAYS/WK	1020	1650	139	--	--	--	--	--
KIMCO AUTO PRODUCTS	M-2A	5 DAYS/WK	--	<13	18.7	--	--	--	2.86	--
REFINED METALS	M-3	5 DAYS/WK	--	2.5	--	--	740.0	--	1370	--
SHULTON INC	M-5	5 DAYS/WK	> 3.7*	55.5	20	--	--	--	--	--
UNITED PAINT	M-6	5 DAYS/WK	< 5	6	8	--	--	--	--	--
DIXIE LITHO PLATE	M-11	5 DAYS/WK	--	304	--	--	--	--	--	--
ALCO GRAVURE	M-12	5 DAYS/WK	126	386	17.0	--	--	--	--	--
QUALITY INDUSTRIAL UNIFORM	M-14	5 DAYS/WK	151	824	173	--	--	0.755	--	--
VALLEY PRODUCTS	M-15	3 DAYS/WK	11800	21300	2330	--	--	--	3210	--
CHAPMAN CHEMICAL	M-16	5 DAYS/WK	--	8.5	3.5	--	--	--	--	--
ILLINOIS CENTRAL GULF RR	M-17	7 DAYS/WK	< 34.6	118	81	--	--	--	--	--
RAINBOW PHOTO SERV.	M-19	5.5DAYS/WK	39.8	54	< 0.22	--	--	--	--	--
RICHARDS MFG	M-20	5 DAYS/WK	< 42.1	35.5	24.5	--	--	--	--	--
NATIONAL STARCH & CHEM	M-21	5 DAYS/WK	133	747	212	--	--	--	--	--
UTREX	M-22	5 DAYS/WK	22.6	80.5	16.7	--	--	0.75	--	--
CLEO WRAP CORP	M-26	5 DAYS/WK	--	4.3	7.4	--	--	--	--	0.001
D & W PLATING	M-27	5 DAYS/WK	--	--	60.1	--	--	4.18	--	6.6
DELTA FOREMOST	M-28	5 DAYS/WK	242	504	11.8	1.04	--	15.8	--	--
J.M. SMUCKER	M-29	5 DAYS/WK	1580	3790	153	--	--	6.97	--	--
RALSTON PURINA	M-32	7 DAYS/WK	22100	47900	8700	--	--	--	--	--
JOS. SCHILTZ BREWING	M-33	5.5DAYS/WK	38800	61000	19600	651	--	297	--	--
FRITO LAY	M-38	5 DAYS/WK	1220	6840	4170	--	--	--	--	--
GENERAL CABLE	M-39	5 DAYS/WK	--	<19	--	--	--	--	--	--
GOULD INC	M-40	5 DAYS/WK	--	--	30	--	--	--	1180	--
HIGHS ICE CREAM	M-41	4 DAYS/WK	493	865	52	--	--	--	--	--
HUNTER FAN & VENT	M-42	5 DAYS/WK	--	<28	--	--	--	4.8	--	--
HUNT WESSON	M-43	7 DAYS/WK	13400	14900	3370	--	--	55	1500	--
KELLOGG	M-44	7 DAYS/WK	7030	14000	2450	--	--	--	--	--
KROGER MEAT	M-45	6 DAYS/WK	7	12	2	--	--	--	--	--
MEMPHIS FURNITURE	M-46	5 DAYS/WK	< 2.8	4	4	--	--	--	--	--
MIDWEST FARMS	M-47	5 DAYS/WK	392	637	147	--	--	--	--	--
CROWN ZELLERBACK	M-51	5 DAYS/WK	22.6	35.0	17	--	--	--	--	--
KLINKE BROS ICE CREAM	M-56	5 DAYS/WK	248	481	101	--	--	--	--	--
KEATHLEY	M-67	5 DAYS/WK	>220	749	184	--	--	--	--	--
J. STRICKLAND	M-71	5 DAYS/WK	< 40	64	--	--	--	--	--	--
PRO-SERV**	M-73	5 DAYS/WK	--	966	362	--	--	--	--	--
TOTAL			99100	178000	42500	652	740.0	385	7260	6.6

* TOXIC TO BOD5 TEST
** BATCH DISCHARGE

TABLE XVI (CONTINUED)

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

COMPOUND	SAMPLE LOCATION NO. M-1	M-5	M-12	M-14	M-15	M-16	M-17	M-20	M-21	M-22	M-26	M-28	M-32	M-33	M-39	M-42	M-43	M-45	M-71	M-73
OIL AND GREASE	309		0.29	515	356.0		14.0	4.9	40.9	22.9	0.04	84.5	148	503	6.0	194	16400	1.2	2.8	
PHENOL *	233	ND			ND				0.39			1.66					3			ND
CHLOROFORM *		ND			ND	ND			ND											0.01
BENZENE *		ND			ND	0.040			ND											ND
DIISOPROPYL ETHER		ND			ND	0.013			ND											ND
PENTANE		< .01			ND	ND			ND											ND
TRICHLOROETHYLENE *		ND			ND	ND			13.6											0.08
TOLUENE *		ND			ND	ND			ND											0.02
ETHYL BENZENE *		ND			ND	ND			ND											0.05
ISOMER OF XYLENE		ND			ND	<0.01			ND											0.07
ACETONE		ND			0.98	23.4			31.3											ND
N-PROPYL ALCOHOL		ND			0.40	ND			ND											ND
METHYL ETHYL KETONE		ND			0.08	ND			ND											ND
ETHYL ACETONE		ND			0.04	ND			ND											ND
METHYL CYCLOPENTANE		ND			0.04	0.31			ND											ND
HEXANE		ND			0.08	0.81			2.40											ND
METHYLENE CHLORIDE *		ND			ND	2.18			7.26											0.06
N-PROPYL BENZENE		ND			ND				ND											0.01
ISOMER OF TERPINEOL		<0.01			ND				ND											ND
N,N DIISOPROPYL ANILINE		ND			ND				ND											3.79
BUTYL BENZYL PHTHALATE *		ND			ND				1.38											ND
ISOMER OF PINENE		<0.01			ND				ND											ND
LIMONENE		0.01			ND				ND											ND
ISOMER OF TERPINENE		<0.01			ND				ND											ND
ISOMER OF TRICHLOROETHANE *		ND			ND	ND			ND											ND
ACETONITRILE		ND			ND				ND											ND
TETRACHLOROETHYLENE *		ND			ND	ND			ND											ND
RAMROD																				1520
CHLORDANE *																				54.2
PROMETON																				0.51
ATRAZINE																				0.28

* - ON CONSENT DECREE '65 TOXIC CHEMICALS LIST'

ND - NONE DETECTED

TABLE XVII

INDUSTRIAL DISCHARGERS CONTRIBUTING ONE PERCENT OR MORE OF INDICATED PARAMETER
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

		PARAMETERS EXCEEDING 1 % OF INFLUENT STP LOADING (LBS/DAY)												
		BOD	COD	TSS	TKN	NH3	TOTAL P	CR	CU	ZN	PB	NI	CD	O&G
1% CRITERIA *		2090	3692	1191	118.4	44.3	55.7	0.24	0.38	0.92	0.53	0.08	<.03	120
INDUSTRY	SAMPLE LOCATION NO													
DELTA REFINING	M-1													309
KIMCO AUTO	M-2							15.2	0.66	4.84			.053	
REFINED METALS	M-3					740								
DIXIE LITHO PLATE	M-11							4.69	0.88	29.1				
ALCO - GRAVURE	M-12							0.26	0.58					
QUALITY IND., UNIF.	M-14													515
VALLEY PRODUCTS	M-15	11800	21300	2330										356
CLEO WRAP	M-26							2.10						
D&W PLATING	M-27							3.53		12.6		0.72	0.86	
J. M. SMUCKER	M-29		3790											
RALSTON PURINA	M-32	22100	47900	8700										148
JOS SCHLITZ BREWING	M-33	38800	61000	9630	631		297							503
FRITO-LAY	M-38	6840	4170											
GOULD INC.	M-40										7.7			
HUNTER FAN & VENT.	M-42													194
HUNT WESSON	M-43	13400	14900	3370					0.4			0.8		16400
KELLOGG	M-44	7030	14000	2450										
		PRESIDENTS ISLAND												
CARGILL	M-81	33200	60600	13800	820		195							
ARMOUR	M-83	9130	16700	5400	475	114	111							
UNARCO	M-85							23.00		0.99		5.12		
FAITH MEMPHIS	M-87							14.0				13		

* THESE FIGURES ARE ONE PERCENT OF THE INFLUENT LOAD MEASURED AT THE WTP DURING THE MONDAY THROUGH FRIDAY SAMPLING PERIOD.

TABLE XVIII

INDUSTRIAL SOURCES DISCHARGING TOXIC CHEMICALS*
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

INDUSTRY	SAMPLE LOCATION NO	CHLOROFORM	BENZENE	TRICHLORO ETHYLENE	TOLUENE	ETHYL BENZENE	METHYLENE CHLORIDE	CHLORDANE	BUTYL BENZYL PHTHALATE	PHENOL	DIETHYL PHTHALATE
DELTA REFINING	M-1									233	
SHULTON	M-5										5
CHAPMAN CHEMICAL	M-16		.09				2.18				
NATIONAL STARCH	M-21			13.6			7.26		1.38	0.39	
DELTA FOREMOST	M-28									1.66	
HUNT WESSON	M-43									3	
PRO-SERV	M-73	0.01		0.08	0.02	0.05	0.06	54.2			

* EPA'S CONSENT DECREE "65 TOXIC CHEMICALS LIST"

TABLE XIX

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
PRESIDENTS ISLAND INTERCEPTOR
MEMPHIS, TENNESSEE
OCTOBER 1976

INDUSTRY	SAMPLE LOCATION NO	OPERATING SCHEDULE	BOD5	COD	TSS	TKN	NH3	TOTAL P	CYANIDE
CARGILL (SOYBEAN)	M-80	7 DAYS/WK	853	1470	97	5.3	4.7	0.72	--
CARGILL (CORN SYRUP)	M-81	7 DAYS/WK	33200	60300	13800	820	12	195	--
MID-SOUTH METAL PLATING	M-82	5 DAYS/WK	--	92	95	--	--	--	16.7*
ARMOUR	M-83	5 DAYS/WK	9130	16700	5400	475	114	111	--
MEMPHIS BUTCHERS	M-84	5 DAYS/WK	932	1550	418	55.3	13.1	12.6	--
UNARCO	M-85	5 DAYS/WK	--	<22	22.5	--	--	--	<0.001
NAT BURING	M-86	5 DAYS/WK	863	1240	909	16.5	2.0	15.4	--
FAITH MEMPHIS	M-87	5 DAYS/WK	--	<18	38	--	--	--	--
MILLER TRANSPORTERS	M-88	7 DAYS/WK	<150	320	86	6.3	3.8	5.5	--
CBI NUCLEAR	M-89	5 DAYS/WK	<628	116	73	--	--	--	--
TOTAL**			45000	81800	20900	1380	150	340	16.7

* APPROXIMATION OF LOAD, IE LOAD CALCULATED WITH INSTANTANEOUS GRABS & AVERAGE OF DAILY DISCHARGE FLOWS
** TOTALS DO NOT INCLUDE < (LESS THAN) VALUES.

TABLE XIX (CONTINUED)

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
PRESIDENTS ISLAND INTERCEPTOR
MEMPHIS, TENNESSEE
OCTOBER 1976

INDUSTRY	SAMPLE LOCATION NO	OPERATING SCHEDULE	CHROMIUM	COPPER	CADMIUM	IRON	ZINC	LEAD	NICKEL	SILVER
MID-SOUTH METAL PLATING	M-82	5 DAYS/WK	1	0.1	1.7	17	31	0.04	0.2	--
UNARCO INDUSTRIES	M-85	5 DAYS/WK	23.0	0.13	<0.01	--	0.99	0.07	5.12	--
FAITH MEMPHIS	M-87	5 DAYS/WK	14	0.08	<0.01	--	0.03	0.06	13	--
MILLER TRANSPORTERS	M-88	5 DAYS/WK	0.04	0.06	<0.01	--	0.05	0.06	< 0.01	--
CBI NUCLEAR	M-89	5 DAYS/WK	0.02	0.08	<0.01	--	0.14	<0.07	0.06	0.02
TOTAL LOAD			38.1	0.45	1.7	17	32.2	0.23	18.4	0.02

NONCONNAH CREEK BASIN

Delta Refining Company--

Introduction--

Delta Refining Company, located at 543 West Mallory, operates an oil and gasoline refinery continuously with a staff of 200 people. Crude oil is taken through a standard refining operation to primary finished products of oil and gasoline.

Wastewaters and Pretreatment Processes--

Sanitary wastes are discharged into septic tank/leachfield systems. Process wastes are pretreated with an API separator, an air flotation unit, and a settling pond prior to discharge through a 90° V-notch weir with a concomitant recorder.

The company grab samples the effluent three times per week. Listed below are the results of the last three months' sampling:

Date	TSS(mg/1)	BOD(mg/1)	pH	O&G(mg/1)	Temp(°C)	Flow(mgd)
7/76	31.4	908	8.5	133.1	42	0.415
8/76	39.3	965	9.5	91.7	43	0.170
9/76	96.5	724	8.9	135.4	42	0.082

Results--

Three consecutive 24-hour composite samples were collected at the settling pond effluent (Location M-1) by means of an automatic sampler. Samples were collected at 15-minute intervals. Flows were determined by using the company's 90° V-notch weir and an EPA installed stage recorder. Operation was considered normal during the sampling period by company personnel. Wastewater loadings are given in Table XX.

Phenol and oil and grease loadings were 116 and 2.6 percent, respectively, of the total phenol and oil and grease loadings into the WTP.

The discrepancy between the phenol loading from this facility and the total phenol loading to the WTP can be attributed to biodegradation and volatization in the collection system. (Facility loading was 116% of total WTP load.)

TABLE XX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
DELTA REFINING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	PHENOLS TOTAL UG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M01	761018	1445	(C)761019	1315	0.277			410.0		19	524	
M01			761019	1320		35.0	8.6		77500			62.00
M01	761019	1445	(C)761020	1420	0.327			315.0		37	484	
M01			761020	1430		32.0	11.0		77500			67.00
M01	761020	1430	(C)761021	1430	0.278			520.0		114	1008	22.00
M01			761021	1440		35.0	9.1		130000			249.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	PHENOLS TOTAL LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M01	761018	1445	(C)761019	1315	0.277	947.8		44	1211	
M01	761019	1445	(C)761020	1420	0.327	859.6	232.94*	101	1321	308.95*
M01	761020	1430	(C)761021	1430	0.278	1206.4		264	2339	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	PHENOLS TOTAL KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M01	761018	1445	(C)761019	1315	0.277	429.9		20	549	
M01	761019	1445	(C)761020	1420	0.327	389.9		46	599	
M01	761020	1430	(C)761021	1430	0.278	547.2		120	1061	23.15

* APPROXIMATION OF LOADS (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW).

Kimco Auto Products, Incorporated--

Introduction--

Kimco Auto Products is an automotive parts rebuilding company, located at 1520 Texas Street, which employs about 550 people; 120 are involved in the parts recovery operation. The facility operates on a five day per week, eight hour per day schedule. This operation consists of rebuilding carburetors and clutches. Used clutches are process-dipped into a series of treatment units, i.e., degreasing, caustic (90% alkali), clear water rinse, and rust inhibitor (90% varsol solution).

Carburetors are processed in the following treatment order: they are first etched with a muriatic and sulphuric acid solution, then dipped in a chromic acid tank, clear water rinsed, and finally dried.

Wastewater Discharges and Pretreatment Processes--

Continuous overflow rinse tanks on the carburetor and clutch lines are the major source of industrial wastewater. The remaining wastewater flow is from sanitary usage, parts recovery, boiler and compressor discharges. Pretreatment at the facility consists of two sump tanks which provide settling.

Results--

Two consecutive composite samples and one grab sample were pumped from the sewer cleanout (M-2A) in front of building 1570 (parts recovery) during October 19 and 21, 1976. Samples were collected at one-half-hour intervals for six to seven hours during the production period. A grab sample was taken the first day of the three-day investigation due to a malfunction of the automatic sampler.

Flows were determined from daily MLG&W water meter readings. Wastewater loadings discharged from the plant were determined from the composite parameter concentrations and total flow during the production period.

Company records indicate an average monthly water usage of 55,000 cubic feet, based upon the average of the previous five months. This equates to a daily usage of 19,130 gallons per day. Discharge flows during the study were 14,615 gpd, 17,503 gpd, and 16,792 gpd for an 8.5 hour production schedule. Company personnel indicated that operation during the study should be considered typical. Analytical results are presented in Table XXI.

This facility is a major contributor of chromium, zinc, and cadmium. Discharges represent 63 percent of the chromium, 5 percent of the nickel, and 1.7 percent of the cadmium load discharged to the WTP during the study. Biological treatment processes, such as those employed at this WTP, are not specifically designed to remove heavy metals.

TABLE XXI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KIMCO AUTO PARTS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L
M02A	761019	1000	(C)761019	1700	0.017			68	40<	247600	64700
M02A			761019	1015	0.015	22.0	9.3	272	222	28000	16670
M02A	761020	1020	(C)761020	1630	0.017			90	40<	42000	21760

STATION	DATE	TIME	DATE	TIME	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	IRON FE,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SULFATE SO4-TOT MG/L
M02A	761019	1000	(C)761019	1700	12180	1330	37760	228	1028	32
M02A			761019	1015	785	904	11780	20<	45	18
M02A	761020	1020	(C)761020	1630	661	188	4920	24	35	18

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D
M02A	761019	1000	(C)761019	1700	0.017	10	6<	36	9	2
M02A			761019	1015	0.015	33	27	3	2	0
M02A	761020	1020	(C)761020	1630	0.017	13	6<	6	3	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT LB/D	IRON FE,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SULFATE SO4-TOT LB/D
M02A	761019	1000	(C)761019	1700	0.017	0	6	0	0	5
M02A			761019	1015	0.015	0	1	0	0	2
M02A	761020	1020	(C)761020	1630	0.017	0	1	0	0	3

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D
M02A	761019	1000	(C)761019	1700	0.017	5	3<	16	4	1
M02A			761019	1015	0.015	15	12	2	1	0
M02A	761020	1020	(C)761020	1630	0.017	6	3<	3	1	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT KG/D	IRON FE,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SULFATE SO4-TOT KG/D
M02A	761019	1000	(C)761019	1700	0.017	0	3	0	0	2
M02A			761019	1015	0.015	0	1	0	0	1
M02A	761020	1020	(C)761020	1630	0.017	0	0	0	0	1

Refined Metals Corporation--

Introduction--

Refined Metals, located at 257 W. Mallory, operates a lead recovery and processing operation with a work force of thirty people. The operation consists of two eight-hour shifts, Monday through Friday, and one eight-hour shift on Saturday.

This operation is classified as a "secondary lead smelting". Lead plate automotive-type batteries are processed to recover lead. The lead is then melted, refined, and sold as ingots. Battery acids are wasted to the sewer in the process. The company plans to install an acid recovery system in the future. No date, however, has been set for its installation.

Wastewater Discharges and Pretreatment Processes--

Wastewater from the production facility is primarily acid fluid from the battery braking operation. Pretreatment consists of neutralizing with gaseous ammonia and settling. Sanitary wastes are discharged directly into the city sewer.

Results--

Four 10-14 hour composite samples were taken at half-hour intervals from the wastewater sump (M-3) between October 19 through 23, 1976. Flows were determined with an EPA-installed stage recorder on the final effluent. Wastewaters were discharged from the final sump by means of a float and a pump.

Loads in Table XXII were calculated from the composite parameter concentrations and the EPA-measured flow. Company personnel considered operations normal during the sampling period.

Lead and cadmium loadings constituted nearly one percent of the total lead and cadmium discharged into the WTP. Ammonia loadings were greater than 15 percent of the total ammonia discharged into the WTP. During the study period, the company's ammonia neutralization system was not operating properly. The contact stabilization treatment process employed at the WTP is not specifically designed to treat heavy metals, ammonia, or sulfates. In addition, sulfate concentrations were very significant (i.e., 25,000 to 60,000 mg/1).

TABLE XXII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
REFINED METALS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	NH3-N TOTAL MG/L	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L
M03	761019	1400	(C)761019	2400	0.005			17500.00	68	60	1675	2750
M03			761020			6.5	11.2					
M03	761020	1400	(C)761020	2400	0.003			38000.00	88	76	2900	1950
M03			761021	1430		18.0	9.6					
M03	761021	1430	(C)761021	2400	0.002			18000.00	74	50<	3275	2825
M03	761022	0900	(C)761022	2400	0.004			17500.00	72	315	3450	3900
M03			761023	1050		20.5	8.7					

STATION	DATE	TIME	DATE	TIME	LEAD PB,TOT UG/L	IRON FE,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SILVER AG,TOT UG/L	SULFATE SO4-TOT MG/L	ANTIMONY SB,TOT UG/L
M03	761019	1400	(C)761019	2400	5725	2620	727	552	22	34000	6900
M03			761020								
M03	761020	1400	(C)761020	2400	15200	4850	584	488	20<	25000	4150
M03			761021	1430							
M03	761021	1430	(C)761021	2400	2881	1875	950	656		50000	
M03	761022	0900	(C)761022	2400	19500	3500	625	862		60000	12980
M03			761023	1050							

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NH3-N TOTAL LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D
M03	761019	1400	(C)761019	2400	0.005	803.23	3	0	0	0	0
M03	761020	1400	(C)761020	2400	0.003	1046.50	2	0	0	0	0
M03	761021	1430	(C)761021	2400	0.002	315.45	1	0<	0	0	0
M03	761022	0900	(C)761022	2400	0.004	627.98	3	0	0	0	1

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	IRON FE,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SILVER AG,TOT LB/D	SULFATE SO4-TOT LB/D	ANTIMONY SB,TOT LB/D
M03	761019	1400	(C)761019	2400	0.005	0	0	0	0	1561	0
M03	761020	1400	(C)761020	2400	0.003	0	0	0	0<	688	0
M03	761021	1430	(C)761021	2400	0.002	0	0	0		876	
M03	761022	0900	(C)761022	2400	0.004	0	0	0		2153	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NH3-N TOTAL KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D
M03	761019	1400	(C)761019	2400	0.005	364.34	1	0	0	0	0
M03	761020	1400	(C)761020	2400	0.003	474.68	1	0	0	0	0
M03	761021	1430	(C)761021	2400	0.002	143.09	1	0<	0	0	0
M03	761022	0900	(C)761022	2400	0.004	284.85	1	0	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	IRON FE,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SILVER AG,TOT KG/D	SULFATE SO4-TOT KG/D	ANTIMONY SB,TOT KG/D
M03	761019	1400	(C)761019	2400	0.005	0	0	0	0	708	0
M03	761020	1400	(C)761020	2400	0.003	0	0	0	0<	312	0
M03	761021	1430	(C)761021	2400	0.002	0	0	0		397	
M03	761022	0900	(C)761022	2400	0.004	0	0	0		977	0

Shulton Incorporated--

Introduction--

This facility is located at 1725 South Third Street. The company employs 50 people in a five-day-a-week, eight or sixteen-hour-per-day operation, depending on the seasonal demand. Shulton Incorporated manufactures alcohol-based lotion and aerosol products requiring a formulation of alcohols and propellants (hydrocarbons - fluorocarbons) as raw product sources.

Wastewater Discharges and Pretreatment Processes--

Wastewaters are generated from the washdown of vats between product changeovers. Compressor cooling water, chiller system water, and sanitary wastewater are on a separate line and were not sampled. A grease sump tank provided pretreatment for the washdown line. The tank is pumped twice a year by a septic service. The method of ultimate disposal of these solids by the septic tank service is unknown.

Results--

Product wastewater was sampled from the sump tank. This site (M-5) was sampled on two consecutive days for 14-hour sampling periods at half-hour intervals. Flow was determined from daily MLG&W water meter readings minus daily domestic consumption, compressor cooling, and chiller system waters. Compressor cooling, domestic consumption, and chiller system wastewaters accounted for an estimated 90 percent of the total raw water usage.

Company records indicated an average monthly usage of 148,300 cubic feet of water based on the last four months. This equates to a daily

usage of 51,595 gpd. Discharge flows were 33,054 gpd during October 18 through 19 and 28,828 gpd during October 19 through 20. Discharge flows used in the loading analysis (losses considered) were 3,305 gpd and 2,882 gpd, respectively (Table XXIII). Operation during the period of study was considered normal by company personnel, and wastewater discharges were assumed typical.

Several terpines and diethyl phthalates were detected in the wastewater. Diethyl phthalate is on the EPA's Consent Decree: "65 Toxic Chemicals List". The wastewater constituents were toxic to the BOD_5 test on the first day of the two-day sampling period.

TABLE XXIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
SHULTON INC.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M05	761018	1100	(C)	761018	2300	0.003			200.0>	1330	3582
M05	761019	0930	(C)	761019	2330	0.003			80.0	132	504
M05				761019	0950		24.0	6.2			
M05				761020	0955		24.0	6.4			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M05	761018	1100	(C)	761018	2300	0.003	5.5>	37	99
M05	761019	0930	(C)	761019	2330	0.003	1.9	3	12

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M05	761018	1100	(C)	761018	2300	0.003	2.5>	17	45
M05	761019	0930	(C)	761019	2330	0.003	0.9	1	5

United Paint Company, Incorporated--

Introduction--

The United Paint plant, located at 404 East Mallory Avenue, manufactures latex paints. Operations are conducted on one eight-hour shift, five days per week with approximately 50 employees.

The latex paint manufacturing process consists of blending ground pigments, wetting agents, latex and water.

Wastewater Discharges and Pretreatment Processes--

The main sources of wastewater are cooling water and wash water from the cleaning of paint mixing tanks. This water passes through a sump before discharging into the city system. Sludge and skimmings from the sump are removed when necessary, and taken to a dump. Sanitary wastewater discharges into the city system separately from the process wastewater.

Results--

Two eight-hour composite samples, collected at two-hour intervals, were collected on two consecutive days (October 20 and 21, 1976) from the sump (M-6). Flows were determined by reading the MLG&W meter and subtracting the water added to the paint product plus the estimated volume of sanitary wastewaters. Water added to the paint product was supplied by company personnel each day. Wastewater loads were determined from composite parameter concentrations and the calculated flows (Table XXIV).

The two most recent water bills averaged 259,180 gallons per month. Based on a 22 work-day month, this amounted to 11,780 gallons per day.

Raw water used during the sampling period was 9,800 gallons per day and 7,000 gallons per day, respectively. The operation was considered normal by company personnel during the sampling. However, since the flows were lower than those during the recent period, the loads discharged during the sampling period are assumed to be less than normal.

This discharger's wastewater is compatible with domestic sewage; the low concentrations and flow relegate it to a very minor contributor status.

TABLE XXIV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
UNITED PAINT
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M06				761019	1345		20.0	6.5			
M06	761020	0800	(C)	761020	1630	0.009			67.0<	170	70
M06	761021	0800	(C)	761021	1630	0.006			67.0<	81	113
M06				761022	0820		22.0	6.5			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M06	761020	0800	(C)	761020	1630	0.009	5.0<	13	5
M06	761021	0800	(C)	761021	1630	0.006	3.4<	4	6

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M06	761020	0800	(C)	761020	1630	0.009	2.3<	6	2
M06	761021	0800	(C)	761021	1630	0.006	1.5<	2	3

Dixie Litho Plate, Inc.--

Introduction--

Dixie Litho Plate is a lithographic negative and printing plate manufacturer located at 3021 Carrier Street. The facility employs eighteen people in a five day per week, eight hour per day operation. Three steps are involved in preparing the plates. First, the plate is prepped in a whirler, where a gum arabic and green pigment formulation is applied. Next, the plates are developed using a solution containing copper, aluminum, isopropyl alcohol, and butyl cellusol. The plates are rinsed as a final step. The facility also has film processing capabilities via two film processors.

Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater is generated in the plate preparation process during the rinsing step. The remaining portion of the total discharge is from sanitary usage and from the two film processors. The only pretreatment prior to discharge is a trap that provides for settling of solids after the whirler unit.

Results--

Sampling consisted of two grab samples collected and composited on two days, October 21 and 22. The sampling site was a manhole inside the plant (M-11) which does not include the sanitary and film processing wastewaters.

The flow (6,179 gpd) was determined from MLG&W water meter readings spaced 24 hours apart, minus that portion of water attributed to sanitary waste (540 gpd). Subsequent loadings reported in the attached table were based on a daily wastewater flow of 5,639 gpd. Company records indicated

that the monthly water usage, during the past three months, varied from 12,700-21,100 cubic feet with an average of 16,433 cubic feet. This equates to an average daily water usage of 5,717 gpd. Operation during the sampling period was considered normal by company personnel. Wastewater discharge loads are given in Table XXV.

The plant discharged 31, 19, and 2 percent of the total zinc, chrome, and copper discharged into the WTP. Heavy metals are not specifically treatable by biological treatment processes.

TABLE XXV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
DIXIE LITHO PLATE
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L
M11	761021	1210	(C)761021	1615	0.006			6841	129000	276000
M11			761022	1105		27.0	2.0			
M11	761022	1105	(C)761022	1420	0.006			6048	70600	960000

STATION	DATE	TIME	DATE	TIME	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SILVER AG,TOT UG/L
M11	761021	1210	(C)761021	1615	24900	310	250	10<	20<
M11			761022	1105					
M11	761022	1105	(C)761022	1420	12820	500	206	19	29

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D
M11	761021	1210	(C)761021	1615	0.006	322	6	13	1
M11	761022	1105	(C)761022	1420	0.006	285	3	45	1

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SILVER AG,TOT LB/D
M11	761021	1210	(C)761021	1615	0.006	0	0	0	0
M11	761022	1105	(C)761022	1420	0.006	0	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D
M11	761021	1210	(C)761021	1615	0.006	146	3	6	1
M11	761022	1105	(C)761022	1420	0.006	129	2	20	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SILVER AG,TOT KG/D
M11	761021	1210	(C)761021	1615	0.006	0	0	0	0
M11	761022	1105	(C)761022	1420	0.006	0	0	0	0

NOTE: LOADS REPORTED ABOVE WERE CALCULATED FROM THE CONCENTRATION OF TWO GRABS COMPOSITED DAILY USED IN CONJUNCTION WITH AVERAGE DAILY FLOW.

Alco Gravure, Incorporated--

Introduction--

Alco Gravure is a commercial printer located at 828 East Holmes Road. Approximately 172 people are employed in a two phase operation, printing and photo-engraving. The printing operation is a seven day per week, 24-hour per day operation. The photo-engraving operation is a five day per week, 14-hour per day operation.

Photo-engraving consists of copper plating and polishing, film developing, etching and chrome plating of cylindrical printing plates. The printing phase consists of inking and roll-pressing the printing plates for transference of impressions to paper.

Wastewater Discharges and Pretreatment Processes--

The only significant wastewater generation was in the photo-engraving department. Excluding any spillage, wastewaters originate from a series of okite (cleaning solution) tanks and clear water rinse tanks. Okite tanks provide preparatory cleaning to plating; rinse tanks provide cleansing after each plating and etching operation.

Pretreatment of these wastewaters is provided by a dual underflow-overflow system which provides clarification by trapping the floatables and settling the solids. The tank is pumped out periodically by a septic tank service. Ultimate disposal of this sludge by the septic tank service is unknown.

Sanitary wastes and cooling waters are on a separate line which discharges directly into the sewerage system.

Results--

On two consecutive days, October 21 and 22, 1976, 14-hour composite samples were collected at half-hour intervals from the tank cleanout (M-12). Tank wastewater flow was determined by daily MLG&W water meter readings minus sanitary and boiler water consumption. Subsequent loadings given in the attached table were determined from the composite parameter concentrations and total calculated flow during the production period.

Company records indicate an average monthly water usage of 51,800 cubic feet, based on the last two months. This equates to an approximate daily usage of 18,020 gpd, based on a five-day work week. Raw water usage on October 20 through 21 and October 21 through 22, was 19,410 and 23,255 gpd, respectively. Wastewater discharge flows, with the subsequent uses subtracted, were 5,022 gpd and 8,867 gpd, respectively. These figures were used in the loading calculations. Operation during the sampling period was considered normal by company personnel. Wastewater discharge loads are given in Table XXVI.

This facility discharges more than one percent of the total chromium and copper load to the plant and was considered to be a major contribution to the sewerage system. Biological treatment processes, such as those employed at the WTP, are not specifically designed to remove heavy metals.

TABLE XXVI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
ALCO GRAVURE INC.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M12	761020	0835	(C)761020	2200	0.005			2500.0	340	6209	
M12			761021			18.0	2.5				5.00<
M12	761021	0900	(C)761021	2400	0.009			2000.0	270	6169	
M12			761022	1130							5.00<

STATION	DATE	TIME	DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	IRON FE,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M12	761020	0835	(C)761020	2200	2020	1045	11300	385	201500	539	10<
M12			761021								
M12	761021	0900	(C)761021	2400	5900	850	8320	534	133600	244	10<
M12			761022	1130							

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M12	761020	0835	(C)761020	2200	0.005	104.7	14	260	0.29*	0	0
M12	761021	0900	(C)761021	2400	0.009	148.0	20	457		0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	IRON FE,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M12	761020	0835	(C)761020	2200	0.005	0	0	8	0	0
M12	761021	0900	(C)761021	2400	0.009	1	0	10	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M12	761020	0835	(C)761020	2200	0.005	47.5	6	118		0	0
M12	761021	0900	(C)761021	2400	0.009	67.2	9	207		0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	IRON FE,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M12	761020	0835	(C)761020	2200	0.005	0	0	4	0	0<
M12	761021	0900	(C)761021	2400	0.009	0	0	4	0	0<

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Quality Industrial Uniform Service--

Introduction--

Quality Industrial Uniform Service, located at 2868 Rudder, is an industrial laundry which employs 66 people seven hours per day, five days per week. The process is a wet cleaning (no dry cleaning) operation.

Wastewater Discharges and Pretreatment Processes--

Wastewaters originate from the washing operation and also contain cooling waters. Sanitary wastes are discharged separately. Pretreatment consists of bar screens and a small settling basin.

Results--

Grab samples were taken from the effluent sump (M-14) twice per day and composited daily during October 19 and 20, 1976. Flow was determined from MLG&W water meter readings with an adjustment made for sanitary wastewaters. Adjusted flows during the sampling periods of October 19 and 20, 1976 were 40,238 gpd and 39,265 gpd, respectively. Company records for the previous three months revealed an average monthly water usage of 152,400 cu. ft. (53,033 gpd). Wastewater discharge loads given in Table XXVII are considered slightly less than normal for this facility.

The BOD_5, TSS, COD, and oil and grease concentrations of this facility's wastewater were well above those of typical domestic wastewaters. Oil and grease loadings from this facility constituted greater than four percent of the WTP influent waste load.

TABLE XXVII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
QUALITY INDUSTRIAL UNIFORM
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M14			761019	1100	0.040	34.0	10.7	350.0	310	2.150	1174	
M14			761019	1500		31.0	7.1					99.00
M14			761020	1140	0.039	50.0		558.0	730	2.400	3790	
M14			761020	1545		35.5	10.9					3002.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M14			761019	1100	0.040	117.4	104	0.721	394	
M14			761020	1140	0.039	183.0	239	0.787	1243	514 *

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M14			761019	1100	0.040	53.3	47	0.327	179	
M14			761020	1140	0.039	83.0	109	0.357	564	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

Valley Products Company--

Introduction--

Valley Products is an industrial soap manufacturer located at 384 East Brooks Road. The facility employs 30 people in a three day per week, two shift operation. The basic saponification is used to hydrolyze vegetable oil with caustic soda to produce soap. The finished soap goes through a chilling roll or is spray dried.

Wastewater Discharges and Pretreatment Processes--

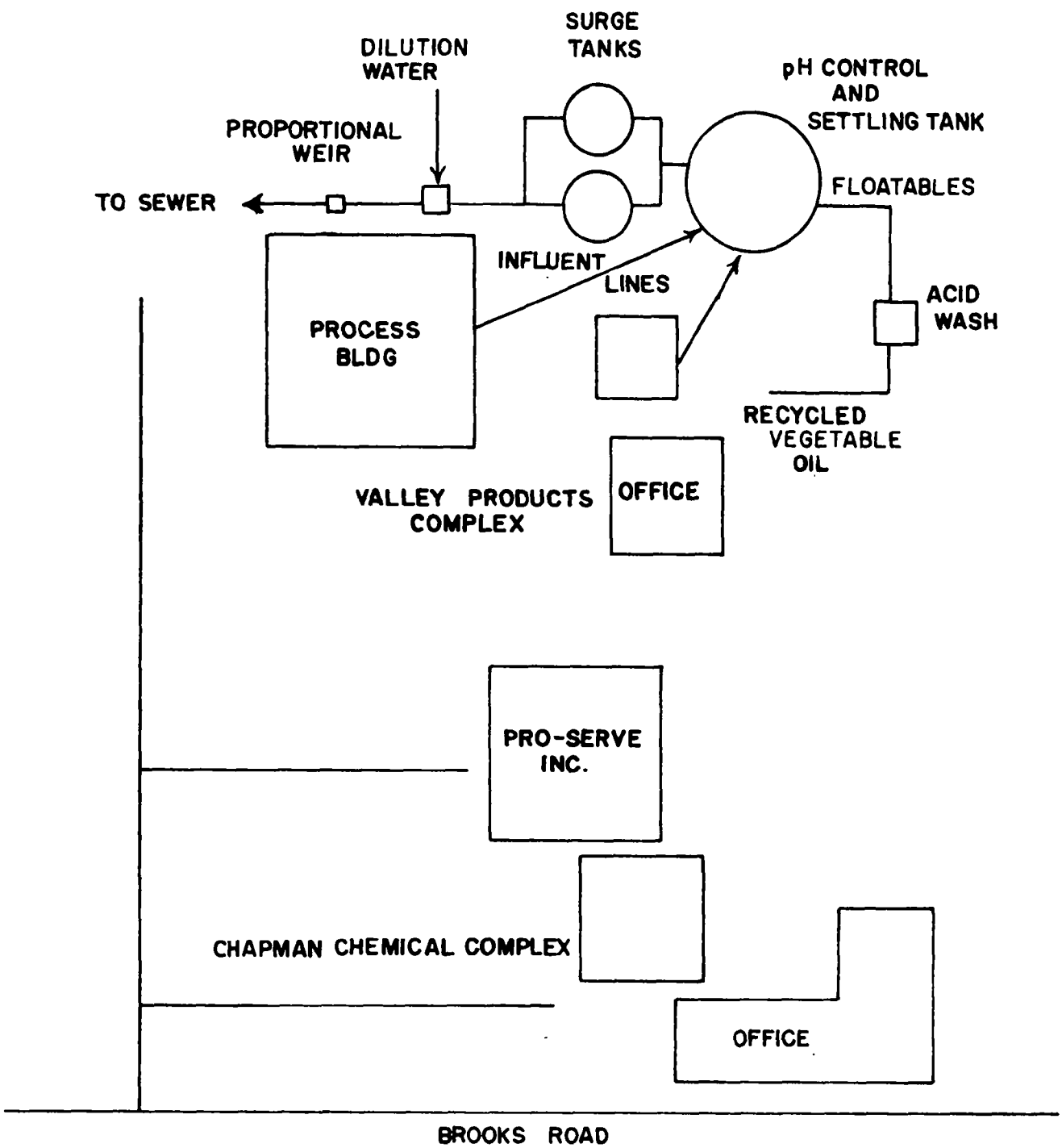
Wastewaters are generated when water is extracted from the highly organic raw material, during cleanup and during process operations.

Caustic process wastewaters are pumped into a common tank (Figure 8). Wastewater is neutralized with sulphuric acid to a pH range of 6.5 - 7.0 and allowed to settle. Floatable fatty acids are skimmed off, acid washed, and pumped back to the plant for reprocessing. Through a series of taps (at 2' vertical increments) on the settling tanks, the layer of liquid between the floatables and solids is determined. This wastewater supernatant is then pumped into one of two surge tanks, the flow from which is throttled by the use of valves to maintain a continuous 15-20 gpm release. The cooling water line discharges downstream from this line, providing dilution prior to the proportional weir.

Results--

Wastewater from the surge tanks was sampled in the open channel just upstream of the company's proportional weir. This site (M-15) was sampled for two consecutive 24-hour periods at 15 minute intervals. Flow was determined from daily readings of the company's totalizer. Discharge flows on October 19 and 20 were 45,050 and 53,500 gpd, respectively.

FIGURE 8
SITE DIAGRAM
VALLEY PRODUCTS CO.
MEMPHIS, TENNESSEE



Loads in Table XXVIII were based on the composite parameter concentrations and daily flows determined with the company totalizer. Operation during the sampling period was considered normal by company personnel. This effluent accounted for nearly six percent of the BOD_5 and COD, 18 percent of the TSS, and three percent of the oil and grease discharged during the study. In addition, significant concentrations of sulfates were measured, ranging from 5,550 to 10,500 mg/l.

TABLE XXVIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
VALLEY PRODUCTS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L	SULFATE SO4-TOT MG/L
M15	761018	1540	(C)761019	1415	0.045			16330.0	2925	26830	960.00	10500
M15			761019	1454		38.0	5.5					
M15	761019	1500	(C)761020	1500	0.053			7330.0	1730	15850		5550
M15			761020	1505		35.0	6.0				784.00	

LOADINGS

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	SULFATE SO4-TOT LB/D
M15	761018	1540	(C)761019	1415	0.045	6139.4	1100	10087	356*	3948
M15	761019	1500	(C)761020	1500	0.053	3272.6	772	7077		2478

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	SULFATE SO4-TOT KG/D
M15	761018	1540	(C)761019	1415	0.045	2784.8	499	4575	163.71	1791
M15	761019	1500	(C)761020	1500	0.053	1484.4	350	3210		1124

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

Chapman Chemical Company--

Introduction--

Chapman Chemical is a wood preservative manufacturer located at 416 East Brooks Road. They employ 48 people in a five day per week, eight hour per day operation.

This process consists of three production lines, one dry and two wet. The dry line operation is a mixing and packaging of true wood preservatives. The wet lines involve mixing, blending, and packaging pigmented wax emulsions, and blending and packaging sapstain control solutions. These solutions provide antimicrobial control of fungi. Active ingredients used in this process are: pentachlorophenol, tetrachlorophenol, copper-8 quinolinolate, and phenyl mercuric lactate.

Wastewater Discharges and Pretreatment Processes--

Mixing vessel washdowns from product changeovers and floor drainage generate the total industrial wastewater volume discharged into the sewerage system. Sanitary sewage is discharged from a separate line. Pretreatment consists of an underflow-overflow chamber that provides discrete separation of floatables and settleables, which are respectively skimmed and pumped off, both going to a common tank for ultimate disposal in a landfill.

Results--

Sampling consisted of composite samples collected at half-hour intervals for seven to eight hours of the production period on two consecutive days during October 18 through 20, 1976.

On the first day of sampling, only the Millbrite 50 product line was in operation. This product is a weather protectant solution for

lumber and plywood. On the second day of sampling, only the Sealtite line was operating. This is a pigmented wax emulsion used as an end coating to control splitting and checking in wood products.

Flows were determined from daily readings of three separate water meters. The MLG&W meter totalized the entire raw water usage, while the other two devices metered specific in-plant usage. The two in-plant meter readings were subtracted from the MLG&W meter reading to give the total industrial water usage and thus the corresponding wastewater discharge. However, 24 gpm was detected as totalized use on the MLG&W meter during the time the system was inoperative. This usage was attributed to a leak in the air compressor chiller system. Resulting discharge flows (leak subtracted) used in the loading analysis, for the period of October 18 through 20 were 18,670 gpd and 7,780 gpd, respectively. Company records indicate that the average monthly usage was 133,600 cubic feet. This equates to a daily usage of 46,480 gpd; subtracting the leakage rate gives an average discharge flow rate of 11,920 gpd. According to company estimates of normal water usage in the processing of the Millbrite product, flow on that first day of sampling was unusually high, and thus this loading was not assumed to be indicative of normal operation. Analytical results are presented in Table XXIX.

During the period of the investigation, only the Sealtite and Millbrite product lines were in operation. Characterization of the wastewaters revealed the presence of benzene, xylene, and several alkyl benzenes. Benzene is on EPA's Consent Decree: "65 Toxic Chemicals List."

Heavy metals, COD, and TSS were not detected in significant concentrations. However, the results are only representative of these two product lines and should not be categorically accepted as typical for all the products manufactured at this facility.

TABLE XXIX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CHAPMAN CHEMICAL
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L
M16	761018	0900	(C)761019	0900	0.019			40	89	50<
M16	761019	0900	(C)761020	0900	0.008			22	53	50<
M16			761019	0918		16.0	6.6			

STATION	DATE	TIME	DATE	TIME	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	MERCURY HG,TOTAL UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M16	761018	0900	(C)761019	0900	82	22	85	3.5	20<	10<
M16	761019	0900	(C)761020	0900	165	14	288	2.3	20<	10<
M16			761019	0918						

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D
M16	761018	0900	(C)761019	0900	0.019	6	14	0	0	0
M16	761019	0900	(C)761020	0900	0.008	1	3	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT LB/D	MERCURY HG,TOTAL LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M16	761018	0900	(C)761019	0900	0.019	0	0.0	0	0
M16	761019	0900	(C)761020	0900	0.008	0	0.0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D
M16	761018	0900	(C)761019	0900	0.019	3	6	0	0	0
M16	761019	0900	(C)761020	0900	0.008	1	2	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT KG/D	MERCURY HG,TOTAL KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M16	761018	0900	(C)761019	0900	0.019	0	0.0	0	0
M16	761019	0900	(C)761020	0900	0.008	0	0.0	0	0

Illinois Central Gulf Railroad - "Johnston Yard"--

Introduction--

The Illinois Central Gulf Railroad Yard is located off Horn Lake Road between Alcy and Peebles Road. The company employs approximately 550 people in a seven day a week, 24-hour operation. This facility is engaged in the transfer of commercial freight, maintenance and refueling of train engines, plus the switching of railway cars.

Wastewater Discharges and Pretreatment Processes--

The major source of wastewater is surface runoff from the yard apron which drains the maintenance and refueling depot. Wastewaters are pretreated in two series-operated lagoons. Both lagoons are equipped with oil flotation collars; the upstream lagoon has two oil mop apparatuses (Figure 9).

Results--

The facility was sampled just downstream of the company's rectangular weir at Site M-17 (Figure 9) for two consecutive 24-hour compositing periods using a 15-minute sampling interval. Flow was determined by daily readings of the company's totalizer. A comparison of instantaneous measurements made on the company's rectangular weir and 12-inch Parshall flume showed the separate primary devices to be closely correlated. Effluent flows used to compute subsequent loadings for the period October 19 through 20 and October 20 through 21 were 258,000 and 156,000 gpd, respectively.

Operation during the sampling period was considered normal by company personnel. Wastewater discharge loads are given in Table XXX. This facility is a minor discharger that contributes a wastewater amenable to treatment by the contact stabilization process used at the WTP.

FIGURE 9
TREATMENT SYSTEM
ILLINOIS CENTRAL GULF RR
MEMPHIS, TENNESSEE

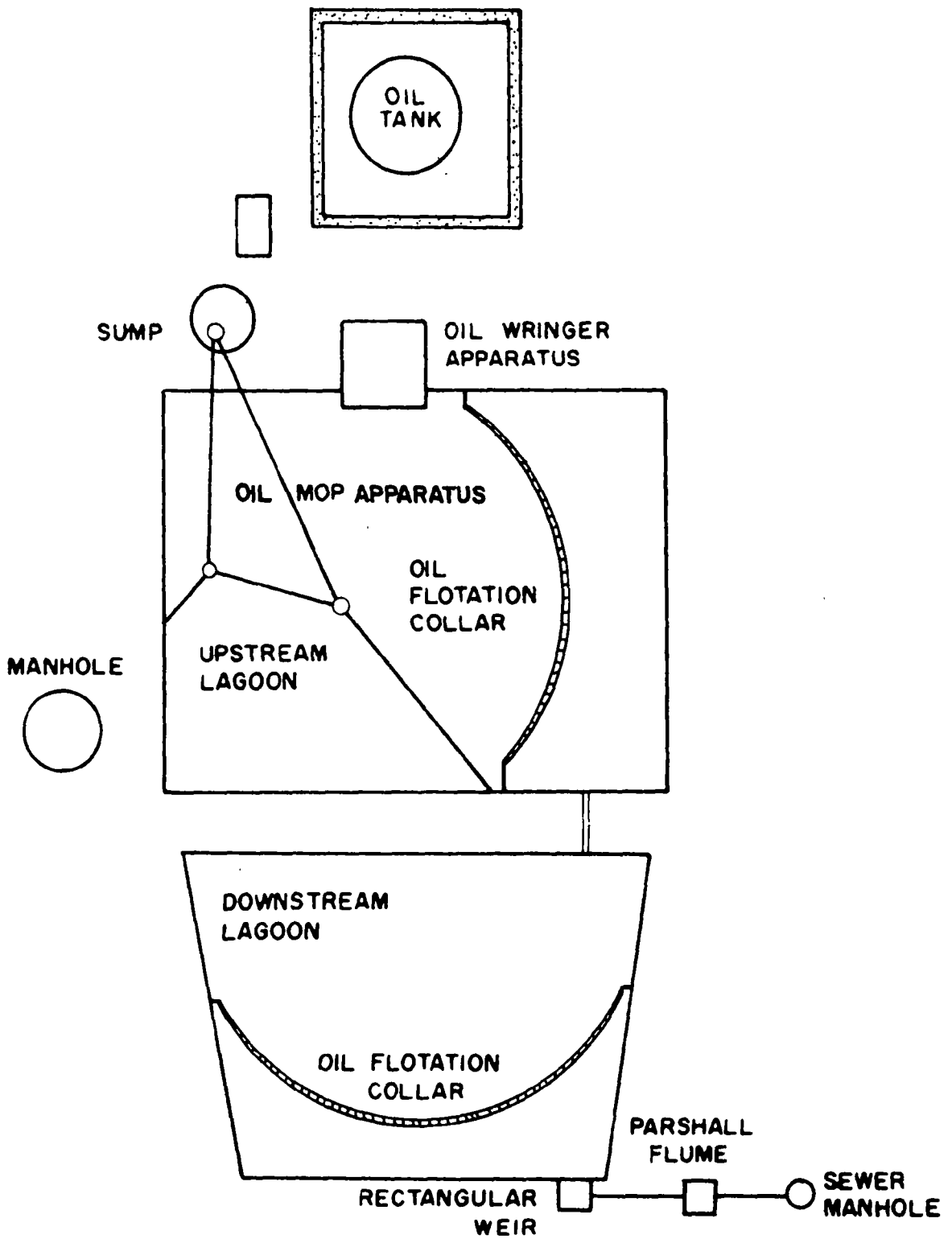


TABLE XXX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
ILLINOIS CENTRAL RR
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	PHENOLS TOTAL UG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M17	761019	1315	(C)761020	1315	0.258			20.0<		40	85	
M17	761020	1310	(C)761021	1410	0.156			20.0<		58	40	
M17			761020	1316		18.0	9.1					8.80
M17			761020	1317					95			
M17			761021	1415		18.0	9.1		52			7.40

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	PHENOLS TOTAL LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M17	761019	1315	(C)761020	1315	0.258	43.1<		86	183	
M17	761020	1310	(C)761021	1410	0.156	26.0<		76	52	14 *

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	PHENOLS TOTAL KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M17	761019	1315	(C)761020	1315	0.258	19.5<		39	83	
M17	761020	1310	(C)761021	1410	0.156	11.8<		34	24	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG DAILY FLOW)

Rainbo Photo Service, Incorporated--

Introduction--

Rainbo Photo Service is a wholesale photo finisher, located at 3061 Millbranch. The facility employs 40 people in a five and one-half day per week, 16-hour per day operation. Eight machines, four paper processing and four film developing, provide the operational capabilities in this photo finishing business.

Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater is generated from a continuous wash and rinse overflow of the eight processing units. These wastes are combined with the sanitary waste prior to discharge. Pretreatment consists of a silver recovery unit, which replates spent silver from the processing operation, and a sump that provides settling for all plant wastewater flow prior to discharge into the sewerage system.

Results--

Two composite samples were collected from the company sump (M-19) for two consecutive days during the period of October 19 through 21, 1976. Samples were collected at 15-minute intervals for 15-16 hours of the production period. The flow of 12,878 gpd used in the loading computation was determined from MLG&W water meter readings spanning 24 hours.

Company estimates of process wastewater were 180 gallons per machine hour. Based on an estimation of 64 machine-hours per day, the total wastewater flow was 11,520 gpd. The sanitary contribution was 1,200 gpd; therefore, the total estimated flow was 12,720 gpd.

Operation during the sampling period was considered normal by company personnel, and loadings reported in Table XXXI were considered indicative

of typical plant operations.

The characteristics of the wastewater from this facility are generally compatible with the contact stabilization process used at the WTP.

TABLE XXXI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
RAINBO PHOTO SERVICE
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L
M19	761019	0830	(C)761020	0830	0.013			370.0	3	559	
M19			761020	0830		21.0	7.1				
M19	761020	0830	(C)761021	1100	0.013				1<	447	50<
M19			761021	1105		22.0	7.2				

STATION	DATE	TIME	DATE	TIME	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SILVER AG,TOT UG/L
M19	761019	0830	(C)761020	0830						
M19			761020	0830						
M19	761020	0830	(C)761021	1100	123	90	80<	20<	10	1620
M19			761021	1105						

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M19	761019	0830	(C)761020	0830	0.013	39.8	0	60		
M19	761020	0830	(C)761021	1100	0.013		0	48	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SILVER AG,TOT LB/D
M19	761019	0830	(C)761020	0830	0.013					
M19	761020	0830	(C)761021	1100	0.013	0	0	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M19	761019	0830	(C)761020	0830	0.013	18.0	0	27		
M19	761020	0830	(C)761021	1100	0.013		0	22	0<	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SILVER AG,TOT KG/D
M19	761019	0830	(C)761020	0830	0.013					
M19	761020	0830	(C)761021	1100	0.013	0	0	0	0	0

Richards Manufacturing Company--

Introduction--

Richards Manufacturing Company is a surgical implant and instrument manufacturer located at 1450 Brooks Road. The facility employs 385 people in a five day per week, two shift per day operation. The process consists of forming, polishing, and chemically finishing 300 and 400-series stainless steel to produce surgical implants and instruments.

Wastewater Discharges and Pretreatment Processes--

Continuous cooling water discharge from a parts coating oven operation, boiler blowdown water, sanitary usage, and rinse water from the electro-plating operation account for the total wastewater discharge into the sewer system. There is no pretreatment of this combined industrial and sanitary discharge.

Results--

Sampling consisted of two grab samples taken and composited on two consecutive days, October 21 and 22, 1976. The sampling site (M-20) was a street manhole located at the northeast corner of the plant. Each individual grab sample at this location was a composite of two samples, one from each of the two discharge pipes that convey the total plant discharge into the manhole.

Flow was determined from MLG&W water meter readings over the sampling period. Subsequent loadings using this flow (42,000 gpd) are given in Table XXXII.

Company records indicate that the monthly water usage during the past four months averaged 116,825 cf. This equates to an average daily

water usage of 41,000 gpd. Operation during the study was considered typical, and thus the discharges are assumed to be representative of typical discharges.

Characteristics of the wastewater from this facility during the study period were compatible with the contact stabilization process used at the WTP. However, the results should not be categorically accepted as typical of the wastewater discharged from this facility at all times.

TABLE XXXII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
RICHARDS MANUFACTURING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M20	761021	1145	(C)761021	1540	0.042			40.0<	62	41	
M20			761022	1050		25.0	8.3				14.00
M20	761022	1050	(C)761022	1440	0.042			200.0<	76	162	

STATION	DATE	TIME	DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M20	761021	1145	(C)761021	1540	211	128	348	80<	80	10<
M20			761022	1050						
M20	761022	1050	(C)761022	1440	148	138	400	80<	69	10<

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	CHROMIUM CR,TOT LB/D
M20	761021	1145	(C)761021	1540	0.042	14.0<	22	14	4.9*	0
M20	761022	1050	(C)761022	1440	0.042	70.1<	27	57		0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M20	761021	1145	(C)761021	1540	0.042	0	0	0	0	0
M20	761022	1050	(C)761022	1440	0.042	0	0	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	CHROMIUM CR,TOT KG/D
M20	761021	1145	(C)761021	1540	0.042	6.4<	10	7		0
M20	761022	1050	(C)761022	1440	0.042	31.8<	12	26		0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M20	761021	1145	(C)761021	1540	0.042	0	0	0	0	0
M20	761022	1050	(C)761022	1440	0.042	0	0	0	0	0

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

NOTE: ALL OTHER LOADS REPORTED WERE CALCULATED FROM THE AVERAGE OF TWO DAILY GRABS (COMPOSITED) AND AVERAGE DAILY FLOW

National Starch and Chemical Corporation--

Introduction

National Starch and Chemical Corporation, located at 4035 Senator Street, produces synthetic adhesives. The facility operates eight hours per day, five days per week, and employs eight people. Using a blending and heating batch process, two categories of adhesives are produced (i.e., Polyvinyl Acetate and Dextren). Chemicals used in the Polyvinyl Acetate adhesives are Dibutyl thiolate, trichloroethylene, formaldehyde, phenols, and defoaming agents. Chemical ingredients used in the formulation of Dextren adhesives are corn starch, borax, caustic soda, and formaldehyde.

Wastewater Discharges and Pretreatment Processes--

Wastewaters are derived from mixing vat cleanups, floor washings, and cooling water flows which discharge untreated through a common drain. Sanitary wastes are not combined with the process wastewaters.

Results--

Three consecutive daily composites were taken from the effluent drain (M-21) during the period of October 19 through October 21, 1976. Samples were taken at half-hour intervals for 6-7 hours of the production period. Flows were determined by an EPA-installed 60^{o} V-notch weir and stage recorder. Subsequent loadings are given in Table XXXIII, and were determined from the composite parameter concentrations and total flow during the production period.

Company records indicate an average monthly water usage of 118,533 cf based upon the last three months ending October 15, 1976. This equates to a daily usage of 41,240 gallons per day. Discharge flows were in the

range of 16,000-25,000 gallons for an 8.5 hour production period. The balance of the water usage is attributed to sanitary waste discharges to the city sewer and to cooling water discharge during non-production periods. Company personnel considered operations normal during the study period.

Although this plant discharges a small volume of wastewater, seven organic compounds, four of which are on EPA's Consent Decree: "65 Toxic Chemicals List," were isolated in samples from the discharge.

TABLE XXXIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
NATIONAL STARCH AND CHEMICAL
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M21				761019	0930							225.00
M21	761019	1000	(C)	761019	1730	0.025			666.0<	1080	4234	
M21				761020	1100		25.0					
M21	761020	1100	(C)	761020	1730	0.024			799.0	1255	3982	
M21	761021	1100	(C)	761021	1700	0.016			640.0	85	605	
M21				761021	1110		31.0	6.4				

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M21	761019	1000	(C)	761019	1730	0.025	138.4<	224	880	
M21	761020	1100	(C)	761020	1730	0.024	162.0	255	808	40.9 *
M21	761021	1100	(C)	761021	1700	0.016	86.5	11	82	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M21	761019	1000	(C)	761019	1730	0.025	62.8<	102	399	
M21	761020	1100	(C)	761020	1730	0.024	73.5	115	366	
M21	761021	1100	(C)	761021	1700	0.016	39.2	5	37	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

Utrex, Incorporated--

Introduction--

Utrex, located at 3820 Delp, is an industrial laundering operation which employs 30 people working eight hours per day on a five day per week work schedule. Industrial uniforms, rags, and shop towels are laundered by both dry cleaning and wet cleaning processes. In this relatively unique process, oil stained materials are solvent cleaned (dry cleaned) and then receive standard wet cleaning.

Wastewater Discharges and Pretreatment Processes--

Process wastewaters include laundry water, cooling water, and dry cleaning solvent carryover and spillage. Sanitary wastes are discharged separately. Pretreatment consists of bar screens and a settling basin. Settled solids are removed by a septic tank service company.

Results--

A single grab sample was taken on October 19 at a location prior to pretreatment. On October 20, two grab samples were composited from the sump (M-22) following pretreatment. In addition, on October 20, a sample (M-22A) was taken from spent solvent found floating on the final settling basin. Flow was determined from MLG&W water consumption adjusted for sanitary waste. Company records for the last three months indicate an average water usage of 105,800 cf (36,800 gpd). During the sampling period of October 19 and 20, process wastewater flows to the sewer were 32,860 gpd and 26,400 gpd, respectively, based upon water meter readings minus sanitary waste. Wastewater discharge loads with the exception of M-22A given in Table XXXIV are considered typical for this facility.

Wastewaters discharged from this facility are compatible with the contact stabilization process at the WTP. Loadings constitute less than one percent of the total loadings to the WTP.

Spilled dry cleaning fluid (COD of 242,000 mg/l), found floating in the company's settling basin, constitutes a significant potential load to the WTP. The company had the fluid (1,800 gallons) removed by a cleanout service during the study period. The ultimate disposal location of this fluid by the cleanout service is unknown.

TABLE XXXIV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
UTREX
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M22			761019	1100	0.033	64.0	9.9	93.0	75	4.600	368	45.00
M22	761020	1100 (C)	761020	1300	0.027			90.0	60	1.500	283	132.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M22			761019	1100	0.033	25.5	21	1.263	101	21.88*
M22	761020	1100 (C)	761020	1300	0.027	20.2	13	0.337	64	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M22			761019	1100	0.033	11.6	9	0.573	46	
M22	761020	1100 (C)	761020	1300	0.027	9.2	6	0.153	29	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL MG/L
M22A			761020	1000	0.002	242000

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL LB/D
M22A			761020	1000	0.002	3635

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL KG/D
M22A			761020	1000	0.002	1649

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Cleo Wrap Corporation--

Introduction--

Cleo Wrap Corporation, located at 4025 Viscount, manufactures wrapping paper, with 1250 employees. The plant operates five days per week on three eight-hour shifts. In the manufacturing process, paper stock is converted to wrapping paper by the passage over various color-impregnating cylinders and over electro-plating cylinders. The primary metals employed in the plating process are chrome, hexavalent chrome and copper.

Wastewater Discharges and Pretreatment Processes--

Cooling waters and sanitary wastes are discharged directly into the city sewer. Production wastes emanate from acid stripping of the printing cylinders and are pretreated with sodium bisulfate (to convert Cr^6 to Cr^3) and sodium hydroxide (to neutralize). Pretreatment occurs in a two stage batch process with sedimentation, Cr reduction, and neutralization in the first stage, and final neutralization adjustment in the final stage prior to discharge. Solids from the pretreatment process are removed by a solid waste disposal company and ultimately incinerated.

Results--

Sampling consisted of two grab samples taken from the final sump (M-26) and composited on October 19; a single grab was taken on October 20. The batch system is discharged to the city sewer once per production day with a flow (reported by the company) of 160-196 gallons. Results given on Table XXXV are based on a flow of 178 gallons per production day.

Company personnel considered the operation normal during the sampling period.

Even though the wastewater flow was only 180 gallons/day, chromium and zinc discharge to the WTP represented 8.7 and 0.5 percent of the total loadings of these parameters discharged to the WTP during the study. In addition, the wastewater is batch-discharged once per day. Biological treatment processes are not specifically designed to remove heavy metals from wastewater.

TABLE XXXV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CLEO WRAP CORP.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L	CYANIDE CN-TOT MG/L
M26				761019	1300		22.0	11.0				
M26	761019	1300	(C)	761019	1520	0.00018			3590	2744	42.00	1.400
M26				761020	1100	0.00018			5940	3049	8.00	1.210
M26				761021	1000	0.00018			5300	2845	37.00	0.600

STATION	DATE	TIME		DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M26				761019	1300						
M26	761019	1300	(C)	761019	1520	1025000	251000	7820	24300	239	50
M26				761020	1100	1767000	420000	13980	35700	271	55
M26				761021	1000	1398000	321000	11160	29400	240	45

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	CYANIDE CN-TOT LB/D	CHROMIUM CR,TOT LB/D
M26	761019	1300	(C)	761019	1520	0.00018	5	4	0.06	0.002	2
M26				761020	1100	0.00018	9	5	0.01	0.002	3
M26				761021	1000	0.00018	8	4	0.06	0.001	2

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M26	761019	1300	(C)	761019	1520	0.00018	0	0	0	0	0
M26				761020	1100	0.00018	1	0	0	0	0
M26				761021	1000	0.00018	0	0	0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	CYANIDE CN-TOT KG/D	CHROMIUM CR,TOT KG/D
M26	761019	1300	(C)	761019	1520	0.00018	2	2	0.03	0.001	1
M26				761020	1100	0.00018	4	2	0.01	0.001	1
M26				761021	1000	0.00018	4	2	0.03	0.000	1

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M26	761019	1300	(C)	761019	1520	0.00018	0	0	0	0	0
M26				761020	1100	0.00018	0	0	0	0	0
M26				761021	1000	0.00018	0	0	0	0	0

D&W Plating Company--

Introduction--

D&W Plating Company, located at 3855 Old Getwell Road, operates a plating operation with a staff of 25 people working five days per week with one eight-hour shift per day. Following a process of caustic rinsing, acid cleaning and electro-plating, seven process lines are used for standard zinc, chrome, and nickel plating.

Wastewater Discharges and Pretreatment Processes--

All wastewaters, including process, sanitary and cooling waters, are discharged untreated through a single in-plant sewerage system. Process wastewater flows originate from the rinse tank's continuous overflow and from plating solution overflow.

Results--

Three 6-7 hour composite samples were collected from the process effluent (M-27) on three consecutive days. Samples were collected at half-hour intervals with an automatic sampler. Flows were determined from daily MLG&W water usage and were 228,581, 205,573, and 255,083 gpd, respectively, for the three-day sampling period. Company records for the last three months reveal a usage of 694,833 cf/month (241,737 gpd). Company personnel considered operations typical during the sampling period. Wastewater discharge loads are given in Table XXXVI.

Chromium, zinc, copper, nickel, and cadmium loadings represent 14.7, 13.7, 0.4, 9.0, and 28.9 percent, respectively, of the total loadings into the plant. Additionally, the mean cyanide concentration in the discharge was 3.4 mg/l. Biological treatment processes are not specifically designed to remove either cyanide or heavy metals from wastewaters.

TABLE XXXVI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
D & W PLATING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	CYANIDE CN-TOT MG/L
M27	761018	1100	(C)761018	1700	0.229			46	3.500	40<	
M27	761019	1000	(C)761019	1700	0.206			24	1.650	40<	
M27			761019	1010		19.0	6.5				4.970
M27	761020	1000	(C)761020	1700	0.255			24	1.400	40<	
M27			761020	1005		19.0					3.450
M27			761021	1040		18.0	6.4				1.870

STATION	DATE	TIME	DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M27	761018	1100	(C)761018	1700	154	7875	41	80<	469	476
M27	761019	1000	(C)761019	1700	3600	6430	127	80<	243	500
M27			761019	1010						
M27	761020	1000	(C)761020	1700	1780	5400	49	80<	418	378
M27			761020	1005						
M27			761021	1040						

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	CYANIDE CN-TOT LB/D	CHROMIUM CR,TOT LB/D
M27	761018	1100	(C)761018	1700	0.229	88	6.677	76<		0
M27	761019	1000	(C)761019	1700	0.206	41	2.831	69<	6.6*	6
M27	761020	1000	(C)761020	1700	0.255	51	2.980	85<		4

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M27	761018	1100	(C)761018	1700	0.229	15	0	0<	1	1
M27	761019	1000	(C)761019	1700	0.206	11	0	0<	0	1
M27	761020	1000	(C)761020	1700	0.255	11	0	0<	1	1

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	CYANIDE CN-TOT KG/D	CHROMIUM CR,TOT KG/D
M27	761018	1100	(C)761018	1700	0.229	40	3.029	35<		0
M27	761019	1000	(C)761019	1700	0.206	19	1.284	31<		3
M27	761020	1000	(C)761020	1700	0.255	23	1.352	39<		2

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M27	761018	1100	(C)761018	1700	0.229	7	0	0<	0	0
M27	761019	1000	(C)761019	1700	0.206	5	0	0<	0	0
M27	761020	1000	(C)761020	1700	0.255	5	0	0<	0	0

* APPROXIMATION OF LOAD (CALCULATED WITH AVERAGE OF DAILY CONCENTRATIONS AND AVERAGE DAILY FLOW)

Delta Foremost Chemical Corporation--

Introduction--

Delta Foremost Chemical Corporation, located at 3915 Airpark, produces cleaning compounds with a staff of 60 people working five days per week with one eight hour shift per day. Both dry cleansers and liquid detergents are produced by blending processes at the facility. In the dry process, the primary ingredients are sodium silicate, phosphates, carbonates, caustic soda and borax. The liquid detergents blending operation includes the following chemicals: chlorinated methylene chloride, perchloroethylene, trichloroethylene, petroleum distillate, mineral oils, mineral spirits, toluene, and acetone.

Wastewater Discharges and Pretreatment Processes--

Washdown wastes and cooling waters are the primary sources of process wastewaters. Sanitary wastes are discharged separately. The process wastewaters receive no pretreatment.

Results--

One six to eight hour composite sample was taken each day from the process wastewater effluent at a cleanout tap (M-28) on October 18, 19, and 20. Samples were taken at half-hour intervals by means of an automatic sampler. Flow was determined by subtracting sanitary wastewater and product consumption from daily MLG&W water usage. Company records reveal a water usage of 21,667 cf/month (7,540 gpd) for the last three months. During the three day sampling period, water usage was 14,265, 10,779, and 7,854 gallons.

Operation during the sampling period was considered normal by company personnel. Wastewater discharge loadings are given in Table XXXVII.

Oil and grease and phenol loadings from this facility constituted nearly one percent of the loadings of these parameters into the WTP during the study. In addition, the volatile organic compounds used in the product, which are subject to enter the sewage system via spillage, are a potential problem in the WTP's contact stabilization process.

TABLE XXXVII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
DELTA FOREMOST CHEMICAL
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	PHENOLS TOTAL UG/L
M28	761018	1200	(C)	761018	1630	0.009			3300.0	
M28				761019	0915					15500
M28	761019	0930	(C)	761019	1700	0.007			5600.0	
M28				761020	1015		16.0			2505
M28	761020	1030	(C)	761020	1700	0.005			3200.0	
M28				761021	1400			9.5		65000

STATION	DATE	TIME		DATE	TIME	RESIDUE TOT NFLT MG/L	TOT KJEL N MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M28	761018	1200	(C)	761018	1630	216	9.55	515.000	7990	
M28				761019	0915					1787.00
M28	761019	0930	(C)	761019	1700	175	34.80	101.000	6150	
M28				761020	1015					58.00
M28	761020	1030	(C)	761020	1700	200	7.80	175.000	11060	
M28				761021	1400					2376.00

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	PHENOLS TOTAL LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M28	761018	1200	(C)	761018	1630	0.009	256.1	1.66*	17	0.74	39.970	620	84.49*
M28	761019	0930	(C)	761019	1700	0.007	331.8		10	2.06	5.984	364	
M28	761020	1030	(C)	761020	1700	0.005	136.2		9	0.33	7.448	471	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	PHENOLS TOTAL KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M28	761018	1200	(C)	761018	1630	0.009	116.2		8	0.34	18.130	281	
M28	761019	0930	(C)	761019	1700	0.007	150.5		5	0.94	2.714	165	
M28	761020	1030	(C)	761020	1700	0.005	61.8		4	0.15	3.378	214	

* APPROXIMATION OF LOADS (CALCULATED W/AVG OF DAILY CONCENTRATIONS [GRAB] AND AVG DAILY FLOW)

J. M. Smucker Company--

Introduction--

J. M. Smucker, located at 4740 Burbank, produces jams and preserves with a staff of 94 people who work one eight-hour production shift per day, five days per week.

The products are manufactured by blending preprocessed fruits, sugar, corn syrup, and natural pectin. The finished foodstuffs are then canned in glass jars through a pasteurizing system. The shift is split so that the period from approximately 7:00 a.m. to 3:30 p.m. is the production period and is followed by a cleanup period ending around 8:00 p.m.

Wastewater Discharges and Pretreatment Processes--

Process and sanitary wastewaters pass through a screen and settling basin prior to discharge. Cooling waters are discharged through a separate sewer. Solids from the settling basin are removed by a solids disposal company.

Results--

Samples were collected from the effluent sump (M-29) for three consecutive days by means of an automatic sampler. The sampler was programmed to take samples at half-hour intervals for periods of 10-12 hours per day. Flows were determined by subtracting metered cooling water usage from total MLG&W metered water consumption. Monthly water usage for the previous four months has averaged 552,850 cf (192,340 gpd). Water usage during the sampling period ranged from 172,000 to 215,000 gpd. When adjusted for cooling water diversion, the flow at the sampling point ranged

from 145,000 to 186,000 gpd. Company personnel considered the operation normal during the sampling period. Wastewater discharge loads are given in Table XXXVIII.

The facility discharges major quantities of BOD_5 and COD which represent 0.8 and 1.1 percent, respectively, of the total loading of these parameters into the WTP.

TABLE XXXVIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
J.M.SMUCKER
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L
M29	761018	1000	(C)	761018	2000	0.145			932.0	140	5.100	2150
M29				761019	0940		24.0	6.5				
M29	761019	1000	(C)	761019	2000	0.186			1932.0	180	4.150	3688
M29				761020	0930		23.0					
M29	761020	0930	(C)	761020	2000	0.161			600.0>	14	6.000	2458
M29				761021	1000		23.0	6.8				

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D
M29	761018	1000	(C)	761018	2000	0.145	1129.3	170	6.180	2605
M29	761019	1000	(C)	761019	2000	0.186	3007.0	280	6.459	5740
M29	761020	0930	(C)	761020	2000	0.161	808.7>	19	8.087	3313

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D
M29	761018	1000	(C)	761018	2000	0.145	512.3	77	2.803	1182
M29	761019	1000	(C)	761019	2000	0.186	1363.9	127	2.930	2604
M29	761020	0930	(C)	761020	2000	0.161	366.8>	9	3.668	1503

Ralston Purina Company--

Introduction--

Ralston Purina, located at 4272 Mendenhall, produces protein food fillers with an employment of 160 people. The facility is operated seven days per week with three eight-hour shifts per day.

Soy flakes (defatted soy bean) are converted to a powdered protein filler used for human consumption. The primary production units consist of extraction, clarification, washing, concentrating, and spray drying.

Wastewater Discharges and Pretreatment Processes--

Wastewaters from the production process are discharged untreated to the city sewer. Sanitary wastes are segregated from the production wastes. The company has installed a rectangular weir and totalizer at the production wastewater discharge point. In addition, by means of an automatic bucket type sampler, the company collects samples monthly for BOD_5 and TSS analysis. The following results were reported for the most recent five months:

Date	BOD_5 (mg/l)	TSS (mg/l)	Flow (million gallons/mo.)
Apr	1,700	984	27.86
Jun	2,250	1,362	22.48
Jul	1,733	1,311	23.75
Aug	1,621	1,033	23.41

Results--

Sampling consisted of three 24-hour composites collected from the effluent manhole (M-32) during October 18 through 21. These samples were collected by means of the company sampler, and similarly, flow was

determined by the company flow device. The flow equipment was calibrated in October 1976. Wastewater discharge loads given in Table XXXIX are considered normal for the facility.

The facility contributed 10.7 percent of the BOD_5, 7.3 percent of the TSS, 13 percent of the COD, and 1.2 percent of the oil and grease discharged into the WTP. This plant is one of the most significant contributors of BOD_5 and TSS sampled during the study.

TABLE XXXIX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
RALSTON - PURINA
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M32	761018	0815	(C)761019	0830	0.890			2000.0	1095	5386	
M32			761019	0830		33.0	10.4				14.00
M32	761019	0830	(C)761020	0800	0.988			2600.0	1000	6403	
M32	761020	0800	(C)761021	0800	0.964			3800.0	1210	6403	
M32			761020	0820		37.0					31.00
M32			761021	0820		39.0	4.9				11.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M32	761018	0815	(C)761019	0830	0.890	14854.6	8133	40004	
M32	761019	0830	(C)761020	0800	0.988	21441.7	8247	52804	147 *
M32	761020	0800	(C)761021	0800	0.964	30570.5	9734	51511	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M32	761018	0815	(C)761019	0830	0.890	6737.9	3689	18145	
M32	761019	0830	(C)761020	0800	0.988	9725.8	3741	23952	
M32	761020	0800	(C)761021	0800	0.964	13866.5	4415	23365	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Joseph Schlitz Brewing Company--

Introduction--

Joseph Schlitz Brewing Company, located at 5151 East Raines, is a large scale brewing, bottling, and canning facility which produces approximately 5.3 million barrels per year of product. The company operates continuously five and one-half days per week with a work force of approximately 650 people. American Can Company is an integral part of the facility.

Through a typical brewing operation, barley, corn, and hops are converted to beer by the following unit operations: milling, cooking, fermenting, filtering, storage, and bottling or canning. Water is supplied by company wells.

Wastewater Discharges and Pretreatment Processes--

Wastewaters emanate from nearly all of the above operations and are discharged to the sewerage system through a 9" Parshall flume. The flume and its accompanying totalizer is calibrated quarterly with the most recent calibration occurring in October 1976. The company collects daily samples of the discharge by means of a Chicago automatic sampler which is capable of taking flow proportioned samples. Company data for the months of August and September are as follows:

Month	Total Flow (million gal/mo.)	BOD_5 (mg/l) Avg	TSS (mg/l)
Aug 76	73.7	1,600	530
Sept 76	81.0	1,730	660

Results--

Three consecutive 24-hour composite samples were collected from the effluent vault (M-33) during October 18 through October 21. Samples were

collected by means of an EPA automatic sampler programmed to take samples at 15-minute intervals. Flows were determined by using the company's Parshall flume and totalizer. Flows during the three day sampling period were 2.45, 2.58, and 2.96 mgd. Wastewater discharge loads given in Table XL were considered normal for this facility.

This facility contributed 18.4 percent of the BOD_5, 16.4 percent of the TSS, 5.2 percent of the TKN, 5.1 percent of the total phosphorus, 16.4 percent of the COD, and 4.2 percent of the oil and grease which discharged into the WTP. This plant was the major industrial contributor of BOD_5 and TSS sampled during the study.

TABLE XL
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
JOS SCHLITZ BREWING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L
M33	761018	0845	(C)	761019	0845	2.450			1882.0	935
M33				761019	0850		28.0	6.1		
M33	761019	0855	(C)	761020	0845	2.580			1932.0	910
M33				761020	0850		25.0			
M33	761020	0850	(C)	761021	0850	2.960			1432.0	810
M33				761021	0900		24.0	6.0		

STATION	DATE	TIME		DATE	TIME	TOT KJEL N MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M33	761018	0845	(C)	761019	0845	30.20	13.000	2766	
M33				761019	0850				20.00
M33	761019	0855	(C)	761020	0845	28.50	13.800	3023	
M33				761020	0850				22.00
M33	761020	0850	(C)	761021	0850			2408	
M33				761021	0900				26.00

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M33	761018	0845	(C)	761019	0845	2.450	38479.3	19117	617.47	265.798	56554	
M33	761019	0855	(C)	761020	0845	2.580	41597.6	19593	613.63	297.126	65088	502.85*
M33	761020	0850	(C)	761021	0850	2.960	35373.3	20009			59483	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M33	761018	0845	(C)	761019	0845	2.450	17453.9	8671	280.08	120.564	25652	
M33	761019	0855	(C)	761020	0845	2.580	18868.4	8887	278.34	134.774	29523	
M33	761020	0850	(C)	761021	0850	2.960	16045.1	9076			26981	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Frito Lay, Inc.--

Introduction--

The facility, located at 2070 Airways Boulevard, manufactures potato and corn chips. Operation is continuous five days per week with 150 employees.

Potato chips are made by peeling, slicing, and frying raw potatoes in oil. Corn chips are made by cooking raw corn, washing, grinding, extruding, and frying.

Wastewater Discharges and Pretreatment Processes--

Wastewater results from potato cleaning, peeling and slicing, corn washing and kernel dehusking, and daily and weekly cleanup operations. About 15-20 percent of the city water supplied to the plant is lost in corn chip production. Process wastewater flows through a sump prior to discharging into the city sewage system. A septic tank service cleans the sump when required. Ultimate disposal of the sludge and skimmings is unknown. Sanitary sewage discharges to the sewerage system via a separate line.

Results--

Three consecutive 24-hour composite samples were collected at 30-minute intervals from the sump (M-38) during October 18 through 21, 1976. Effluent flows were determined by reading the MLG&W water meter and subtracting consumptive product loss (20 percent of water use) and sanitary uses.

Wastewater loadings (Table XLI) were determined from composite parameter concentrations and calculated flow during the sampling period. The most recent water bill from MLG&W showed the monthly use to be 5,610,000 gallons for a four week period. This equates to about 255,000 gallons

per day based on 22 work days per month. Raw water used during the sampling period were 245,000 gallons, 256,000 gallons and 258,000 gallons for each of the three days. Company personnel indicated that production was about normal during the sampling period.

This discharger is a major contributor to the sewerage system. It accounts for almost 2 percent of the COD load and 3.5 percent of the total suspended solids discharged into the WTP. The BOD_5 contribution is about 0.6 percent. The TSS concentrations in the discharge (2500 mg/l) are roughly eight times that in domestic sewage; the COD concentrations (4050 mg/l) are about six times that of sewage; BOD_5 concentrations (720 mg/l) are approximately three times that of sewage.

TABLE XLI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
FRITOLAY
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M38				761018	1415		24.0	9.4			
M38	761018	1415	(C)	761019	1430	0.196			733.0	3380	4535
M38				761019	1430		23.0	5.7			
M38	761020	1430	(C)	761021	1415	0.205			666.0<	1780	3830
M38				761021	1415		21.0	6.9			
M38	761021	1415	(C)	761022	1400	0.207			766.0	2280	3790

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M38	761018	1415	(C)	761019	1430	0.196	1199.0	5529	7418
M38	761020	1430	(C)	761021	1415	0.205	1139.4<	3045	6552
M38	761021	1415	(C)	761022	1400	0.207	1323.2	3939	6547

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M38	761018	1415	(C)	761019	1430	0.196	543.8	2508	3365
M38	761020	1430	(C)	761021	1415	0.205	516.8<	1381	2972
M38	761021	1415	(C)	761022	1400	0.207	600.2	1787	2970

General Cable Corp.--

Introduction--

The facility, located at 1278 Orgill Avenue, manufactures electrical building wire. Operation is continuous five days per week with 27 employees working each eight-hour shift (total employment of 81).

Raw materials used in the process are aluminum, copper, and plastic (PVC). The process consists of extruding and twisting the aluminum or copper and jacketing with PVC. After jacketing, the wire is spooled or boxed for shipping.

Wastewater Discharges and Pretreatment Processes--

Air compressor cooling water, contact cooling water and sanitary sewage are combined at a sump and discharged without pretreatment into the city sewer. Scum which accumulates in the sump is disposed of as trash.

Results--

Two consecutive 24-hour composite samples (30-minute collection interval) were obtained at the company sump (M-39) during October 19 through 21, 1976. Flows were determined by reading the MLG&W water meter. Since there are no consumptive losses, the raw water usage was assumed to be the effluent wastewater flow.

Wastewater loadings (Table XLII) were determined from composite parameter concentrations and the MLG&W water meter readings. The most recent water bill from MLG&W showed the monthly use to be 1.02 million gallons; i.e., 46,400 gallons per day based on twenty-two production days per month. Raw water readings for the sampling period were 57,000

and 51,000 gallons per day. Company personnel indicated that production was lower than normal but similar to recent months.

Since the flows are nearly representative of recent operating conditions, the wastewater discharge was assumed to be representative of existing conditions. The low pollutant concentrations and wastewater flows at this facility relegate it to a minor contributor status.

TABLE XLII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
GENERAL CABLE
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L	CHROMIUM CR,TOT UG/L
M39				761019	1100		25.0	6.6			
M39	761019	1100	(C)	761020	1100	0.057			40<		50<
M39	761020	1100	(C)	761021	1030	0.051			40<		50<
M39				761020	1115		26.0			15.00	
M39				761021	1030		25.0	6.5		12.00	

STATION	DATE	TIME		DATE	TIME	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	ALUMINUM AL,TOT UG/L	CADMIUM CD,TOT UG/L
M39				761019	1100						
M39	761019	1100	(C)	761020	1100	144	22	80<	20<	100<	10<
M39	761020	1100	(C)	761021	1030	136	20	80<	20<	100	10<
M39				761020	1115						
M39				761021	1030						

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D
M39	761019	1100	(C)	761020	1100	0.057	19<	6*	0	0	0
M39	761020	1100	(C)	761021	1030	0.051	17<		0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	ALUMINUM AL,TOT LB/D	CADMIUM CD,TOT LB/D
M39	761019	1100	(C)	761020	1100	0.057	0	0	0	0
M39	761020	1100	(C)	761021	1030	0.051	0	0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D
M39	761019	1100	(C)	761020	1100	0.057	9<		0	0	0
M39	761020	1100	(C)	761021	1030	0.051	8<		0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	ALUMINUM AL,TOT KG/D	CADMIUM CD,TOT KG/D
M39	761019	1100	(C)	761020	1100	0.057	0	0	0	0
M39	761020	1100	(C)	761021	1030	0.051	0	0	0	0

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Gould, Inc.--

Introduction--

This facility, located at 2215 E. Person Street, manufactures lead acid storage batteries. The plant operates two shifts per day, five days per week, with an employment of approximately 100.

The process consists of casting the lead grids (for plates), pasting and assembling plates into groups, placing groups into battery containers, and strapping them together, covering the battery, flushing with acid and final forming. About 0.9 gallons of water and about 0.6 gallons of sulfuric acid are added to each battery.

Wastewater Discharges and Pretreatment Processes--

Wastewater originates primarily from the washdown after plate pasting. Wastewaters also originate from the rinsing of completed batteries before packaging. Sanitary sewage from 100 employees contributes to the total wastewater discharge.

Process wastewater is pretreated with lime before it combines with the sanitary sewage and is discharged into the sewerage system. A series of seven basins with a pH probe at the beginning and end of the system is used in the neutralization process. These basins also remove suspended solids. Sludge is periodically pumped out by a septic tank service. Ultimate disposal of the sludge is unknown.

Results--

Two 24-hour composite samples were collected at 30-minute intervals from the company manhole (M-40) on October 18 and 19, and on October 20 and 21, 1976. All process wastewater and sanitary sewage passes through this point before discharging into the city sewerage system.

Flows during the sampling period were estimated using the latest MLG&W water bill. This was necessary since one of the two water meters installed in series indicated negative readings (i.e., the company appeared to be giving water to MLG&W). The most recent monthly bill showed Gould used 1.256 million gallons of water per month; this equates to 57,000 gallons per day (based on 22 work days per month).

The wastewater loads (Table XLIII) were calculated using composite parameter concentrations and estimated daily flows. Production during the sampling was reported to be typical by company personnel. Therefore, the loads discharged during the study are considered to be representative.

The lead (16 mg/l) in the discharge is not specifically treatable by the treatment process employed at the WTP. The daily quantity of lead discharged by this facility constituted approximately 15 percent of the lead discharged into the WTP. The quantity of other metals detected in the discharge (zinc, copper, nickel, cadmium) were negligible.

TABLE XLIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
GOULD INC.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L
M40	761018	1500	(C)	761019	1450	0.057			74	50<	136
M40				761018	1505		25.0	10.7			
M40				761019	1450		26.0	11.0			
M40	761020	1500	(C)	761021	1530	0.057			50	50<	152
M40				761020	1530		24.0	5.9			
M40				761021	1545		24.0	9.9			

STATION	DATE	TIME		DATE	TIME	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SULFATE SO4-TOT MG/L
M40	761018	1500	(C)	761019	1450	124	13825	20	10<	550
M40				761018	1505					
M40				761019	1450					
M40	761020	1500	(C)	761021	1530	111	18750	40	10	4400
M40				761020	1530					
M40				761021	1545					

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D
M40	761018	1500	(C)	761019	1450	0.057	35	0	0	0
M40	761020	1500	(C)	761021	1530	0.057	24	0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SULFATE SO4-TOT LB/D
M40	761018	1500	(C)	761019	1450	0.057	7	0	0	262
M40	761020	1500	(C)	761021	1530	0.057	9	0	0	2093

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D
M40	761018	1500	(C)	761019	1450	0.057	16	0	0	0
M40	761020	1500	(C)	761021	1530	0.057	11	0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SULFATE SO4-TOT KG/D
M40	761018	1500	(C)	761019	1450	0.057	3	0	0	119
M40	761020	1500	(C)	761021	1530	0.057	4	0	0	949

High's Ice Cream Novelties, Inc.--

Introduction--

The High's plant, located at 1184 Severson Street, manufactures ice cream novelties. About 40 employees work one shift per day, Tuesday through Friday.

The manufacturing process consists of blending pasteurized ice cream with flavoring, nuts, cones, cookies, etc., depending on the end product desired. The process includes filling molds, freezing, defrosting, and removal from molds. The manufacturing operation runs from 7:00 a.m. until 3:00 p.m.; cleanup operations follow until 9:00 p.m.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from cleaning pasteurization equipment and floors during the cleanup period. Lesser volumes of water are used to rinse molds during the manufacturing process. Cooling water and sanitary wastewater are also discharged with process wastewater. All wastewater is collected in a sump before it is discharged into the sewerage system.

Results--

The wastewater discharged into the sump (M-41) was grab sampled in front of the building on two consecutive days (October 19 and 20, 1976). Four samples were collected the first day and three were collected on the second day. Estimates of the flow into the sump were made with a bucket and stopwatch each time a sample was collected.

The samples were composited proportioned to flow each day. Wastewater loads (Table XLIV are based on composite parameter concentrations

and the average of the individual wastewater flows determined at the time of sample collection.

The most recent MLG&W water bill showed that the monthly consumption was 1.3 million gallons or 72,500 gallons per day based on an 18-day work month. Cooling water for the compressors is continuous, however, and therefore lowers the daily average below the 72,500 gallons. Flows during the sampling period (average of the individual grab flow measurements) were 94,000 gallons one day and 62,600 gallons the second day. The flows measured during sampling periods were indicative of only the grab sampling, and were not representative of normal continuous discharges during the week. Company personnel stated that operation was normal during the sampling period. Therefore, the wastewater loads discharged (Table XLIV) should be considered as peak daily loads and not representative of the continuous discharge. The untreated wastewater contained high BOD_5 (780 mg/1) and COD (1,350 mg/1) concentrations. The TSS concentration was low (75 mg/1). This facility contributed about 0.25 percent of the BOD_5, and COD loads into the WTP and was considered to be a minor contributor to the sewerage system.

TABLE XLIV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
HIGHS ICE CREAM
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M41				761019	0825		20.0	7.0			
M41	761019	0825	(C)	761019	1630	0.094			632.0	78	1174
M41				761019	1030		24.0	6.9			
M41				761019	1410		24.0	6.8			
M41				761020	0815		23.5	7.2			
M41	761020	0815	(C)	761020	1630	0.063			932.0	80	1538
M41				761020	1100		20.0	7.9			
M41				761020	1630		18.0	7.8			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M41	761019	0825	(C)	761019	1630	0.094	495.8	61	921
M41	761020	0815	(C)	761020	1630	0.063	490.0	42	809

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M41	761019	0825	(C)	761019	1630	0.094	224.9	28	418
M41	761020	0815	(C)	761020	1630	0.063	222.3	19	367

Hunter Fan and Ventilating Company--

Introduction--

The Hunter plant, located at 2500 Frisco Avenue, manufactures electric fans, motors, and electric heaters. The facility operates two shifts per day, five days a week. Total employment is about 300 people. The manufacturing operation consists of complete fabrication of all components from strip steel plus assemblage of motors, heaters, fans, etc.

Wastewater Discharges and Pretreatment Processes--

Wastewaters are derived from cooling water, sanitary use, four spray booths, and overflow from three and five stage washers using caustic solutions. All wastewaters are discharged without pretreatment to the city sewer system. Sanitary wastewater is discharged separately.

Results--

Composite samples of process wastewater and cooling water were collected at 30-minute intervals on two consecutive days (October 20 and 21, 1976) from the manhole (M-42) in front of the building. Wastewater flows were obtained by daily MLG&W water meter readings minus the estimated volume of sanitary wastewater.

Wastewater loads (Table XLV) were determined from composite parameter concentrations and the calculated flow during the sampling period. The most recent water bill from MLG&W showed the monthly use to be 2,199,868 gallons, or 99,000 gpd based on a five day work week (twenty-two workday month). Raw water uses during the sampling period were 92,000 gpd and 94,000 gpd. Company personnel indicated that production was slightly lower than normal and thus may account for the lower than average water use.

Since the flows are nearly representative of normal operating conditions, and since the operation was considered essentially normal by company personnel, the wastewater discharge is assumed to be representative of normal operating conditions.

Except for the 579 mg/l of oil and grease in the discharge on one day (grab sample on October 21, 1976) this facility was considered a minor wastewater contributor to the sewerage system.

TABLE XLV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
HUNTER FAN & VENTILATING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M42	761020	0900	(C)	761020	2300	0.081			6.800	40<	
M42				761020	0915		25.0				12.00
M42	761021	0900	(C)	761021	2300	0.083			7.400	40<	
M42				761021	0915						579.00
M42				761022	0900		27.0	6.8			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M42	761020	0900	(C)	761020	2300	0.081	4.597	27<	194*
M42	761021	0900	(C)	761021	2300	0.083	5.126	28<	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M42	761020	0900	(C)	761020	2300	0.081	2.085	12<	
M42	761021	0900	(C)	761021	2300	0.083	2.325	13<	

* APPROXIMATION OF LOADS (CALCULATED BY USING GRAB CONCENTRATIONS AND AVERAGE OF DAILY FLOWS)

Hunt Wesson Foods, Incorporated--

Introduction--

Hunt Wesson, located at 3151 Williams Avenue, manufactures vegetable oils. During the week, operation is continuous with a total three-shift employment of 200. On weekends, ten to twelve people work during each shift.

The manufacturing process consists of producing vegetable oils from soybean and cotton oils through refining, bleaching, hydrogenation, winterization, and deodorization steps.

Wastewater Discharges and Pretreatment Processes--

The main source of wastewater is from the deodorization procedure, with lesser volumes from refining and other manufacturing steps. Pretreatment consists of floatation and sedimentation followed by neutralization. The mixture of acid and alkaline wastewaters results in a slightly acidic waste, which is ultimately neutralized with caustic or ammonia before being discharged into the sewerage system.

Floatables are sold as cattle feed ingredients; sludge is dredged about once each year and deposited in landfills. Sanitary wastewater is discharged into the sewer.

Results--

Three consecutive 24-hour composites were collected at 30-minute intervals from the pretreatment system effluent from October 18 through 21, 1976 (M-43). Flows were determined using the company's six-inch Parshall flume.

Wastewater loads (Table XLVI) were determined from composite parameter concentrations and Parshall flume readings. Normal daily effluent wastewater flow ranges from 1.5-2 mgd, and this is consistent with flows deter-

mined during the sampling period. Since the effluent flows were representative of normal operating conditions, and since the operation was considered normal by company personnel, the wastewater discharge is assumed to be representative of normal operating conditions.

This discharger was a significant source of BOD_5, COD, and oil and grease discharged into the WTP. It accounted for six percent of the BOD_5 and four percent of the COD during this study period. The oil and grease concentrations ranged from 295 mg/l to 2,233 mg/l. The high oil and grease concentration (606 mg/l) measured at the WTP influent on October 21, 1976 may have been from the Hunt Wesson plant.

TABLE XLVI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
HUNT WESSON
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	PHENOLS TOTAL UG/L	RESIDUE TOT NFLT MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L
M43			761018	0945	1.870	26.0	1.9					
M43	761018	0945 (C)	761019	0945	1.470			370.0		218	2.600	492
M43			761019	0945	1.870				270			
M43			761019	0950		30.0	6.4					
M43	761019	1000 (C)	761020	0930	1.550			860.0		25	6.300	1250
M43			761020	0930	1.870	25.0	5.6		105			
M43	761020	0930 (C)	761021	0930	1.470			1998.0>		580	4.150	1823
M43			761021	0930	1.870	27.0	9.8		175			

STATION	DATE	TIME	DATE	TIME	OIL-GRSE FREON-GR MG/L	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SULFATE SO4-TOT MG/L
M43			761018	0945								
M43	761018	0945 (C)	761019	0945		50<	48	20	80<	69	10<	120
M43			761019	0945	295.00							
M43			761019	0950								
M43	761019	1000 (C)	761020	0930		50<	58	32	80	87	10<	130
M43			761020	0930	620.00							
M43	761020	0930 (C)	761021	0930		50<	29	40	80<	47	10<	110
M43			761021	0930	2233.00							

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	PHENOLS TOTAL LB/D	RESIDUE TOT NFLT LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	CHROMIUM CR,TOT LB/D
M43			761018	0945	1.870							
M43	761018	0945 (C)	761019	0945	1.470	4539.0		2674	31.896	6036		1<
M43			761019	0945	1.870		4				4603.68	
M43	761019	1000 (C)	761020	0930	1.550	11124.3		323	81.492	16169		1<
M43			761020	0930	1.870		2				9675.54	
M43	761020	0930 (C)	761021	0930	1.470	24510.6>		7115	50.910	22364		1<
M43			761021	0930	1.870		3				34847.52	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SULFATE SO4-TOT LB/D
M43			761018	0945	1.870						
M43	761018	0945 (C)	761019	0945	1.470	1	0	1<	1	0	1472
M43			761019	0945	1.870						
M43	761019	1000 (C)	761020	0930	1.550	1	0	1	1	0	1682
M43			761020	0930	1.870						
M43	761020	0930 (C)	761021	0930	1.470	0	0	1<	1	0	1349
M43			761021	0930	1.870						

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	PHENOLS TOTAL KG/D	RESIDUE TOT NFLT KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	CHROMIUM CR,TOT KG/D
M43			761018	0945	1.870							
M43	761018	0945 (C)	761019	0945	1.470	2058.9		1213	14.468	2738		0<
M43			761019	0945	1.870		2				2088.20	
M43	761019	1000 (C)	761020	0930	1.550	5045.9		147	36.964	7334		0<
M43			761020	0930	1.870		1				4388.75	
M43	761020	0930 (C)	761021	0930	1.470	11117.8>		3227	23.093	10144		0<
M43			761021	0930	1.870		1				15806.58	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SULFATE SO4-TOT KG/D
M43			761018	0945	1.870						
M43	761018	0945 (C)	761019	0945	1.470	0	0	0	0	0	668
M43			761019	0945	1.870						
M43	761019	1000 (C)	761020	0930	1.550	0	0	0	1	0	763
M43			761020	0930	1.870						
M43	761020	0930 (C)	761021	0930	1.470	0	0	0	0	0	612
M43			761021	0930	1.870						

Kellogg Company--

Introduction--

The Kellogg plant, located at 2168 Frisco Street, manufactures "ready-to-eat" cereals. Operation is continuous during three shifts per day, six days per week, with a total employment of 600 people.

Raw rice, grains, corn, and bran are steam cooked, dried, milled, re-cooked (dry), coated, and packaged.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is water and steam from cereal cookers and from cleanup during the day and at the end of each shift. This wastewater is pretreated using screens prior to discharge into the sewerage system; screenings are sold as animal feed. Sanitary wastewater is also discharged into the sewerage system along with the process wastewater. All wastewaters pass through a common manhole before discharge. Cooling water (about 0.4 mgd) is discharged separately into a storm sewer. The company has an NPDES permit for this discharge. At the present time, the company uses a well exclusively for water supply; however, they do have a MLG&W connection available.

Results--

Four consecutive 24-hour composite samples (October 18 through 22, 1976) were collected at 30-minute intervals from the manhole immediately upstream from the company's metering vault (M-44). Flows were determined by using the company's six-inch magnetic flowmeter. Wastewater loadings (Table XLVII) were calculated from composite parameter concentrations and the flow data from the magnetic flowmeter.

Flows obtained during the sampling period were typical of normal flows as determined over the past few months. Since the operation was considered normal during the study period, the loads should be considered representative of typical operations.

This discharger is a significant contributor to the sewerage system since it accounted for three percent of the BOD_5, two percent of the TSS, and almost four percent of the COD discharged into the WTP. The BOD_5 and COD concentrations in the discharge averaged about five times that of a typical domestic sewage (1,560 mg/l and 3,110 mg/l, respectively).

TABLE XLVII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KELLOGG
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M44				761018	0820		26.5	6.3			
M44	761018	0830	(C)	761019	0830	0.552			1199.0	350	2640
M44	761019	0900	(C)	761020	0830	0.507			1498.0	745	3326
M44				761019	0915		28.0	6.1			
M44				761020	0830		23.0	5.9			
M44	761020	0830	(C)	761021	0855	0.537			2299.0	610	3064
M44				761021	0815		20.0	6.0			
M44	761021	0900	(C)	761022	0900	0.564			1265.0	490	3427
M44				761022	0900		21.5	7.8			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M44	761018	0830	(C)	761019	0830	0.552	5523.3	1612	12161
M44	761019	0900	(C)	761020	0830	0.507	6338.1	3152	14073
M44	761020	0830	(C)	761021	0855	0.537	10302.8	2734	13731
M44	761021	0900	(C)	761022	0900	0.564	5954.0	2306	16130

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M44	761018	0830	(C)	761019	0830	0.552	2505.3	731	5516
M44	761019	0900	(C)	761020	0830	0.507	2874.9	1430	6383
M44	761020	0830	(C)	761021	0855	0.537	4673.3	1240	6228
M44	761021	0900	(C)	761022	0900	0.564	2700.7	1046	7316

The Kroger Company--

Introduction--

The Kroger facilities, located at 2330 Frisco Street, include an office complex, warehouse, distribution center, truck maintenance garage and meat processing plant. Only the meat processing plant was investigated during the study. This plant employs about 50 people and operates two eight-hour shifts a day, six days per week.

The operation consists of cutting animal quarters into "saw-ready-cuts" which are then shipped to retail stores for final cutting. No slaughtering or quartering operations are performed at this plant. The cutting operation is conducted during the first shift, while the second shift is devoted to cleanup operations.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is the cleanup operation during the second shift and it accounts for the greatest volume of flow from the meat plant. Wastewater during the first shift is from wash water used during the cutting operation. Sanitary wastewater is discharged with the process waste.

Two grease traps in series remove floatable solids. When required, the traps are cleaned by a septic tank service company. Ultimate disposal of the sludge and scum is unknown. Meat plant wastewaters flow via a lift station to an in-plant sewer that also receives wastes from the other operations in the Kroger complex.

Results--

To distinguish between the cutting operation (first shift) and

cleanup (second shift), two separate composite samples were taken each day. One composite sample was taken during each shift for two consecutive days (October 19 and 20, 1976) from the lift station discharge (M-45). These composite samples were collected at 30-minute intervals. Flow volumes were determined using the meat plant's water meter. Since there were no consumptive losses, the raw water used was assumed to be discharged.

Wastewater loads (Table XLVIII) were calculated using composite parameter concentrations and the meat plant's flow volumes. Company personnel indicated that operations were normal during the investigation, and thus the discharges are assumed to be representative.

There was no appreciable difference in wastewater constituent concentrations between the cutting and cleanup operations. However, slightly greater quantities of water were used during the cleanup operation. The low concentrations of pollutants detected, along with low flow volumes, relegate this discharge to a minor contributor status.

TABLE XLVIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KROGER
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M45A				761018	1605		26.0	6.6				
M45A	761019	0900	(C)	761019	1530	0.005			193.0	90	393	
M45A				761019	1530		24.0	7.2				
M45A				761019	1545							22.00
M45A	761020	0700	(C)	761020	1530	0.008			90.0	20	100	
M45A				761020	1530		15.0	7.3				

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M45A	761019	0900	(C)	761019	1530	0.005	8.1	4	16	1.2*
M45A	761020	0700	(C)	761020	1530	0.008	6.0	1	7	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M45A	761019	0900	(C)	761019	1530	0.005	3.7	2	7	
M45A	761020	0700	(C)	761020	1530	0.008	2.7	1	3	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M45B	761019	1530	(C)	761019	2100	0.008	185.0	40	330
M45B	761020	1530	(C)	761020	2130	0.009	163.0	60	347

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M45B	761019	1530	(C)	761019	2100	0.008	12.4	3	22
M45B	761020	1530	(C)	761020	2130	0.009	12.2	5	26

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M45B	761019	1530	(C)	761019	2100	0.008	5.6	1	10
M45B	761020	1530	(C)	761020	2130	0.009	5.6	2	12

* APPROXIMATION OF LOAD (CALCULATED BY USING GRAB CONCENTRATIONS AND AVERAGE DAILY FLOW)

Memphis Furniture Company--

Introduction--

The Memphis Furniture Company, located on Frisco Street, produces wood furniture. About 160 employees work at the plant, one shift per day.

The facility is classified as a wood-working case goods plant. Raw wood is worked into finished wooden bedroom furniture including chests, dressers, beds, etc. Finishing or painting of the furniture at spray booths is the final production process.

Wastewater Discharges and Pretreatment Processes--

Sanitary sewage and batch discharges from nine paint spray booths make up the wastewater discharge from this facility. These booths are arranged in sets of three, with wastewater from each set discharging into separate sumps before subsequent discharge into the sewerage system. Only one booth is cleaned each day, allowing a nine-day recycle time between cleanings.

The only treatment provided is the collection of scum in the sumps, and periodic sump cleaning by septic tank cleaning services. Ultimate disposal of the sludge is unknown. Sanitary sewage is discharged into the city sewer separately.

Results--

Composite samples were collected at two to five minute intervals on two consecutive days (October 20 and 21) during spray booth draining operations. The samples were collected directly from the lines draining into one of the three sumps (M-46). Flows were determined each day from the spray booth volumes.

The operation was considered normal by company personnel during the study; therefore, these batch dumps were considered representative of the normal wastewater discharge. The wastewater contained low concentrations of zinc, copper, and lead (Table XLIX). These low concentrations, coupled with a very low flow of 500 gallons per day, makes this discharge a minor contributor of wastewater into the sewerage system.

TABLE XLIX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MEMPHIS FURNITURE
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M46	761020	1500	(C)761020	1530	0.000				255	
M46			761020	1510		15.0	6.5			
M46	761021	1500	(C)761021	1530	0.000			666.0<	1370	1052
M46			761021	1510		18.0	8.2			

STATION	DATE	TIME	DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M46	761020	1500	(C)761020	1530	50<	390	103	80<	20<	10<
M46			761020	1510						
M46	761021	1500	(C)761021	1530	50<	400	27	310	10<	10<
M46			761021	1510						

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M46	761020	1500	(C)761020	1530	0.000		1		0	0
M46	761021	1500	(C)761021	1530	0.000	2.8<	6	4	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M46	761020	1500	(C)761020	1530	0.000	0	0	0	0
M46	761021	1500	(C)761021	1530	0.000	0	0	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M46	761020	1500	(C)761020	1530	0.000		0		0	0
M46	761021	1500	(C)761021	1530	0.000	1.3<	3	2	0	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M46	761020	1500	(C)761020	1530	0.000	0	0	0	0
M46	761021	1500	(C)761021	1530	0.000	0	0	0	0

Midwest Farms--

Introduction--

The Midwest Farms Plant, located at 1039 South Bellevue Street, bottles milk, milk products, and orange juice. Operation is continuous five to six days per week, with a total employment of 25 to 30 people.

The operation consists of standardizing, pasteurizing and bottling raw milk (delivered by truck). Buttermilk and chocolate milk are also produced. Reconstituted orange juice is the only product to which water is added. However, this consumptive use is negligible when compared to the total water consumption of this facility.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from cleanup with almost a negligible volume from sanitary sources. All wastewater is combined in a sump in the building before discharge without pretreatment into the city sewerage system.

Results--

Two consecutive 24-hour composite samples, collected at 30-minute intervals, were obtained from the sump in the building (M-47) from October 18 through 20, 1976. Discharge flow volumes were determined from daily readings of the MLG&W water meter. Consumptive loss in the product was considered to be negligible. Wastewater loadings (Table L) were determined from composite parameter concentrations and MLG&W meter flows.

The most recent water bill from MLG&W showed the monthly use to be 1,403,996 gallons. This represents about 70,200 gallons per day based on 20 working days per month. Raw water usage during the sampling period was

48,600 gallons per day and 42,600 gallons per day, respectively. Company personnel indicated that production was about normal; however, lower than normal wastewater flows do not reflect this. Loads discharged during the study period were considered lower than normal and not representative of typical discharge.

The untreated wastewater contained high concentrations of BOD_5 (1,030 mg/l), and COD (1,650 mg/l). The TSS concentrations were only slightly greater than domestic sewage (390 mg/l). The facility contributed less than 0.2 percent of the total BOD_5, COD and TSS into the WTP and was considered a minor discharger to the sewerage system.

TABLE L
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MIDWEST FARMS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M47				761018	1055			6.8			
M47	761018	1100	(C)	761019	1100	0.049			920.0	315	1736
M47				761019	1100		18.0	6.9			
M47	761019	1100	(C)	761020	1040	0.043			1140.0	460	1572
M47				761020	1045		18.0	6.4			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M47	761018	1100	(C)	761019	1100	0.049	376.2	129	710
M47	761019	1100	(C)	761020	1040	0.043	409.1	165	564

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M47	761018	1100	(C)	761019	1100	0.049	170.6	58	322
M47	761019	1100	(C)	761020	1040	0.043	185.6	75	256

Crown-Zellerbach Corporation--

Introduction--

Crown-Zellerbach is a corrugated box manufacturer located at 611 Winchester Road. The facility employs 55 people in a five day per week, 16-hour per day operation.

The process consists of corrugating (molding and gluing) kraft paper into sheets (cardboard) and pressing the sheets (cutting and scoring) with an optional box construction phase (stitch gluing or pasting).

Wastewater Discharges and Pretreatment Processes--

Wastewaters are generated at three sites: (1) rinse waters used in the pressing department; (2) process water used in the corrugating department; and (3) cleanup water used in the glue mixing department.

Pretreatment consists of a dual chamber tank. The first chamber is a grease sump, the second chamber is a settling tank. Sludge is periodically pumped out by a septic tank service; ultimate disposal is not known. Domestic wastewaters are discharged from separate lines directly into the city sewerage system.

Results--

Plant wastewater was sampled at the cleanout just downstream from the pretreatment tank. The site (M-51) was sampled for 14-hour periods at 30-minute intervals on two consecutive days. Flowrates were determined from daily MLG&W water meter readings minus daily domestic consumption. Discharge flows used in the loading analyses were 21,605 gpd during the period of October 19 through 20, 1976; and 21,827 gpd during the period of October 20 through 21, 1976.

Company records indicate an average monthly usage of 61,666 cubic feet of water based on the last three months. This equates to a daily water usage of 21,450 gpd and a discharge (usage less sanitary flow) to the sewer of 19,804 gpd. Operation during the sampling period was considered normal by company personnel. Analytical results are presented in Table LI. This facility was considered a minor discharger.

TABLE LI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CROWN ZELLERBACH
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M51	761019	0710	(C)	761019	2400	0.022			130.0	46	131
M51	761020	0715	(C)	761020	2400	0.022			120.0	145	252
M51				761020	0723		18.0	9.0			
M51				761021	0815		19.0	5.9			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M51	761019	0710	(C)	761019	2400	0.022	23.4	8	24
M51	761020	0715	(C)	761020	2400	0.022	21.8	26	46

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M51	761019	0710	(C)	761019	2400	0.022	10.6	4	11
M51	761020	0715	(C)	761020	2400	0.022	9.9	12	21

Klinke Brothers Ice Cream Company--

Introduction--

The Klinke Brothers plant, located at 2450 Scaper Street, produces ice cream during one ten-hour production shift per day, five days per week. Approximately 20 office and production people are employed at the plant.

The basic process consists of blending sweet cream and ice cream with flavorings, sugar, and a stabilizer. The mixture is then pasteurized, homogenized, packaged, and frozen.

Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater flow is from cleanup operations between batches during production periods and end of the day cleanup. Sanitary sewage is also discharged. All wastewaters combine at a sump before they are discharged into the city sewerage system. When required, a septic tank service cleans the sump. Ultimate disposal of the sludge and scum is unknown.

Results--

Two eleven-hour composite samples, with aliquots collected at 30-minute intervals, were obtained for two sampling periods (October 19 and 20, 1976) from the sump (M-56). Discharge volumes were determined from daily readings of the MLG&W water meters. There is no consumptive loss in the operation; thus, the raw water volume was assumed to be equal to the discharge volume. The wastewater loads (Table LII) were determined from composite parameter concentrations and MLG&W meter readings.

The most recent water bill showed the monthly use to be about 292,000 gallons; i.e., 13,300 gallons per day based on 22 work days per month.

During the sampling period, the flow was 8,000 gallons the first day and 11,000 gallons the second day.

Company personnel indicated that operations were normal. Lower than normal water usage during the study period was probably due to less ice cream demand during the cooler weather. Therefore, the loads discharged are considered to be representative for the time of year samples were collected.

The untreated wastewater contained high concentrations of BOD_5 (3,200 mg/l), COD (5,979 mg/l) and TSS (1,260 mg/l). However, it accounted for only about 0.1 percent of BOD_5, COD, and TSS loads discharged into the WTP, and was considered to be a minor discharger.

TABLE LII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KLINKE BROS. ICE CREAM
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M56				761019	0830		22.0	6.9			
M56	761019	0830	(C)	761019	2100	0.008			3600.0	1160	5364
M56	761020	0630	(C)	761020	2115	0.011			2800.0	1365	6587
M56				761020	0640		21.0	6.8			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M56	761019	0830	(C)	761019	2100	0.008	240.3	77	358
M56	761020	0630	(C)	761020	2115	0.011	257.0	125	605

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M56	761019	0830	(C)	761019	2100	0.008	109.0	35	162
M56	761020	0630	(C)	761020	2115	0.011	116.6	57	274

Keathleys--

Introduction--

Keathleys, a division of Fairmont Foods, is a bakery located at 965 Philadelphia Street. About 100 people are employed in a three-shift operation four to five days per week.

Brownies, pecan pies and cakes are the principal products of this bakery. The first shift has three bake lines; the second shift has one line; the third shift is devoted to cleanup.

Wastewater Discharges and Pretreatment Processes--

Wastewater, primarily derived from cleanup operations and sanitary sewage, is conveyed into a sump in the building before discharging into the sewerage system. Floatable solids and sludge which remain in the sump are removed, when warranted, by a septic tank cleanout service. Ultimate disposal of these solids by this service is not known.

Results--

Three consecutive 24-hour composite samples (October 18 through 21, 1976) were collected at 30-minute intervals from the sump (M-67). Wastewater flow was to be determined by reading the three MLG&W water meters and subtracting consumptive product loss. However, one of three meters was inoperative, and the actual volume was not determined in the field. Instead, the average flow for the past four months was determined from MLG&W water bills and assumed to be the flow for the sampling period. Therefore, the wastewater loads (Table LIII) are based on composite parameter concentrations and average flows, and may not be representative of normal operating conditions. The MLG&W meter should be repaired so accurate flow measurements can be made.

The BOD_5, TSS, and COD concentrations were high (1,100 mg/l, 920 mg/l, and 3,740 mg/l, respectively). However, the facility contributed less than 0.2 percent of the total load into the WTP.

TABLE LIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KEATHLEY INC.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M67	761018	1200	(C)761019	1150	0.024			1100.0>	395	2842
M67			761018	1205		25.0	4.4			
M67			761019	1150		24.0	5.4			
M67	761019	1200	(C)761020	1140	0.024			1100.0>	630	3326
M67			761020	1140		21.5	4.6			
M67	761020	1140	(C)761021	1115	0.024			1100.0>	1735	5060
M67			761021	1115		23.0	4.3			

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M67	761018	1200	(C)761019	1150	0.024	220.3>	79	569
M67	761019	1200	(C)761020	1140	0.024	220.3>	126	666
M67	761020	1140	(C)761021	1115	0.024	220.3>	347	1013

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M67	761018	1200	(C)761019	1150	0.024	99.9>	36	258
M67	761019	1200	(C)761020	1140	0.024	99.9>	57	302
M67	761020	1140	(C)761021	1115	0.024	99.9>	158	460

J. Strickland and Company--

Introduction--

The facility, located at 1400 Ragan Street, manufactures hair preparations. The plant operates one eight-hour shift per day, five days per week. About 60 people are employed, with 30 working in the manufacturing operation and 30 office personnel.

The process consists of heating and blending petroleum jelly with perfumes and oils to produce a finished product which is then packaged. Heat is necessary to completely blend all ingredients with the petroleum jelly.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from kettle cleanout between product batches. The cleaning process consists of washing the kettles with steam, soapy water, and then rinsing. Cooling water and sanitary sewage are combined with the process wastewater discharge. No pretreatment is provided.

Results--

Two eight-hour composite samples of the combined discharge were collected at 30-minute intervals for two consecutive days (October 20 and 21, 1976) from a sewer cleanout inside the building (M-71). Flow was determined using the MLG&W water meter. Negligible water is used in the product; therefore, the city water usage was assumed to equal the wastewater discharged. Wastewater loads (Table LIV) were determined from composite parameter concentrations and the flows from MLG&W water meter readings. The most recent water bill from MLG&W showed the monthly use to be about 350,000 gallons, i.e., 15,700 gallons per day based on 22 workdays per month. Raw

water used during the sampling period was 8,400 gallons the first day and 11,000 gallons the second day. Lower than normal flows during the sampling period indicate that production may have been less than normal. Therefore, the discharge during the study period should be considered less than normal and not representative of the typical discharge.

The BOD_5 and COD concentrations during the first sampling period were high (>600 and 1,457 mg/l, respectively). However, the loads discharged that day were only 40 and 97 lbs/day, respectively. The low flows discharged and the absence of toxic substances in the wastewater classify the facility as a minor contributor.

TABLE LIV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
J. STRICKLAND
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M71	761020	0830	(C)	761020	1630	0.008			600.0>	1457	
M71				761020	0845		22.0	7.0			
M71	761021	0800	(C)	761021	1630	0.011			121.0	343	
M71				761021	0815		45.0				35.00
M71				761022	0840		50.5	6.8			

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M71	761020	0830	(C)	761020	1630	0.008	40.1>	97	2.8*
M71	761021	0800	(C)	761021	1630	0.011	11.1	31	

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M71	761020	0830	(C)	761020	1630	0.008	18.2>	44	
M71	761021	0800	(C)	761021	1630	0.011	5.0	14	

* APPROXIMATION OF LOADS (CALCULATED BY USING GRAB CONCENTRATIONS AND AVERAGE DAILY FLOW)

Pro-Serv, Incorporated--

Introduction--

Pro-Serv is a herbicide manufacturer located at 400 East Brooks Road. The work force consists of 18 people who are engaged in a five day per week, 24-hour per day operation.

The facility formulates raw chemicals into herbicide powders, pellets, and granules. Ramrod 65, Prometon, and ramrod 65 with atrazine make up the product line.

Wastewater Discharges and Pretreatment Processes--

Wastewaters are derived from runoff in and around the immediate processing building. Runoff is channeled to sump pumps (north and south) located on either side of the structure. From the sumps, wastewaters are pumped to a common 16,000 gallon holding tank. When the tank volume reaches approximately 13,000 gallons, the contents are analyzed. The analytical results are submitted to the WTP personnel for approval to batch dump the contents.

Results--

Sampling consisted of two grab samples collected from the tank (site M-73) and composited on October 19, 1976. The tank contents are discharged to the city sewer system at an approximate rate of once every two months. Plant personnel stated that the tank may have a detectable concentration of chlordane due to a past accident. Company personnel indicated that plant operation during the study was normal. Analytical results are presented in Table LV.

This facility is classified as a major discharger due to the toxic organic compounds detected. Trichloroethylene, toluene, ethyl benzene, methylene chloride, and chlordane, which were detected in the tank contents, are all on EPA's Consent Decree: "65 Toxic Chemicals List." The chlordane concentration was 500 mg/l; however, this compound is no longer in use, and its detection was expected because of a past spill. In addition, ramrod was detected at a concentration of 14,000 mg/l.

TABLE LV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
PRO SERV
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L
M73	761021	1110	(C)	761021	1500	0.013	3339	8905

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D
M73	761021	1110	(C)	761021	1500	0.013	362	966

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D
M73	761021	1110	(C)	761021	1500	0.013	164	438

PRESIDENTS ISLAND BASIN

Cargill, Incorporated--

Introduction--

Cargill, located at 1877 Channel Avenue on Presidents Island, manufactures soybean meal and soybean oil. The facility operates continuously with a total employment of 80 persons.

The process consists of solvent extraction of soybeans. Production steps include cracking soybeans, heating, flaking, extracting, drying and grinding of meal, and storage.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is the continuous boiler blowdown. Wastewater from skimming pits, steam condensation, spillage, and sanitary sewage are discharged with process wastewater. All wastewaters are discharged into the city sewerage system without treatment. Cooling water is discharged to McKellar Lake. The company has an NPDES permit for this discharge.

Results--

Three consecutive 24-hour composite samples collected at 30-minute intervals were obtained at the manhole (M-80) in front of the mill office building from October 25 through 28. Flows were obtained by daily readings of the MLG&W water meter minus estimated consumptive uses. The consumptive water use consists of approximately thirty percent of incoming flow and includes waters in the soybean meal and waters exhausted to the atmosphere. Cooling water is obtained from deep wells.

Wastewater loads (Table LVI) were determined from composite parameter concentrations and the calculated flow during the inspection period. The

most recent water bill from MLG&W showed the monthly use to be approximately 6.42 million gallons or 214,000 gallons per day based on the 30 day work month. Raw water used during the sampling period ranged from 175,000 gallons per day to 246,000 gallons per day. Company personnel indicated that production was about normal.

Since the flows are nearly representative of normal operating conditions, and since the operation was considered normal by company personnel during the visit, the wastewater discharged is assumed to be representative of normal operating conditions. Wastewaters from this facility are similar to domestic sewage.

TABLE LVI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CARGILL, INC.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	TOT KJEL N MG/L
M80			761025	1100		40.0	6.8			
M80	761025	1100	(C)761026	1000	0.123			340.0	20	5.40
M80			761026	1040		60.0	10.4			
M80	761026	1100	(C)761027	1000	0.173			173.0	5	3.72
M80			761027	0945		48.0	6.7			
M80	761027	1000	(C)761028	0900	0.168			1399.0	188	3.55
M80			761028	0915		40.0	6.1			

STATION	DATE	TIME	DATE	TIME	NH3-N TOTAL MG/L	NO2&NO3 N-TOTAL MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M80			761025	1100					
M80	761025	1100	(C)761026	1000	4.90	0.01<	0.420	344	
M80			761026	1040					61.00
M80	761026	1100	(C)761027	1000	3.52	0.01<	0.410	222	
M80			761027	0945					108.00
M80	761027	1000	(C)761028	0900	2.90	0.01<	0.810	2663	
M80			761028	0915					369.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	NH3-N TOTAL LB/D
M80	761025	1100	(C)761026	1000	0.123	349.0	21	5.54	5.03
M80	761026	1100	(C)761027	1000	0.173	249.8	7	5.37	5.08
M80	761027	1000	(C)761028	0900	0.168	1961.4	264	4.98	4.07

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M80	761025	1100	(C)761026	1000	0.123	0.01<	0.431	353	231*
M80	761026	1100	(C)761027	1000	0.173	0.01<	0.592	321	
M80	761027	1000	(C)761028	0900	0.168	0.01<	1.136	3734	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	NH3-N TOTAL KG/D
M80	761025	1100	(C)761026	1000	0.123	158.3	9	2.51	2.28
M80	761026	1100	(C)761027	1000	0.173	113.3	3	2.44	2.31
M80	761027	1000	(C)761028	0900	0.168	889.7	120	2.26	1.84

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M80	761025	1100	(C)761026	1000	0.123	0.00<	0.196	160	
M80	761026	1100	(C)761027	1000	0.173	0.01<	0.268	145	
M80	761027	1000	(C)761028	0900	0.168	0.01<	0.515	1694	

* APPROXIMATION OF LOAD , (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG OF DAILY FLOW).

Cargill, Incorporated--

Introduction--

The Cargill plant, located at 2330 Buoy Street on Presidents Island, produces corn syrup, corn starch, and feed byproducts. Operation is continuous (three shifts per day, seven days per week) with 15 to 20 production employees per shift.

The operation is classified as a wet corn milling process. Corn which arrives either by barge or by rail is cleaned, stored, and cleaned again before going to steep tanks for soaking in warm water. The steep water is drawn off and the softened kernels go to degerminating mills and on to separators where the oil-laden germs are removed and the oil is extracted. The remaining slurry of starch, gluten, and hulls is ground finely, then passed through reels and shaken for hull removal. Starch and gluten are then separated in centrifuges. The starch is washed, dried, prepared for shipment as starch and dextrin, or converted into syrup and dextrose.

Wastewater Discharges and Pretreatment Processes--

The major source of wastewater is condensate from evaporators in the steamhouse and refining areas. Significant volumes of wastewater also originate in the grinding and washing operations. There is no pretreatment per se; however, in-plant controls return most solids to the process. Cooling water discharges into McKellar Lake (there is an NPDES permit for this discharge). Sanitary wastewater discharges separately into the sewerage system.

Results--

Three consecutive 24-hour composite samples, collected at 30-minute intervals were obtained at the Parshall flume pit (M-81) from October 25 to 28, 1976. Flows were determined using the company's 6-inch Parshall flume.

Wastewater loads (Table LVII) were based on the composite parameter concentrations and the daily flows determined with the Parshall flume. Over the past few months, the daily flows ranged from 0.75 to 1 mgd, and this is consistent with flows during the sampling period. Company personnel indicated that the operation was not up to normal at the time of the sampling. The facility is new (operation began in May 1976). Usually, a period of six months or more is required to bring this type of operation to normal production. At that time, company personnel indicate that wastewater and waste loads should decrease if similar operations can be used as a guide.

This discharger is the most significant source of BOD_5, COD, and TSS served by the Presidents Island interceptor. The BOD_5 loadings ranged from 22,000 lbs/day to 52,000 lbs/day; COD ranged from 25,000 lbs/day to 107,000 lbs/day; TSS ranged from 5,000 lbs/day to 28,000 lbs/day. During the third sampling period (October 27 through 28, 1976), operational problems in the facility caused notably higher concentrations in all parameters measured.

If this Cargill plant discharged into the WTP during the study, it would have accounted for about ten percent of the influent BOD_5 and COD, and about five percent of the TSS influent loadings. When the Presidents Island interceptor is connected to the WTP, this additional wastewater will contribute to existing overloading conditions experienced at the plant.

TABLE LVII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CARGILL, INC.
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	TOT KJEL N MG/L
M81	761025	1000	(C)	761026	0900	0.790			3900.0	760	50.00
M81				761025	1020	1.120	27.0	4.0			
M81	761026	0900	(C)	761027	0900	0.840			3100.0	1240	68.50
M81				761026	0930	0.700					
M81	761027	0900	(C)	761028	0900	0.720			8666.0	4635	275.00
M81				761027	0910	0.700	18.0	4.5			
M81				761028	0830	0.700	30.0	3.5			

STATION	DATE	TIME		DATE	TIME	NH3-N TOTAL MG/L	NO2&NO3 N-TOTAL MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M81	761025	1000	(C)	761026	0900	1.80	0.02	9.400	3893	
M81				761025	1020					
M81	761026	0900	(C)	761027	0900	1.75	0.01<	13.600	6761	
M81				761026	0930					8.00
M81	761027	0900	(C)	761028	0900	1.85	0.06	71.500	17930	
M81				761027	0910					21.00
M81				761028	0830					152.00

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	NH3-N TOTAL LB/D
M81	761025	1000	(C)	761026	0900	0.790	25711.9	5011	329.64	11.87
M81				761025	1020	1.120				
M81	761026	0900	(C)	761027	0900	0.840	21731.2	8692	480.19	12.27
M81				761026	0930	0.700				
M81	761027	0900	(C)	761028	0900	0.720	52070.7	27850	1652.37	11.12
M81				761027	0910	0.700				
M81				761028	0830	0.700				

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M81	761025	1000	(C)	761026	0900	0.790	0.13	61.972	25666	
M81				761025	1020	1.120				
M81	761026	0900	(C)	761027	0900	0.840	0.07<	95.337	47395	
M81				761026	0930	0.700				46.73
M81	761027	0900	(C)	761028	0900	0.720	0.36	429.616	107734	
M81				761027	0910	0.700				122.68
M81				761028	0830	0.700				887.94

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	NH3-N TOTAL KG/D
M81	761025	1000	(C)	761026	0900	0.790	11662.7	2273	149.52	5.38
M81				761025	1020	1.120				
M81	761026	0900	(C)	761027	0900	0.840	9857.1	3943	217.81	5.56
M81				761026	0930	0.700				
M81	761027	0900	(C)	761028	0900	0.720	23618.9	12633	749.50	5.04
M81				761027	0910	0.700				
M81				761028	0830	0.700				

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M81	761025	1000	(C)	761026	0900	0.790	0.06	28.110	11642	
M81				761025	1020	1.120				
M81	761026	0900	(C)	761027	0900	0.840	0.03<	43.244	21498	
M81				761026	0930	0.700				21.20
M81	761027	0900	(C)	761028	0900	0.720	0.16	194.870	48867	
M81				761027	0910	0.700				55.64
M81				761028	0830	0.700				402.76

Mid-South Plating Company, Inc.--

Introduction--

Mid-South Plating, located at 1520 Channel Avenue on Presidents Island, is a commercial metal finisher, operating three shifts per day, five days per week, with a total employment of 18 people.

The facility operates three plating lines and has the capability for zinc, cadmium, and bronze plating. Both barrel and rack lines are used. All three lines usually operate during the first shift, two during the second shift, and one on the third shift. Each line has the following units: alkaline cleaner; rinse; muriatic acid pickling; continuous rinse; plating; counter-flow rinse; chromate dip; double rinse; hot water rinse; drying, and packaging.

Wastewater Discharges and Pretreatment Processes--

The primary sources of wastewater are from the rinsing operations with negligible volumes from sanitary sewage. Process wastewaters receive pH neutralization in a 6,000 gallon tank by manually adding a caustic solution. Caustic is added to adjust the pH to neutral or slightly greater than neutral. Process wastewaters and sanitary sewage are combined before discharge into the interceptor.

Results--

Two consecutive 24-hour composite samples, collected at hourly intervals, were taken from the cleanout in front of the building (M-82) from October 25 through 27, 1976. Flows were determined from daily readings of the MLG&W water meter. There are no consumptive losses in this operation. Wastewater loads (Table LVIII) were determined from composite parameter concentrations and the flows from water meter readings.

The most recent water bill from MLG&W showed the monthly use to be 1.58 million gallons. This represents about 72,000 gallons per day based on 22 working days per month. Raw water during the sample period was 52,000 and 58,000 gallons per day. Company personnel indicated that production was about normal; however, lower than normal flows do not reflect this. Loads discharged during the study period may be less than normal and not representative of normal discharges.

This wastewater contains high concentrations of cyanide (average 34.8 mg/l) and heavy metals (zinc - 65 mg/l average, iron - 36 mg/l average, cadmium - 3.5 mg/l average). The WTP treatment process is not specifically designed to remove either heavy metals or cyanide.

TABLE LVIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MID SOUTH PLATING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	CYANIDE CN-TOT MG/L	CHROMIUM CR,TOT UG/L
M82			761025	1520		20.5	4.9				
M82	761025	1530	(C)761026	1510	0.057			155	166		3100
M82	761026	1500	(C)761027	1400	0.058			240	214		2000
M82			761026	1510		20.0	5.1			50.000	
M82			761027	1405		18.0	6.2			19.600	

STATION	DATE	TIME	DATE	TIME	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	IRON FE,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M82			761025	1520						
M82	761025	1530	(C)761026	1510	68700	222	80	27600	738	1700
M82	761026	1500	(C)761027	1400	61940	319	82	44600	85	5320
M82			761026	1510						
M82			761027	1405						

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CYANIDE CN-TOT LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M82	761025	1530	(C)761026	1510	0.057	74	79	16.7*	1	33
M82	761026	1500	(C)761027	1400	0.058	116	104		1	30

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	IRON FE,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M82	761025	1530	(C)761026	1510	0.057	0	0	13	0	1
M82	761026	1500	(C)761027	1400	0.058	0	0	22	0	3

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CYANIDE CN-TOT KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M82	761025	1530	(C)761026	1510	0.057	33	36		1	15
M82	761026	1500	(C)761027	1400	0.058	53	47		0	14

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	IRON FE,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M82	761025	1530	(C)761026	1510	0.057	0	0	6	0	0
M82	761026	1500	(C)761027	1400	0.058	0	0	10	0	1

*APPROXIMATION OF LOAD (CALCULATED WITH AVERAGE OF DAILY CONCENTRATIONS AND AVERAGE DAILY FLOW)

Armour Corporation--

Introduction--

Armour is a slaughtering and meat packing operation located at 1337 Riverside. They employ 475 people in a five day per week, 24-hour per day operation.

This operation consists of slaughtering (7 a.m. - 3:30 p.m.), processing (3:30 - 11:00), then cleanup (11:00 p.m. - 7:00 a.m.). Products include fresh beef and pork and processed meats (franks, bologna, sausage, and hams.)

Wastewater Discharges and Pretreatment Processes--

Cooling waters and sanitary wastes are discharged directly into the city sewer. Process wastes, including slaughtering and cleanup wastewaters, are discharged to the pretreatment system. Wastewaters from the hog slaughtering operation result from scald tank and dehairing processes. A negligible amount of wastewater is generated by the polishing unit. Wastewaters from cattle slaughtering are generated at the head washing unit, washing tray, and the wash cabinet (100 gpm). The remainder of the wastewater is generated in the cleanup operation.

Pretreatment consists of grit removal and settling. Wastewaters flow through a grit cyclone unit into a settling tank. Solids from the settling tank are recycled to the influent of the cyclone unit to recapture the greatest possible portion of this marketable product. Floatables are skimmed off and pumped to the tank house to be marketed out. Overflow effluent is discharged through a parabolic open flow nozzle.

Results--

Sampling consisted of two consecutive 24-hour composites taken during the period of October 26 through 28, 1976. Samples were taken at 20-minute intervals at the stilling basin (M-83) just upstream of the company's parabolic flume. Flow was determined from daily readings of the company's totalizer: 548,000 gpd on the first day, 490,000 gpd on the second day. Analytical results of the composite samples are given in Table LIX. Company personnel indicated that operations were normal during the investigation, and thus the loadings were assumed to be representative of typical discharges.

This facility, located on the Presidents Island interceptor, is a major discharger with respect to BOD_5, COD, TSS, TKN, and oil and grease. If this wastewater had discharged into the WTP during the study, it would represent greater than four percent of the total influent BOD_5, TSS, COD, and TKN, and more than ten percent of the oil and grease. The facility plans to discontinue slaughtering at this site and correspondingly, future loadings should be in the range of normal sanitary sewage.

TABLE LIX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
ARMOUR
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	TOT KJEL N MG/L
M83	761026	0830	(C)761027	0810	0.548			2131.0	1250	126.00
M83	761027	0820	(C)761028	0820	0.490			2082.0	1245	91.50
M83			761027	0825		26.0	6.2			
M83			761028	0823		30.0	6.2			

STATION	DATE	TIME	DATE	TIME	NH3-N TOTAL MG/L	NO2&NO3 N-TOTAL MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M83	761026	0830	(C)761027	0810	32.50	0.05	26.200	4390	
M83	761027	0820	(C)761028	0820	19.50	0.12	24.800	3252	
M83			761027	0825					348.00
M83			761028	0823					223.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	NH3-N TOTAL LB/D
M83	761026	0830	(C)761027	0810	0.548	9745.5	5717	576.23	148.63
M83	761027	0820	(C)761028	0820	0.490	8513.7	5091	374.16	79.74

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M83	761026	0830	(C)761027	0810	0.548	0.23	119.818	20076	1236*
M83	761027	0820	(C)761028	0820	0.490	0.49	101.412	13298	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	NH3-N TOTAL KG/D
M83	761026	0830	(C)761027	0810	0.548	4420.5	2593	261.37	67.42
M83	761027	0820	(C)761028	0820	0.490	3861.8	2309	169.72	36.17

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M83	761026	0830	(C)761027	0810	0.548	0.10	54.349	9107	
M83	761027	0820	(C)761028	0820	0.490	0.22	46.000	6032	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG DAILY FLOW)

Memphis Butchers (Subsidiary of Buring Food Group, Inc.)--

Introduction--

Memphis Butchers is a slaughtering and processing facility located at 1186 Riverside Drive. They employ 61 people in a five day per week, eight hour per day operation, with six additional people on a second shift cleanup force.

The facility slaughters 20 hogs and 90 cattle daily. Hogs are processed into sausage, and the beef is deboned before marketing.

Wastewater Discharges and Pretreatment Processes--

Wastewater is generated from the post slaughtering process units, the cleanup operation, and cooling and compressor units. Sanitary wastewater is discharged directly into the city sewer. Pretreatment consists of two grease sumps.

Results--

Three 13-14 hour composite samples were collected at half-hour intervals during production periods from October 25 through 28, 1976. The sampling site (M-84) was a manhole on the west side of the facility. Flows were determined from daily MLG&W water meter readings minus the domestic usage (2,310 gpd). Company records indicate that the average monthly water use was 379,300 cf based upon the past four months. This equates to a daily water usage of 131,961 gpd. Daily water usage during the study ranged from 73,363 to 103,066 gpd, considerably less than the expected normal usage. Company personnel indicated that production was about normal; however, lower than normal flows do not reflect this condition. Loads discharged during

the study period may be less than normal and may not be representative of normal discharges. Analytical results are presented in Table LX. Wastewater from this facility is discharged into the Presidents Island interceptor.

Average BOD_5, COD, TSS, and nutrient concentrations were higher than the average WTP influent wastewater concentrations. However, this facility's wastewater is amenable to biological treatment, and should not detrimentally affect the contact stabilization process used at the WTP when the interceptor goes on-line.

TABLE LX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MEMPHIS BUTCHERS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	TOT KJEL N MG/L
M84	761025	1010	(C)761025	2400	0.071			2900.0	1350	134.00
M84	761026	0940	(C)761027	0100	0.074			380.0	80	38.50
M84			761026	0955		18.0	6.7	230.0	25	24.90
M84	761027	0910	(C)761028	0100	0.101			999.0	480	74.50
M84			761027	0920		23.0	6.9			
M84			761028	0935		20.0	7.2			

STATION	DATE	TIME	DATE	TIME	NH3-N TOTAL MG/L	NO2&NO3 N-TOTAL MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M84	761025	1010	(C)761025	2400	30.00	0.12	17.300	4187	
M84	761026	0940	(C)761027	0100	7.50	0.03	13.800	691	
M84			761026	0955	4.50	0.06	3.300	173	6.00
M84	761027	0910	(C)761028	0100	20.00	0.07	22.400	2074	
M84			761027	0920					315.00
M84			761028	0935					236.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	NH3-N TOTAL LB/D
M84	761025	1010	(C)761025	2400	0.071	1719.5	800	79.45	17.79
M84	761026	0940	(C)761027	0100	0.074	235.9	50	23.90	4.66
M84	761027	0910	(C)761028	0100	0.101	840.0	404	62.64	16.82

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M84	761025	1010	(C)761025	2400	0.071	0.07	10.258	2483	
M84	761026	0940	(C)761027	0100	0.074	0.02	8.566	429	127*
M84	761027	0910	(C)761028	0100	0.101	0.06	18.836	1744	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	NH3-N TOTAL KG/D
M84	761025	1010	(C)761025	2400	0.071	780.0	363	36.04	8.07
M84	761026	0940	(C)761027	0100	0.074	107.0	23	10.84	2.11
M84	761027	0910	(C)761028	0100	0.101	381.0	183	28.42	7.63

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M84	761025	1010	(C)761025	2400	0.071	0.03	4.653	1126	
M84	761026	0940	(C)761027	0100	0.074	0.01	3.885	195	
M84	761027	0910	(C)761028	0100	0.101	0.03	8.544	791	

* APPROXIMATION OF LOAD CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS ANDAVG DAILY FLOW).

Unarco Commercial Products (Subsidiary of Unarco Industries, Inc.)--

Introduction--

Unarco is a metal plating facility, located at 1132 Kansas Street, which employs 200 people in a five day per week 24-hour per day operation.

This facility metal-plates unassembled grocery cart components. Parts are metal-finished in either zinc or nickel-chrome plating lines, according to specifications. The nickel-chrome plating lines consist of the following unit process tanks in order: pre-soak; electrode cleaner; rinse; electrode acid; rinse; nickel plating; rinse; chromic acid, and rinse. The only difference between the zinc and the nickel-chrome line is the substitution of zinc as the metal source.

Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater is generated from the continuous overflow rinse tanks in the zinc and nickel-chrome lines. The remainder of the total wastewater is from in-plant usages (boiler, etc.) Sanitary wastes are discharged from a separate line into the city sewer. The facility provides no pretreatment for their wastewaters, but they have plans to do so in the future. The treatment scheme has not yet been developed.

Results--

Sampling consists of two consecutive 24-hour composites taken during the period of October 25 through 27. Samples were pumped at half-hour intervals from the cleanout (M-85) at the front of the building. Wastewater flow at this site was determined from the company's average monthly water usage and not from daily water meter readings, since the meters were submerged in the meter manhole. Company records indicate an average

monthly usage of 215,200 cubic feet based on five previous months, this equates to an average daily usage of 73,230 gpd. This flow, minus the estimated sanitary waste (6,000 gpd) gives the flow (67,230 gpd) used in the loading computation. Operation during the sampling period was considered normal. Wastewater discharge loads are given in Table LXI.

This facility is probably the most significant source of chromium and nickel discharging into the Presidents Island interceptor, averaging 23.0 lbs/day of chromium and 5.12 lbs/day of nickel. If this facility had discharged into the WTP during the study, it would have accounted for about 95 percent of the influent chromium and about 67 percent of the influent nickel. Heavy metals are not amenable to treatment by biological treatment processes.

The facility is in the process of designing a pretreatment system.

TABLE LXI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
UNARCO
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	CYANIDE CN-TOT MG/L
M85	761025	1145	(C)761026	1130	0.067			36	40<	0.001<
M85	761026	1130	(C)761027	0100	0.067			44	40<	
M85			761026	1132		20.0	6.4			
M85			761027	1240		23.0	8.2			0.008

STATION	DATE	TIME	DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M85	761025	1145	(C)761026	1130	38400	1900	245	154	5420	10<
M85	761026	1130	(C)761027	0100	43600	1640	226	82	12840	10<
M85			761026	1132						
M85			761027	1240						

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CYANIDE CN-TOT LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M85	761025	1145	(C)761026	1130	0.067	20	22<	0.001<	22	1
M85	761026	1130	(C)761027	0100	0.067	25	22<		24	1

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M85	761025	1145	(C)761026	1130	0.067	0	0	3	0<
M85	761026	1130	(C)761027	0100	0.067	0	0	7	0<

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CYANIDE CN-TOT KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M85	761025	1145	(C)761026	1130	0.067	9	10<	0.000<	10	0
M85	761026	1130	(C)761027	0100	0.067	11	10<		11	0

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M85	761025	1145	(C)761026	1130	0.067	0	0	1	0<
M85	761026	1130	(C)761027	0100	0.067	0	0	3	0<

Nat Buring Packing (Div. of Buring Foods Group)--

Introduction--

Nat Buring is a meat packing facility located at 1837 Harbor Avenue. They employ 293 people in a five day per week 16-hour per day operation.

Deboned beef and pork are flaked, ground, mixed, cooked, and packaged into luncheon meats. Pork slabs are flattened, brine injected, smoked, washed down, compressed, cut and packaged for sale as bacon. Deboned beef is flaked, ground, mixed, packed in dye transfer pouches, heat treated, and repackaged for sale as franks.

Wastewater Discharges and Pretreatment Processes--

Wastewater is generated from continuous cleanup throughout the day, including product washdown after smokehouse operation, mid-morning cleanup, process water (cooking), boiler blowdown, and water wasted from the ammonia compressors. Consumptive loss is from evaporative cooling towers and product water makeup. Pretreatment consists of a sediment bucket and grease trap.

Results--

Sampling consisted of two composites taken from the manhole on the west side of the building (M-86) during the period October 25 through 27. Samples were collected at one-half hour intervals for 11-12 hours of the production period. Flows were determined from daily MLG&W water meter readings.

Company records indicate an average monthly water usage of 1,153,900 cubic feet based upon the last four months. This equates to an approximate daily usage of 0.32-0.36 mgd.

Daily water usage during the study was 0.298 mgd the first day of sampling and 0.335 mgd the second day. Sanitary use (8,790 gpd), evaporative water loss, compressor cooling (67,800 gpd) during the eight non-processing hours, and product water (negligible) were subtracted from the daily raw water usage to determine the daily discharge. Discharge flows used in the loading computations were 0.221 mgd and 0.259 mgd, respectively.

Company personnel indicated that operations on the first day of sampling were not typical, and thus the discharge was assumed to be non-representative of average daily discharge.

This facility is on Presidents Island and does not presently discharge to the WTP. None of the parameters measured in the discharge (Table LXII) exceeded one percent of the current total influent loading; thus, the facility was considered a minor discharger.

TABLE LXII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
NAT BURING PACKING
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	TOT KJEL N MG/L
M86	761025	1310	(C)761026	0100	0.221			420.0	810	10.80
M86	761026	1345	(C)761027	0100	0.259			440.0	150	6.02
M86			761026	1410						
M86			761027	1330		24.0	6.8			

STATION	DATE	TIME	DATE	TIME	NH3-N TOTAL MG/L	NO2&NO3 N-TOTAL MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M86	761025	1310	(C)761026	0100	1.00	0.01<	6.000	870	
M86	761026	1345	(C)761027	0100	1.00	0.35	9.100	406	
M86			761026	1410					25.00
M86			761027	1330					47.00

********** LOADINGS **********

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	NH3-N TOTAL LB/D
M86	761025	1310	(C)761026	0100	0.221	774.6	1494	19.92	1.84
M86	761026	1345	(C)761027	0100	0.259	951.0	324	13.01	2.16

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D
M86	761025	1310	(C)761026	0100	0.221	0.02<	11.066	1605	16.8*
M86	761026	1345	(C)761027	0100	0.259	0.76	19.669	878	

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	NH3-N TOTAL KG/D
M86	761025	1310	(C)761026	0100	0.221	351.4	678	9.03	0.84
M86	761026	1345	(C)761027	0100	0.259	431.4	147	5.90	0.98

STATION	DATE	TIME	DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D
M86	761025	1310	(C)761026	0100	0.221	0.01<	5.019	728	
M86	761026	1345	(C)761027	0100	0.259	0.34	8.922	398	

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG DAILY FLOW)

Faith-Memphis Plating Company--

Introduction--

The Faith-Memphis plant, located at 2511 Harbor Avenue on Presidents Island, repairs and rechromes auto bumpers. The operation has twenty-seven employees working one ten-hour shift five days per week.

The process consists of rechroming auto bumpers and includes buffing, straightening, and polishing the bumpers before the electro-plating process. The electro-plating process includes the following sequential steps: caustic rinse tank; two rinses; acid rinse tank; rinse; nickel plating tank; rinse; dead rinse; chrome plating; two cold rinses, and a hot rinse.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from the rinsing steps in the plating process, with lesser volumes from sanitary sewage. All wastewater is combined at a common sump before discharging untreated into the sewerage system.

Results--

Composite samples were collected at thirty-minute intervals during the hours of operation on two consecutive days (October 25 and 26, 1976) from the above described sump (M-87).

Flows were determined from daily MLG&W water meter readings. There are no consumptive losses. Wastewater loads (Table LXIII) were determined from composite parameter concentrations and daily MLG&W water meter readings. Recent water bills from MLG&W showed that the water use for the past three months ranged from 55,000 to 60,000 gallons per day. During the sampling period, the flow ranged from 48,000 to 53,000 gallons per day.

The operation was considered normal by company personnel, and since the flows reflect this, wastewater discharges are assumed to be representative of normal operating conditions.

The chromium and nickel discharged by Faith-Memphis are not specifically treatable by biological treatment processes. If discharged into the WTP at the time of the study, this company would have accounted for about one-third of the total chromium and two-thirds of the nickel.

TABLE LXIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
FAITH MEMPHIS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	RESIDUE, TOT NFLT MG/L	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L
M87	761025	0930	(C)	761025	1730	0.048			70	40<	40200
M87				761025	0940		15.0	6.4			
M87	761026	0800	(C)	761026	1700	0.053			106	40<	27600
M87				761026	0830				8	40<	23600
M87				761027	0810		15.0	6.4			

STATION	DATE	TIME		DATE	TIME	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL, NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M87	761025	0930	(C)	761025	1730	70	190	130	39500	10<
M87				761025	0940					
M87	761026	0800	(C)	761026	1700	97	167	140	22800	10<
M87				761026	0830	18	84	82	5500	10<
M87				761027	0810					

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M87	761025	0930	(C)	761025	1730	0.048	28	16<	16	0
M87	761026	0800	(C)	761026	1700	0.053	47	18<	12	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M87	761025	0930	(C)	761025	1730	0.048	0	0	16	0
M87	761026	0800	(C)	761026	1700	0.053	0	0	10	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M87	761025	0930	(C)	761025	1730	0.048	13	7<	7	0
M87	761026	0800	(C)	761026	1700	0.053	21	8<	6	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M87	761025	0930	(C)	761025	1730	0.048	0	0	7	0
M87	761026	0800	(C)	761026	1700	0.053	0	0	5	0

Miller Transporters, Inc.--

Introduction--

Miller Transporters, located at 2000 Channel Avenue on Presidents Island, is a liquid transporter terminal and operates continuously. Fifty employees over three shifts constitute the normal staff at the facility.

The process includes cleaning operations (interior and exterior) of tank trucks as well as maintenance and repair. Cleaning is accomplished by using steam, hot water, and detergents; solvents are not normally used. Mild caustics may be used occasionally. Tank trucks containing poisons or insecticides are not cleaned at this location.

Wastewater Discharges and Pretreatment Processes--

All wastewater, except sanitary sewage, flows into a sump before discharge without treatment into the city sewerage system. Sanitary sewage discharges separately.

Results--

Two consecutive 24-hour composite samples, composited at hourly intervals, were collected from the above described sump (M-88) on October 25 through 27, 1976. Flows were determined by using the MLG&W water meter and subtracting the estimated volume of sanitary sewage, which is discharged separately. Wastewater loads (Table LXIV) are based on the calculated flows and composite parameter concentrations.

The most recent water bills show the average daily use, based on a six day work week, was about 23,000 gallons per day. Raw water into the facility during the sampling period was 22,000 and 28,000 gallons per day. Company personnel indicated that operation was normal at this time.

Since the operation was considered normal during the study, the waste loads discharged are assumed to be representative of normal discharge. During the sampling period, the wastewater was generally compatible with the contact stabilization process at the WTP. The heavy metal concentrations were low enough not to inhibit biological waste treatment. If the cleaning operation remains the same, and tank trucks containing toxics (pesticides, etc.) are not cleaned at this location, the wastewaters from Miller should not detrimentally affect the WTP's operation.

TABLE LXIV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MILLER TRANSPORTERS
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	PHENOLS TOTAL UG/L	RESIDUE TOT NFLT MG/L
M88	761025	1400	(C)	761026	1400	0.021			666.0<		415
M88	761026	1400	(C)	761027	1345	0.027			666.0<		438
M88				761026	1415		18.0	7.2		10<	
M88				761027	1315		15.5	8.2			

STATION	DATE	TIME		DATE	TIME	TOT KJEL N MG/L	NH3-N TOTAL MG/L	NO2&NO3 N-TOTAL MG/L	PHOS-TOT MG/L P	COD HI LEVEL MG/L	OIL-GRSE FREON-GR MG/L
M88	761025	1400	(C)	761026	1400	62.80	35.00	0.42	10.900	650	
M88	761026	1400	(C)	761027	1345	7.00	6.50	0.50	40.000	2338	
M88				761026	1415						28.00
M88				761027	1315						250.00

STATION	DATE	TIME		DATE	TIME	CHROMIUM CR,TOT UG/L	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L
M88	761025	1400	(C)	761026	1400	268	140	360	205	20<	10<
M88	761026	1400	(C)	761027	1345	102	343	290	415	29	10
M88				761026	1415						
M88				761027	1315						

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	PHENOLS TOTAL LB/D	RESIDUE TOT NFLT LB/D	TOT KJEL N LB/D	NH3-N TOTAL LB/
M88	761025	1400	(C)	761026	1400	0.021	116.7<		73	11.01	6.13
M88	761026	1400	(C)	761027	1345	0.027	150.1<		99	1.58	1.46

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL LB/D	PHOS-TOT LB/D	COD HI LEVEL LB/D	OIL-GRSE FREON-GR LB/D	CHROMIUM CR,TOT LB/D
M88	761025	1400	(C)	761026	1400	0.021	0.07	1.910	114		0
M88	761026	1400	(C)	761027	1345	0.027	0.11	9.013	527	5-50*	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT LB/D	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D
M88	761025	1400	(C)	761026	1400	0.021	0	0	0	0	0
M88	761026	1400	(C)	761027	1345	0.027	0	0	0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	PHENOLS TOTAL KG/D	RESIDUE TOT NFLT KG/D	TOT KJEL N KG/D	NH3-N TOTAL KG/D
M88	761025	1400	(C)	761026	1400	0.021	52.9<		33	4.99	2.78
M88	761026	1400	(C)	761027	1345	0.027	68.1<		45	0.72	0.66

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	NO2&NO3 N-TOTAL KG/D	PHOS-TOT KG/D	COD HI LEVEL KG/D	OIL-GRSE FREON-GR KG/D	CHROMIUM CR,TOT KG/D
M88	761025	1400	(C)	761026	1400	0.021	0.03	0.866	52		0
M88	761026	1400	(C)	761027	1345	0.027	0.05	4.088	239		0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	ZINC ZN,TOT KG/D	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D
M88	761025	1400	(C)	761026	1400	0.021	0	0	0	0	
M88	761026	1400	(C)	761027	1345	0.027	0	0	0	0	

* APPROXIMATION, i.e. LOADS CALCULATED WITH INSTANTANEOUS GRABS AND AVERAGE DAILY DISCHARGE FLOWS

CBI Nuclear Corporation--

Introduction--

CBI is located at 2700 Channel Avenue on Presidents Island, and manufactures nuclear reactor pressure vessels. Operation is continuous five days per week, with approximately 400 employees.

Flat plate steel is formed and welded into cylinders; hemispherical sections are formed and welded to form vessel heads. Internals such as pumps, fuel gauges, etc., are installed in some units. X-raying and ultrasonic and pressure testing are conducted on the vessels.

Wastewater Discharges and Pretreatment Processes--

The bulk of the wastewater discharged is from vessel washwater and hydroblasting water; X-ray rinse water and sanitary wastewater contribute a minor volume. All wastewater discharges through a common sewer into the Presidents Island sewer. Compressor water is discharged directly to McKellar Lake.

Results--

Two consecutive 24-hour composite samples of the wastewater discharge, collected at twenty minute intervals, were obtained from a cleanout (M-89) prior to discharge into the city sewer from October 25 through 27, 1976. Flows were determined from daily MLG&W water meter readings less the volume of compressor cooling water discharged. However, two of the six compressor flowmeters were not working, and company personnel estimated the flow-through of these two compressors to be approximately the flow through either of the other two units. Therefore, discharge flows are estimates, not measurements.

Wastewater loads (Table LXV) were calculated from composite parameter concentrations and estimated flow. Flows determined the first sampling day were about twice the flow during the second day. This apparently is not unusual because of the large volumes of water used in hydroblasting or washing vessels. These operations do not occur each day.

Recent monthly flows at the facility based on the MLG&W water bills averaged about 280,000 gallons per day. This average is slightly greater than the flows determined during the sampling period; however, operations have been similar to those at the time of sampling for the past several months. The discharges determined during the sampling period should be considered representative of recent operations and not of full production capacity.

This discharger's wastewater is compatible with the contact stabilization process; the low concentrations and loads relegate it to a minor contributor status.

TABLE
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CBI NUCLEAR
MEMPHIS, TN
OCTOBER, 1976

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	WATER TEMP CENT	PH SU	BOD 5 DAY MG/L	RESIDUE TOT NFLT MG/L	COD HI LEVEL MG/L	CHROMIUM CR,TOT UG/L
M89	761025	1300	(C)	761026	1400	0.113			666.0<	130	194	50<
M89				761026	1245		16.0	8.4				
M89	761026	1400	(C)	761027	1400	0.031			666.0<	102	194	68
M89				761027	1400		19.0	7.8				

STATION	DATE	TIME		DATE	TIME	ZINC ZN,TOT UG/L	COPPER CU,TOT UG/L	LEAD PB,TOT UG/L	NICKEL NI,TOTAL UG/L	CADMIUM CD,TOT UG/L	SILVER AG,TOT UG/L
M89	761025	1300	(C)	761026	1400	230	135	80<	65	10<	20<
M89				761026	1245						
M89	761026	1400	(C)	761027	1400	193	142	80<	20	10<	66
M89				761027	1400						

********** LOADINGS **********

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY LB/D	RESIDUE TOT NFLT LB/D	COD HI LEVEL LB/D	CHROMIUM CR,TOT LB/D	ZINC ZN,TOT LB/D
M89	761025	1300	(C)	761026	1400	0.113	628.1<	123	183	0	0
M89	761026	1400	(C)	761027	1400	0.031	172.3<	26	50	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT LB/D	LEAD PB,TOT LB/D	NICKEL NI,TOTAL LB/D	CADMIUM CD,TOT LB/D	SILVER AG,TOT LB/D
M89	761025	1300	(C)	761026	1400	0.113	0	0	0	0	0
M89	761026	1400	(C)	761027	1400	0.031	0	0	0	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	BOD 5 DAY KG/D	RESIDUE TOT NFLT KG/D	COD HI LEVEL KG/D	CHROMIUM CR,TOT KG/D	ZINC ZN,TOT KG/D
M89	761025	1300	(C)	761026	1400	0.113	284.9<	56	83	0	0
M89	761026	1400	(C)	761027	1400	0.031	78.2<	12	23	0	0

STATION	DATE	TIME		DATE	TIME	CONDUIT FLOW MGD	COPPER CU,TOT KG/D	LEAD PB,TOT KG/D	NICKEL NI,TOTAL KG/D	CADMIUM CD,TOT KG/D	SILVER AG,TOT KG/D
M89	761025	1300	(C)	761026	1400	0.113	0	0	0	0	0
M89	761026	1400	(C)	761027	1400	0.031	0	0	0	0	0

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APPENDICES

APPENDIX A

LABORATORY DATA

APPENDIX A
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

INFLUENT

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	BOD5 mg/l	COD mg/l	TOTAL SOLIDS mg/l	TOTAL VOLATILE SOLIDS mg/l	TOTAL SUSPENDED SOLIDS mg/l	TOTAL VOLATILE SUSPENDED SOLIDS mg/l	TKN-N mg/l	NH3-N mg/l	NO3-NO2-N mg/l	TOTAL PHOSPHORUS mg/l	Pb ug/l	Cr ug/l	Cu ug/l	Cd ug/l	Zn ug/l	OIL & GREASE mg/l	PHENOLS mg/l
1214	Max I	10	19	76	0940	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	38	—
1215		10	18/19	76	24-hr. Comp.	505	928	726	262	247	160	33.7	17.5	0.05	24	100	60	115	<10	260	—	—
1278		10	19/20	76	24-hr. Comp.	620	996	800	400	262	182	33	17.5	0.01	15.5	145	121	116	<10	263	—	—
1292		10	20	76	1100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	27	—
1314		10	20/21	76	24-hr Comp	540	1114	918	497	282	208	37.3	15	0.01	12.2	125	<50	92	<10	241	—	—
1315		10	21	76		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1318		10	21	76	0850	>1200	2442	1242	903	803	750	21.5	5.0	0.01	10.9	<80	<50	83	<10	166	60.6	—
1390		10	21/22	76	24-hr Comp	673	1212	992	544	480	347	31	5.0	0.01	11.3	215	53	111	<10	256	—	—
1391		10	22	76	0930	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18	540
1392		10	22/23	76	24-hr Comp	684	1083	1010	454	450	331	36.2	9.0	0.01	17.4	180	67	123	<10	309	—	—
1393		10	23	76	0930	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	600
1394		10	23/24	76	24-hr Comp	460	948	814	412	420	307	28.0	11	<0.01	18.8	140	<50	119	<10	248	—	—
1395		10	24	76	0930	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	27	400
1396		10	24/25	76	24-hr Comp.	250	605	928	428	547	240	24.4	7.5	0.01	9.3	121	53	92	<10	237	—	—
1397		10	25	76	0810	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34	<10

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

EFFLUENT

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	BOD_5 mg/l	COD mg/l	TOTAL SOLIDS mg/l	TOTAL VOLATILE SOLIDS mg/l	SUSPENDED SOLIDS mg/l	VOLATILE SUSPENDED SOLIDS mg/l	TKN-N mg/l	NH_3-N mg/l	NO_3-NO_2-N mg/l	TOTAL PHOSPHORUS mg/l	Pb ug/l	Cr ug/l	Cu ug/l	Cd ug/l	Zn ug/l	OIL & GREASE mg/l	TURBIDITY NTU	TURBIDITY @ 30 MIN NTU	PHENOLS mg/l		
1240	MAX E	10	18/19	76	24-hr Comp.	63	179	462	108	64	44	21.8	18.5	<0.01	17.2	<80	<50	31	<10	73	—	—	—	—		
1241		10	19	76	0940	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<5	—	—	—		
1265		10	19	76	1510	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19	—	—		
1276		10	20	76	0900	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32	25	—		
1277		10	19/20	76	24-hr Comp.	94	207	488	116	64	33	19.4	16.0	<0.01	19.2	85	<50	41	<10	70	—	—	—	—		
1293		10	20	76	1115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—	—	—		
1314		10	20	76	1400	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	70	—	—		
1316		10	20/21	76	24-hr Comp.	130	326	546	214	125	83	26.6	18.0	<0.01	9.6	<80	<50	50	<10	115	—	—	—	—		
1317		10	21	76		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
1324		10	21	76	0852	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21	—	—		
1398		10	21/22	76	24-hr Comp.	180	583	686	280	280	190	26.8	12.5	<0.01	8.9	180	<50	91	<10	175	—	—	—	—		
1399		10	22	76	1000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<5	—	—	<10		
1400		10	22/23	76	24-hr Comp.	270	769	924	472	480	337	32.0	13.2	<0.01	11.6	158	63	121	<10	276	—	—	—	—		
1401		10	23	76	0942	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19	—	—	<10		
1402		10	23/24	76	24-hr Comp.	300	798	802	344	356	256	32.3	16.0	<0.01	15.9	145	58	133	<10	301	—	—	—	—		
1403		10	24	76	0950	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	—	—	<10		
1404		10	24/25	76	24-hr Comp.	120	279	376	134	100	60	12.4	5.5	<0.01	7.4	<80	<50	60	<10	131	—	—	—	—		
1405		10	25	76	0825	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—	—	<10		

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

CONTACT BASINS

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	TOTAL SUSPENDED SOLIDS mg/l	VOLATILE SUSPENDED SOLIDS mg/l	% SOLIDS V/V Centrifuge	SETTLOMETER 5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 min	120 min	COMMENTS
1193	S-2	10	18	76	1115	2,067	1,500	6.0	85	60	53	48	44	40	37	35	31	—	Supernatant TURBID with Light Colored Floc
1195		10	18	76	1600	1,500	1,033	5.0	60	50	45	41	40	37	30	—	—	—	TURBID Supernatant
1242		10	19	76	1030	2,300	1,667	7.0	93	85	74	64	57	53	51	47	42	31	FLUFFY Light grey colored solids - Super Turbid
1261		10	19	76	1455	—	—	4.5	90	85	80	79	78	77	74	70	70	—	TURBID Supernatant - FLUFFY Solids
1269		10	20	76	0945	1,733	1,167	6.5	63	52	48	44	41	38	35	30	28	18	TURBID Supernatant - Norise of Solids @ 2hrs.
1294		10	20	76	1330	2,000	1,333	5.0	80	67	60	55	50	48	44	40	36	—	31 @ 90 min TURBID Supernatant
1359		10	21	76	0940	2,915	2,238	7.5	95	90	87	75	70	65	60	55	50	—	Supernatant clear @ 5 min - Turbid @ 30 min
1389		10	23	76	1000	2,933	2,333	—	90	85	85	78	—	70	—	60	43	35	— — — — — — — —
1194	N-2	10	18	76	1116	1,584	1,084	4.0	55	40	37	32	30	30	26	25	23	—	Supernatant Turbid - Light colored Floc
1202		10	18	76	1457	1,300	900	5.0	57	45	39	35	34	31	29	—	—	—	Turbid Supernatant
1245		10	19	76	1030	2,029	1,488	6.0	90	75	66	59	54	49	46	41	38	27	Flaffy Light Grey solids - Supernatant Turbid
1262		10	19	76	1455	—	—	4.5	90	82	80	78	75	74	70	70	65	—	Turbid Supernatant - Flaffy Solids
1270		10	20	76	0845	1,467	1,033	5.0	58	48	45	41	40	37	35	32	30	20	Turbid Supernatant - Norise of Solids @ 2hrs
1295		10	20	76	1330	1,800	1,200	5.2	81	72	67	61	59	54	50	44	40	—	35 @ 90 min Turbid Supernatant
1354		10	21	76	0945	2,467	1,933	7.0	95	94	73	65	60	57	53	48	45	—	Turbid Supernatant - FLUFFY Solids
1389		10	23	76	1005	2,733	2,100	—	85	75	70	60	—	55	—	50	53	30	— — — — — — — —

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

REAERATION BASINS

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	TOTAL SUSPENDED SOLIDS mg/l	VOLATILE SUSPENDED SOLIDS mg/l	% SOLIDS V/V CENTRIFUGE
1196	S-6	10	18	76	1455	5,550	4,050	20
1254		10	19	76	1100	6,150	4,500	17
1280		10	20	76	0945	6,000	4,400	18
1297		10	20	76	1340	6,600	4,900	20
1361		10	21	76	0920	7,700	5,850	19
1279	S-4	10	20	76	0940	6,016	4,450	20
1296		10	20	76	1342	6,600	4,967	18
1360		10	21	76	0917	8,233	6,300	20
1203	N-6	10	18	76	1450	4,600	3,550	17
1257		10	19	76	1115	5,650	4,300	18
1288		10	20	76	0945	5,900	4,400	19
1300		10	20	76	1330	5,800	4,350	20
1355		10	21	76	0938	7,050	5,600	18
1208	N-10	10	18	76	1433	4,400	3,300	15
1258		10	19	76	1112	5,300	4,050	17
1289		10	20	76	1003	5,500	4,100	19
1301		10	20	76	1330	5,700	4,250	20
1356		10	21	76	0935	6,450	4,950	17

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

DIGESTERS

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	TOTAL SUSPENDED SOLIDS mg/l	VOLATILE SUSPENDED SOLIDS mg/l	% SOLIDS V/V CENTRIFUGE
1197	S-12	10	18	76	1430	6,550	3,850	20
1255		10	19	76	1103	6,700	3,950	15
1281		10	20	76	0945	6,300	3,250	15
1298		10	20	76	1337	6,450	3,850	15
1362		10	21	76	0925	6,350	3,900	13
1198	S-13	10	18	76	1442	6,300	3,900	20
1256		10	19	76	1105	6,500	3,950	15
1282		10	20	76	0947	6,650	4,050	17
1299		10	20	76	1335	6,600	3,900	17
1363		10	21	76	0922	6,300	3,800	14.5
1204	N-12	10	18	76	1445	5,000	3,150	14
1259		10	19	76	1110	5,050	3,400	13
1290		10	20	76	0953	5,100	3,400	15
1302		10	20	76	1330	5,300	3,350	14
1357		10	21	76	0930	4,900	3,150	12
1205	N-13	10	18	76	1440	4,950	3,250	16
1260		10	19	76	1108	5,200	3,600	14
1291		10	20	76	0957	5,300	3,750	15
1303		10	20	76	1330	5,150	3,650	13
1358		10	21	76	0933	4,800	3,250	12

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

RETURN SLUDGE

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	TOTAL SUSPENDED SOLIDS mg/l	VOLATILE SUSPENDED SOLIDS mg/l	% SOLIDS V/V CENTRIFUGE
1199	2RS-S	10	18	76	1412	5,625	4,375	20
1243		10	19	76	1015	6,750	5,050	18
1283		10	20	76	1000	7,750	5,900	15
1304		10	20	76	1343	7,250	5,550	23
1325		10	21	76	0907	8,800	6,850	26
1200	3RS-S	10	18	76	1410	6,000	4,750	23
1244		10	19	76	1015	6,450	5,000	18
1284		10	20	76	0955	7,700	6,000	23
1305		10	20	76	1340	7,300	5,600	22
1326		10	21	76	0903	9,000	6,100	26
1201	4RS-S	10	18	76	1415	5,525	4,200	20
1248		10	19	76	1015	5,250	3,900	15
1285		10	20	76	0950	7,550	5,700	26
1306		10	20	76	1332	7,900	5,800	23
1327		10	21	76	0959	7,500	5,600	25
1206	2RS-N	10	18	76	1417	4,175	3,125	17
1246		10	19	76	1025	4,350	3,200	14
1286		10	20	76	0945	6,450	4,650	24
1307		10	20	76	1347	6,150	4,550	22
1328		10	21	76	0944	4,600	3,350	16

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

RETURN SLUDGE & CLARIFIERS

O&M SAD #	STATION	MONTH	DAY	YEAR	TIME	TOTAL SUSPENDED SOLIDS MG/L	VOLATILE SUSPENDED SOLIDS MG/L	% SOLIDS V/V CENTRIFUGE	TURBIDITY NTU	TURBIDITY @ 30 MIN NTU
1207	3RS-N	10	18	76	1420	4,400	3,250	18	—	—
1247		10	19	76	1020	5,550	4,050	18	—	—
1297		10	20	76	1005	5,600	4,150	26	—	—
1308		10	20	76	1353	6,000	4,400	20	—	—
1329		10	21	76	0846	5,500	3950	18	—	—
1213	C-2S	10	18	76	1545	—	—	—	44	14
1249		10	19	76	1005	—	—	—	14	12
1266		10	19	76	1513	—	—	—	10	—
1271		10	20	76	0900	—	—	—	27	22
1311		10	20	76	1342	—	—	—	43	—
1319		10	21	76	0910	—	—	—	17	—
1212	C-3S	10	18	76	1537	—	—	—	68	15
1250		10	19	76	1005	—	—	—	14	12
1267		10	19	76	1515	—	—	—	13	—
1272		10	20	76	0900	—	—	—	28	23
1312		10	20	76	1341	—	—	—	15	—
1320		10	21	76	0858	—	—	—	61	—

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

CLARIFIERS

O+M SAD #	STATION	MONTH	DAY	YEAR	TIME	TURBIDITY NTU	TURBIDITY @ 30 min NTU
1210	C-4S	10	18	76	1530	11	7
1251		10	19	76	1005	21	17
1268		10	19	76	1519	15	—
1273		10	20	76	0900	22	20
1313		10	20	76	1330	15	—
1321		10	21	76	0856	17	—
1209	C-2N	10	18	76	1517	11	7
1252		10	19	76	1025	20	15
1263		10	19	76	1505	14	—
1274		10	20	76	0900	24	20
1309		10	20	76	1345	15	—
1322		10	21	76	0840	12	—
1211	C-3N	10	18	76	1510	9	8
1253		10	19	76	1020	26	17
1264		10	19	76	1507	14	—
1275		10	20	76	0900	38	32
1310		10	20	76	1352	270	—
1323		10	21	76	0848	11	—

APPENDIX A (CONTINUED)
INFLUENT COD
T. E. MAXSON WTP

DATE	TIME	FLOW(MGD)	COD(MG/L)	LOAD(#/DAY)
10/18	900	27.4	720.	164531.
10/18	1000	31.6	729.	192124.
10/18	1100	35.5	810.	239817.
10/18	1200	38.5	824.	264578.
10/18	1300	40.9	960.	327462.
10/18	1400	43.7	898.	327283.
10/18	1500	43.4	927.	335533.
10/18	1600	45.2	979.	369052.
10/18	1700	44.9	786.	294330.
10/18	1800	45.3	773.	292041.
10/18	1900	44.6	765.	284552.
10/18	2000	45.2	839.	316276.
10/18	2100	45.1	810.	304669.
10/18	2200	44.6	825.	306870.
10/18	2300	44.7	755.	281462.
10/18	2400	45.1	777.	292256.
10/19	100	45.7	814.	310246.
10/19	200	45.6	881.	335048.
10/19	300	45.9	888.	339932.
10/19	400	45.5	1160.	440185.
10/19	500	44.6	1150.	427759.
10/19	600	44.4	1180.	436949.
10/19	700	40.5	1120.	378302.
10/19	800	34.6	873.	251916.
AVERAGE		42.2	885.	313048.

APPENDIX A (CONTINUED)
INFLUENT COD
T. E. MAXSON WTP

DATE	TIME	FLOW(MGD)	COD(MG/L)	LOAD(#/DAY)
10/20	900	40.0	932.	310915.
10/20	1000	40.0	684.	228182.
10/20	1100	40.1	783.	261862.
10/20	1200	42.4	964.	340886.
10/20	1300	42.0	1080.	378302.
10/20	1400	54.8	1300.	594142.
10/20	1500	54.5	869.	394987.
10/20	1600	48.3	972.	391543.
10/20	1700	50.1	956.	399449.
10/20	1800	43.8	892.	325840.
10/20	1900	45.0	1070.	401571.
10/20	2000	54.4	1240.	562582.
10/20	2100	46.3	980.	378419.
10/20	2200	43.6	1010.	367260.
10/20	2300	43.4	1010.	365575.
10/20	2400	44.1	1260.	463420.
10/21	100	44.4	980.	362890.
10/21	200	44.1	924.	339842.
10/21	300	43.6	932.	338898.
10/21	400	42.8	932.	332679.
10/21	500	40.6	741.	250906.
10/21	600	35.5	629.	186228.
10/21	700	31.8	2480.	657726.
10/21	800	31.6	1910.	506555.
AVERAGE		43.6	1064.	380860.

APPENDIX A (CONTINUED)
INFLUENT COD
T. E. MAXSON WTP

DATE	TIME	FLOW(MGD)	COD(MG/L)	LOAD(#/DAY)
10/22	900	30.0	421.	105334.
10/22	1000	32.4	306.	82686.
10/22	1100	35.9	313.	93714.
10/22	1200	43.2	774.	278863.
10/22	1300	43.5	595.	215860.
10/22	1400	43.8	635.	231960.
10/22	1500	44.1	747.	274742.
10/22	1600	45.8	509.	194424.
10/22	1700	38.0	1120.	354950.
10/22	1800	31.8	1370.	363340.
10/22	1900	31.8	1250.	331515.
10/22	2000	32.7	1220.	332716.
10/22	2100	39.1	920.	300006.
10/22	2200	32.6	1448.	393688.
10/22	2300	39.6	1038.	342814.
10/22	2400	41.5	1171.	405295.
10/23	100	32.8	1045.	285862.
10/23	200	32.4	1076.	291293.
10/23	300	32.8	1276.	349052.
10/23	400	31.3	1052.	274616.
10/23	500	28.3	807.	190470.
10/23	600	24.4	1237.	251724.
10/23	700	23.7	721.	142511.
10/23	800	22.2	483.	89426.
AVERAGE		34.7	897.	257369.

APPENDIX B

DISSOLVED OXYGEN CONCENTRATIONS

APPENDIX B

T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

STATION	DATE	TEMP CENT	DO-MG/L 1 FT	DO-MG/L 6 FT	DO-MG/L 11 FT	DO-MG/L 12 FT	DO-MG/L 15 FT	DO-MG/L 16 FT
NORTH BASIN								
N-1A	761018	25.0	0.1	0.0		0.0		
N-1A	761019	24.5	0.2	0.2		0.1		
N-1A	761020	24.0	0.2	0.1				
N-1A	761023	25.0	0.3		0.1			
N-1B	761018	25.0	0.1	0.0		0.0		
N-1B	761023	25.0	0.3		0.0			
N-1C	761018	25.0	0.2	0.1		0.2		
N-1C	761019	25.0	0.2	0.2		0.2		
N-1C	761020	24.0	3.4	3.4		3.4		
N-1C	761023	25.0	0.2		0.0			
N-2A	761018	25.0	0.5*					
N-2A	761018	25.0	0.6	0.4		0.0		
N-2A	761020	24.0	4.8	5.2		4.2		
N-2A	761023	25.0	2.2		1.8			
N-2B	761018	25.0	0.0	0.0				
N-2B	761023	25.0	1.2		0.7			
N-2C	761018	25.0	0.2	0.1		0.2		
N-2C	761023	25.0	0.1		0.0			
N-3A	761023	25.5	0.2		0.1			
N-3B	761023	25.5	0.3		0.1			
N-3C	761023	25.5	0.2		0.0			
N-4A	761023	25.5	0.4		0.1			
N-4B	761023	25.5	0.3		0.2			
N-4C	761023	25.5	0.2		0.0			
N-5A	761018	25.0	0.2	0.1		0.0		
N-5A	761019	25.5	0.1	0.0				
N-5A	761020	25.0	0.2					
N-5A	761023	25.0	1.3		0.2			
N-5B	761018	26.0	0.5	0.4		0.2		
N-5B	761023	26.0	3.3		3.2			
N-5C	761018	26.0	1.2	1.0		1.0		0.6
N-5C	761019		0.1	0.0				
N-5C	761023	26.0	4.6		4.2			
N-6A	761018	26.0	3.3	3.3		3.0		2.7
N-6A	761019	26.0	0.6	0.5		0.2		
N-6A	761020	25.0	4.4	4.6		4.4		
N-6A	761023	25.0	7.0					
N-6A	761023	26.0			5.4			
N-6B	761018	26.0	2.4	2.6		2.2		2.0
N-6B	761023	24.5	6.3		5.6			
N-6C	761023	26.0	5.2		5.0			
N-9A	761018	25.0	0.3	0.0				
N-9A	761019	26.0	0.0	0.0				
N-9A	761020	25.0	0.1					
N-9C	761018	25.0	0.5	0.0				
N-9C	761020	25.0	0.5	0.2				

APPENDIX B

T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

STATION	DATE	TEMP CENT	DO-MG/L 1 FT	DO-MG/L 6 FT	DO-MG/L 11 FT	DO-MG/L 12 FT	DO-MG/L 15 FT	DO-MG/L 16 FT
NORTH BASIN								
N-10A	761018	25.0	1.6*					
N-10A	761018	25.0	1.6	1.5		1.2		0.3
N-10A	761019	25.0	0.4	0.4		0.0		
N-10A	761020	24.0	6.2	3.8		3.1		
N-11A	761018	26.0	2.0*					
N-11A	761018	26.0	1.8	1.7		1.6		1.4
N-11A	761019	25.5	0.4	0.4		0.4		
N-11A	761020	25.0	3.2	3.2		3.1		
N-11A	761023	23.0	8.4		8.4			
N-11B	761018	26.5	2.0	2.0		1.9		1.9
N-11B	761023	22.0	8.9		8.9			
N-11C	761023	23.0	8.6		8.6			
N-12A	761019	26.0	1.3	1.0		1.1		
N-12A	761020	25.0	3.2	3.1		3.1		
N-12A	761023	23.0	8.1		8.1			
N-12B	761018	26.5	2.4	2.3		2.2		2.2
N-12B	761023	23.0	8.2		8.2			
N-12C	761023	23.0	8.3		8.2			
N-13A	761019	24.0	0.1					
N-13A	761020	24.0	3.5	3.4		3.4		
N-13A	761023	23.0	2.4		2.2			
N-13B	761018	23.5	2.9	2.9		2.8	2.7	
N-13B	761023	23.0	2.4		2.2			
N-13C	761023	23.0	2.6		2.4			
N-14A	761018	24.0	0.4*					
N-14A	761018	24.0	0.6	0.4		0.2		0.0
N-14A	761019	24.5	0.3	0.1				
N-14A	761020	24.0	3.1	3.1		3.2		
N-14A	761023	23.0	0.6		0.4			
N-14B	761023	23.0	1.0		0.9			
N-14C	761018	24.0	1.0	0.9		0.9		0.8
N-14C	761019	24.5	0.2					
N-14C	761023	23.0	1.8		1.6			

APPENDIX B

T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

STATION	DATE	TEMP CENT	DO-MG/L 1 FT	DO-MG/L 6 FT	DO-MG/L 11 FT	DO-MG/L 12 FT	DO-MG/L 15 FT	DO-MG/L 16 FT
SOUTH BASIN								
S-1A	761018	25.0	0.4	0.3		0.2		
S-1A	761019	25.0	0.2	0.1		0.1		
S-1A	761020	24.0	0.2	0.1				
S-1A	761023	25.0	0.6		0.2			
S-1B	761018	25.0	0.2	0.1		0.1		
S-1B	761023	25.0	1.4		1.1			
S-1C	761018	25.0	0.4	0.2		0.2		
S-1C	761023	25.0	0.2		0.1			
S-2A	761018	25.0	0.3*					
S-2A	761018	25.0	0.3	0.2		0.1		
S-2A	761019	25.0	2.2	2.3		1.6		1.0
S-2A	761020	24.5	6.6	6.6		6.6		
S-2A	761023	25.0	0.9		0.2			
S-2B	761018	25.0	0.4	0.2		0.1		
S-2B	761023	25.0	1.4		1.0			
S-2C	761019	25.0	0.2	0.1		0.1		
S-2C	761020	24.0	3.3	3.0		2.2		
S-2C	761023	25.0	0.4		0.2			
S-3A	761020	25.0	0.1					
S-3A	761023	25.0	5.9					
S-3A	761023	26.0			1.9			
S-3B	761023	26.0	1.4		0.5			
S-3C	761020	25.5	0.4	0.5		0.2		
S-3C	761023	22.5	4.3					
S-3C	761023	25.5			0.2			
S-4A	761020	25.0	3.0	2.9		2.6		
S-4A	761023	26.0	5.8		2.7			
S-4B	761023	26.0	6.0		2.1			
S-4C	761023	26.0	6.1					
S-4C	761023	25.0			4.1			
S-5A	761018	25.0	0.2	0.2		0.0		
S-5A	761019	25.0	0.2	0.2				
S-5A	761020	25.0	0.1					
S-5A	761023	25.5	0.2					
S-5A	761023	26.0			0.0			
S-5B	761018	25.0	0.4	0.3		0.2		
S-5B	761023	26.0	0.2					
S-5B	761023	25.5			0.0			
S-5C	761018	25.0	0.8	0.8		0.4		
S-5C	761019	25.0	0.3	0.1				
S-5C	761023	25.0	0.1		0.0			
S-6A	761018	26.0	0.4*					
S-6A	761018	26.0	2.8	2.6		2.3		2.3
S-6A	761019	26.0	0.8	0.6		0.4		
S-6A	761020	25.0	2.6	2.5		2.0		
S-6A	761023	25.5	1.1		0.5			
S-6B	761018	26.0	2.8	2.7		2.4		1.6
S-6B	761023	25.5	1.8		1.3			
S-6C	761020	25.0	0.4	0.2		0.2		
S-6C	761023	26.0	3.1					
S-6C	761023	25.5			2.9			

APPENDIX B

T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

STATION	DATE	TEMP CENT	DO-MG/L 1 FT	DO-MG/L 6 FT	DO-MG/L 11 FT	DO-MG/L 12 FT	DO-MG/L 15 FT	DO-MG/L 16 FT
SOUTH BASIN								
S-7A	761023	25.5	0.6					
S-7A	761023	26.0			0.3			
S-7B	761023	25.5	0.4					
S-7B	761023	26.0			0.1			
S-7C	761023	25.5	0.2		0.0			
S-8A	761023	25.0	5.7					
S-8A	761023	26.0			1.2			
S-8B	761023	25.0	6.1					
S-8B	761023	26.0			2.3			
S-8C	761023	26.0	3.5		3.0			
S-11A	761018	23.0	5.6					
S-11A	761018	23.0	6.7	6.5		6.5	6.4	
S-11A	761019	22.5	8.2	8.1				
S-11A	761020	21.0	6.6	6.5		6.5		
S-11A	761023	20.0	6.2		6.3			
S-11B	761023	20.0	6.2		5.9			
S-11C	761023	20.0	6.6		6.5			
S-12A	761019	22.5	8.2					
S-12A	761020	21.0	7.0	6.8		6.8		
S-12A	761023	19.5	7.0		6.8			
S-12B	761023	19.5	6.5		6.3			
S-12C	761023	20.0	6.2					
S-12C	761023	19.5			6.2			
S-13A	761019	22.0	8.2	8.0		8.0		
S-13A	761020	21.0	7.4	7.5		7.5		
S-13A	761023	20.0	7.8		7.8			
S-13B	761023	19.5	7.9		7.9			
S-13C	761018	23.0	4.9	4.8		4.6	4.6	
S-13C	761023	19.5	8.1		7.9			
S-14A	761018	23.0	3.9	3.9		3.8	3.8	
S-14A	761020	21.0	7.7	7.6		7.6		
S-14A	761023	19.5	8.2		8.1			
S-14B	761023	19.5	7.9		7.7			
S-14C	761019	22.5	8.2					
S-14C	761023	19.5	7.4		7.3			

APPENDIX B

T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

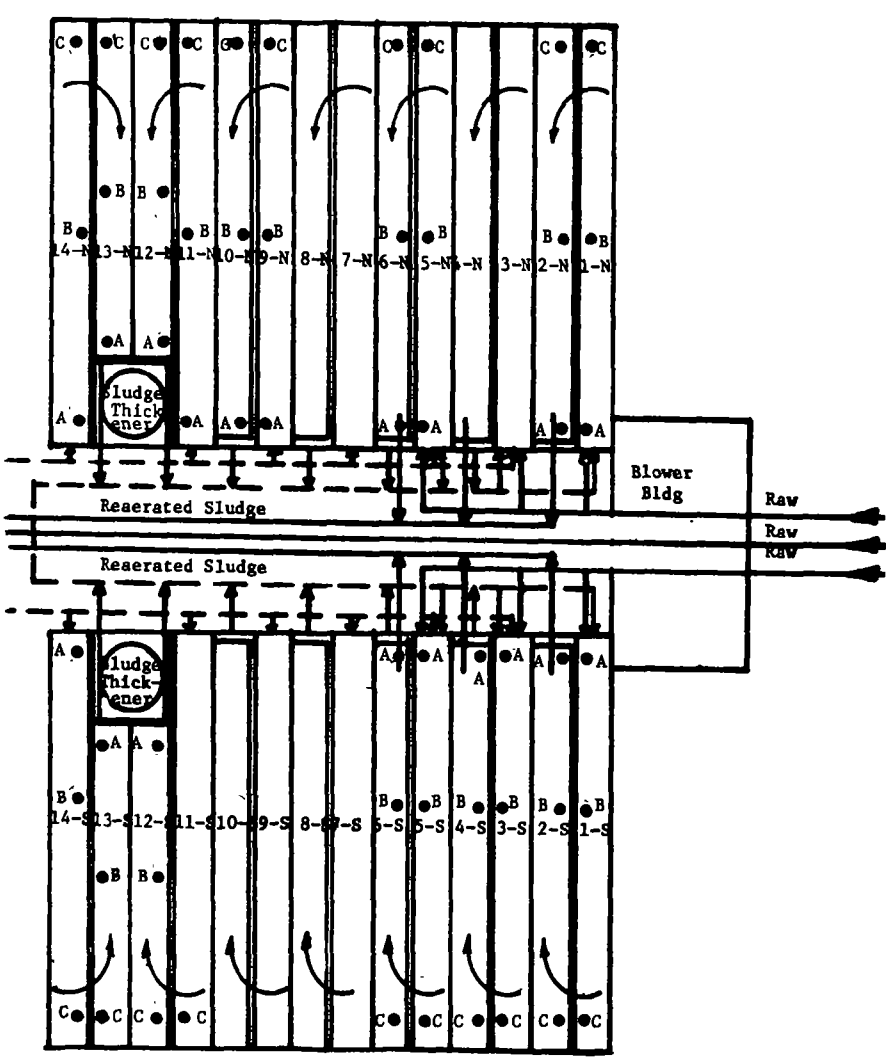
STATION	DATE	TEMP CENT	DO-MG/L 1 FT	DO-MG/L 6 FT	DO-MG/L 11 FT	DO-MG/L 12 FT	DO-MG/L 15 FT	DO-MG/L 16 FT
CLARIFIER								
C-2N	761018	24.5	0.2	0.0				
C-2N	761019	25.0	0.1					
C-3N	761018	24.0	0.4	0.2		0.2		
C-3N	761019	25.0	0.1					
C-2S	761018	24.5	0.4	0.2		0.0		
C-2S	761019	25.0	0.1					
C-3S	761018	24.5	0.3	0.2		0.0		
C-3S	761019	25.0	0.1					
C-4S	761018	24.5	0.2	0.0				
C-4S	761019	25.0	0.1					
INFLUENT								
I	761019	24.0	0.2	0.2				
I	761020	24.0	0.2					

* BASIN DO METER READING

TEMPERATURE ARE SAME FOR EACH STATION DEPTHS

DISSOLVED OXYGEN SAMPLE STATION LOCATIONS

T. E. MAXSON WTP



APPENDIX C

OXYGEN UPTAKE PROCEDURE

APPENDIX C

OXYGEN UPTAKE PROCEDURE [1/]

A. Apparatus

1. Electronic DO analyzer and bottle probe
2. Magnetic stirrer
3. Standard BOD bottles (3 or more)
4. Three wide mouth sampling containers (approx. 1 liter each)
5. DO titration assembly for instrument calibration
6. Graduated cylinder (250 ml)
7. Adapter for connecting two BOD bottles

B. Procedure

1. Collect samples of return sludge, aerator influent and final clarifier overflow. Aerate the return sludge sample promptly.
2. Mix the return sludge and measure that quantity for addition to a 300 ml BOD bottle that corresponds to the return sludge proportion of the plant aerator, i.e. for a 40% return sludge percentage in the plant the amount added to the test BOD bottle is:

$$\frac{300 \times .4}{1.0 + .4} = \frac{120}{1.4} = 86 \text{ ml}$$

3. Carefully add final clarifier overflow to fill the BOD bottle and to dilute the return sludge to the plant aerator mixed liquor solids concentration.
4. Connect the filled bottle and an empty BOD bottle with the BOD bottle adapter. Invert the combination and shake vigorously

while transferring the contents. Re-invert and shake again while returning the sample to the original test bottle. The sample should now be well mixed and have a high DO.

5. Insert a magnetic stirrer bar and the previously calibrated DO probe. Place on a magnetic stirrer and adjust agitation to maintain a good solids suspension.
6. Read sample temperature and DO at test time t=). Read and record the DO again at 1 minute intervals until at least three consistent readings for the change in DO per minute are obtained (ΔDO/min). Check for the final sample temperature. This approximates sludge activity in terms of oxygen use after stabilization of the sludge during aeration (unfed sludge activity).
7. Repeat steps 2 through 6 on a replicate sample of return sludge that has been diluted with aerator influent (fed mixture) rather than final effluent. This Δ DO/minute series reflects sludge activity after mixing with the new feed. The test results indicate the degree of sludge stabilization and the effect of the influent waste upon that sludge.

The load factor (LF), a derived figure, is helpful in evaluating sludge activity. It is calculated by dividing the DO/min of fed sludge by the DO/min of the unfed return sludge. The load ratio reflects the conditions at the beginning and end of aeration. Generally, a large

factor means abundant, acceptable feed under favorable conditions. A small LF means dilute feed, incipient toxicity, or unfavorable conditions. A negative LR indicates that something in the wastewater shocked or poisoned the "bugs".

1/ Taken from "Dissolved Oxygen Testing Procedure," F.J. Ludzack and script for slide tape XT-43 (Dissolved Oxygen Analysis - Activated Sludge Control Testing) prepared by F. J. Ludzack, NERC, Cincinnati.

APPENDIX D

GENERAL STUDY METHODS

APPENDIX D
GENERAL STUDY METHODS

Methods used to accomplish the stated objective included extensive sampling, physical measurements and daily observations. The WTP influent-effluent stations were sampled for seven consecutive 24-hour periods with ISCO Model 1392-X automatic samplers. Aliquots of sample were pumped at hourly intervals into individual refrigerated glass bottles which were composited proportional to flow at the end of each sampling period. Additional individual hourly influent samples, over three 24-hour periods were analyzed for COD.

Flows were determined from plant totalizers and hourly computer print outs.

All dissolved oxygen levels were determined using the YSI Model 51A dissolved oxygen meter.

An Analytical Measurements Model 30 WP cordless pH recorder was installed at the grit chamber to monitor influent pH through the sampling periods. Temperatures and pH were determined at other stations with thermometer and portable pH meter.

Depth of the secondary clarifier sludge blankets were determined daily using equipment suggested by Alfred W. West, EPA, NFIC, Cincinnati (10).

Sludge activity was determined by the oxygen uptake procedure presented in Appendix C.

A series of standard operational control tests were run daily:

(1) Settleability of mixed liquor suspended solids (MLSS) as determined by the settlometer test;

(2) Percent solids of the mixed liquor and return sludge determined by centrifuge;

(3) Suspended Solids and Volatile Suspended Solids analysis on the aeration basin mixed liquor and return sludge;

(4) Turbidity of each final clarifier effluent.

Visual observations of individual unit processes were recorded.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the Environmental Protection Agency.

APPENDIX E

INDUSTRIAL DISCHARGERS

NONCONNAH CREEK BASIN AND PRESIDENTS ISLAND BASIN

APPENDIX E

INDUSTRIAL DISCHARGERS
NONCONNAH CREEK BASIN AND PRESIDENTS ISLAND BASIN

NONCONNAH CREEK BASIN

AAA ALUMINUM
AIR PRODUCTS & CHEM., INC.
ALCO-GRAVURE, INC.
ALLIED MILLS (LAMAR)
ALTON BOXBOARD
ALUMA FORM, INC.
AMERICAN CAN CO.
AMERICAN FABRICATING ENG., INC.
AMERICAN MOLDED PLASTICS
AVIATION MAT'LS, INC.
W.M. BARR & CO., INC.
BEMIS CO., INC.
RUTH BERRY CO.
R.H. BOGLE CO., INC.
BOISE CASCADE
BOND MFG. CO.
BROYLES BAKERY
BRYCE CORP.
BUCKEYE CELLULOSE (S.PLT.)
BURK-HALL PAINT CO.
C.P. INDUSTRY, INC.
C & R CABINET
CARRIER EXCAVATION & FOUND.
CENTRAL SOYA
CHAPMAN CHEMICAL
CHECKS, INC.
CHEMICAL DYNAMICS, INC.
CHICKASAW BROOM MFG. CO.
CHRIS FIELDER CO., INC.
CLEO WRAP, INC.
CELVEPAK CORP.
COLE MANF. CO.
CONE MILLS, INC.
CONLEY FROG & SWITCH
CONSOLIDATED PACKAGING CORP.
COTTONWOOD CONVERTING CORP.
COYNE CYLINDER
CRAFT MACHINE, INC.
CREATIVE MFG. CO., INC.
CROWN ZELLERBACH
CUMMINS MID-SOUTH
DQF FOODS
D & W PLATING
THE DAVIS CO.
DELTA CHEMICAL CO.
DELTA REFINING CO.
DIXICO, INC.
DIXIE LITHO PLATE, INC.
DUNAVANT ENTERPRISES
ELY-WALKER
EZON PRODUCTS
FAMOUS PIES
FIBERFINE OF MEMPHIS
FISCHER STEEL CORP.
FORTIFIBER CORP.
FRITO-LAY
FRUEHAUF CORP.
GANT IND., INC.
GATES LUMBER
GEM, INC.
GENERAL CABLE CORP.
GENERAL METALS
GENERAL PRINTING INK CO.
G.D. GOODFELLOW CO., INC.
J.O. GOSHORN CO., INC.
GOULD, INC.
GRINNELL F. P. SYSTEMS
HANSON ENGRAVING
HARBIN MIX CO., INC.
HIGHS ICE CREAM
HOERNOR WALDORF CORP.
HOLIDAY PRESS
HOLIDAY WOODCRAFT
HUNTER FAN & VENTILATING
HUNT-WESSON FOODS, INC.
ILLINOIS CENTRAL/JOHNSTON YD.
IDEAL CHEMICAL CO.
INDUSTRIAL UNIFORM & LINEN SER.
INMONT CORP.
J & J QUICK MEATS
JIFFY PRINT
JOHN DEERE
JORDAN CO.
W.S. JORDAN SAND & GRAVEL CO.
KEATHLEY'S INC.
KEIFFER PKG. CO.
KELLOGG CO.
KIMCO AUTO PRODUCTS
KING JUICES
KLINKE BROS. ICE CREAM
KRAFT FOODS DIV. OF KRAFTCO
KROGER - FRISCO
LEHMAN ROBERTS
LILLY CO.
MCCLEARY, INC.
MEMPHIS DINETTES, INC.
MEMPHIS FURNITURE CO.
MEMPHIS PLYWOOD CORP.
MEMPHIS SMELTING & REFINING (FORMERLY MEMPHIS LEAD CO.)
MEMPHIS SASH & DOOR
MID-SOUTH REFRIGERATED WHSE.
MID-WEST FARMS
MSU PRESS
J.W. MOORE PRINTING CO., INC.
MOORE & SON
NATIONAL MFG. CO., INC.
NATIONAL STARCH & CHEM. CO.
NORTON MFG. CO.
NYLON NET CO.
ORGILL BROTHERS CO., INC.
OVERHEAD DOOR CO.
PERMANENT RECORDS CO.
PIONEER METAL SPEC.
PLASTIC COLORS UNLTD.
PLASTIC PIGMENTS (J & C COLOR IND.)
POLYMER INDUSTRIES, INC.
POLYPRODUCTS, INC.
PRECISION THERMOPLASTICS CORP. (THERMOPLASTICS CORP.)
PRO-SERV
QUALITY IND. UNIFORM SERV.
RADEFIELDS BAKERIES
RAINBO PHOTO SERVICE
RALSTON PURINA (MEAL DIV.)
RALSTON PURINA (PROTEIN DIV.)
REXHAM CORP.
RICHARDS MFG. CO.
RIVIANA FOODS, INC.
ST. JOE PAPER CO.
SCHLITZ BREWING CO.
SHANNON BROTHERS LUMBER CO.
SHASTA BEVERAGE CO.
D.G. SHELTER PRODUCTS
SHULTON, INC.
SINCLAIR & VALENTINE
J.M. SMUCKER CO.
SOUTHEAST INK & LACQUER
SOUTHERN COTTON OIL
SOUTHERN FABRICATORS, INC.
SOUTHERN LAMINATING
SOUTHERN METAL (PLAST. DIV.)
SOUTHERN PAPER PROD., INC.
SOUTHERN WOOD PARTS, INC.
SPECIALITIES, INC.
STANDARD BRAKE SHOE & FOUND.
SPECTRUM CEREMICS
J. STRICKLAND & CO.
STUCK, INC.
STYRO-FLORAL PRODUCTS, INC.
TENN. FABRICATING CO.
TENSION ENVELOPE CO.
THORNTON'S FLAV-O-RICH DONUTS
TRI-STATE COMMUNICATIONS
TRI-STATE IND. (GLASGOW GRAVEL)
UNIFORM CORP.
UNITED PAINT CO.
USS AGRI. CHEM. DIV.
VALLEY PRODUCTS CO.
VICO DIESEL
WAR BROOKS, INC.
WATKINS PRODUCTS, INC.
WELLS LAMONT
WESTERN PAPER
WHITE STONE CO.

APPENDIX E (CONT'D)

INDUSTRIAL DISCHARGERS
NONCONNAH CREEK BASIN AND PRESIDENTS ISLAND BASIN

PRESIDENTS ISLAND BASIN

AMERICO INC.
ANDERSON CHEMICAL CO.
ARMCO STEEL CORP.
ARMOUR FOOD CO.
ARROW TRAILERS, INC.
BELL-MEMPHIS, INC.
BENGAL WIRE
BLOCK DRUG CO.
CARGILL, INC.
CARGILL, INC. WET CORN MILL PLANT
CBI NUCLEAR
CHEMICAL SPECIALTIES
CONSTRUCTION PRECAST CONCRETE
DIXIE MILLS COMPANY
DIXIE PORTLAND FLOUR MILLS, INC.
FAITH MEMPHIS PLATING CO.
FEATHERLITE CORPORATION
GENERAL ELEC. MPHS. LAMP PLANT
HENDER'S BOILER & TANK CO.
LILLY INDUSTRIAL COATING, INC.
MEMPHIS BUTCHERS
MEMPHIS SHEET METAL WORKS, INC.
MEMPHIS WIRE & IRON WORKS
MID-AMERICA INDUSTRIES, INC.
MID-SOUTH METAL TREATING
MID-SOUTH PLATING CO.
MILLER TRANSPORTERS, INC.
NAT BURING
NATIONAL ALFALFA DEHY & MILLING CO.
NATIONAL BEDDING & FURNITURE
NATIONAL DISTILLERS PRODUCTS
PIPER STEEL PROCESSING
PORTEC, INC.
PRIMARY STEEL, INC.
REES MEMPHIS, INC.
RICHARDSON INK CO.
ROYAL CROWN BOTTLING CO.
SHELTON TRUCK & TRAILER, INC.
SPEAS CO.
SYTHAX CORP.
THERMO-PAK BOILERS, INC.
TROJAN LUGGAGE CO.
UNARCO COMMERCIAL PRODUCTS
WESTERN TAR PRODUCTS CORP.
WILLIAMS MACHINE WORKS

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