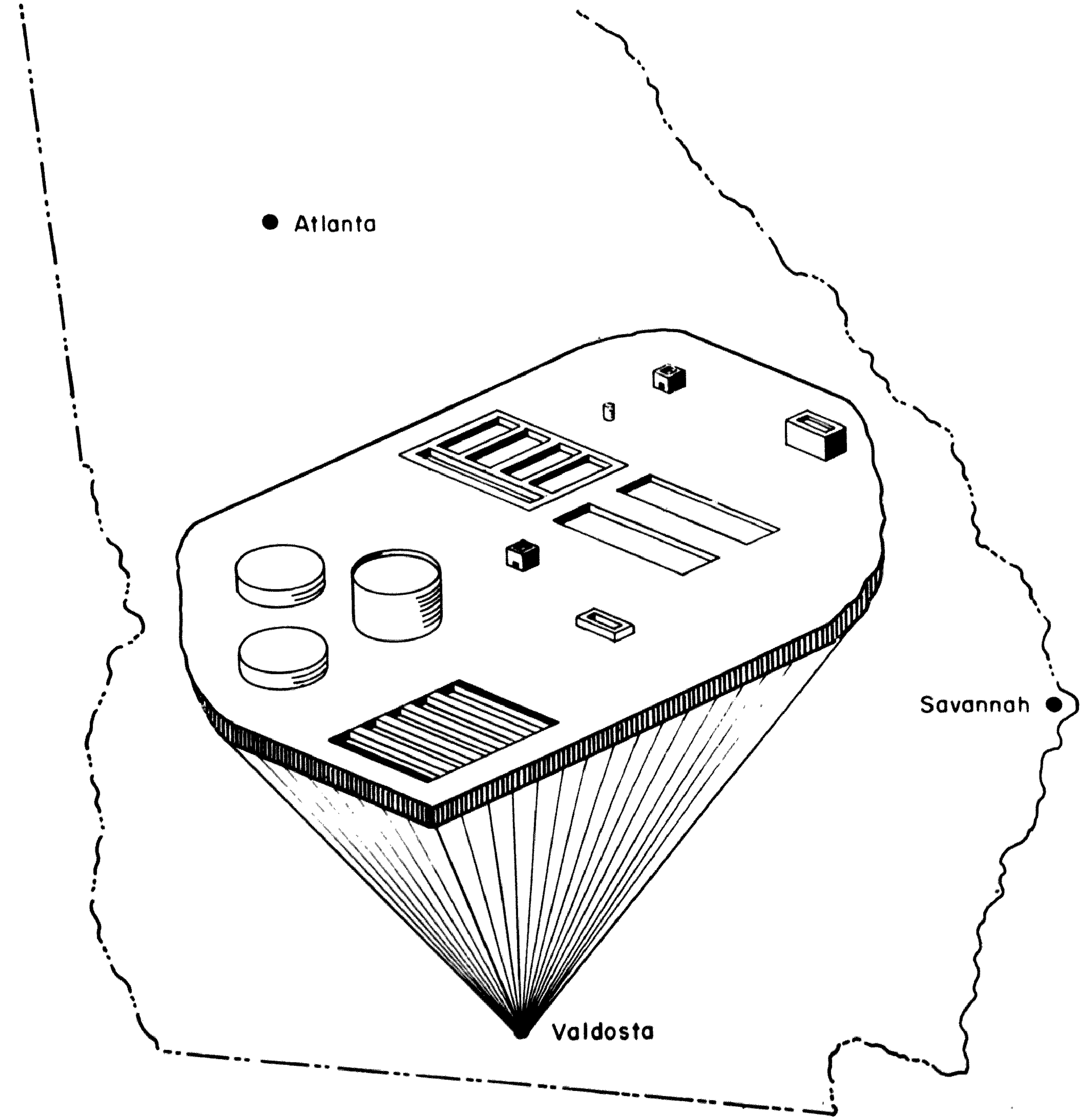
OPERATIONS AND MAINTENANCE STUDY
VALDOSTA, GEORGIA SEWAGE TREATMENT PLANT



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Enviromental Protection Agency
Surveillance and Analysis Division
Athens, Georgia

The planning and operation of this project was carried out under the supervision of Mr. B. H. Adams, Chief, Engineering Services Branch

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INTRODUCTION

This report contains the Environmental Protection Agency's evaluation of the operation and maintenance at the modified activated sludge plant serving Valdosta, Georgia. The operation and maintenance problems associated with municipal wastewater treatment facilities are recognized as a "weak link" in the drive for cleaner waters. In response to this problem, the Environmental Protection Agency (EPA) is initiating a program which will provide technical advice and assistance to help Federally funded municipalities achieve the maximum efficiency for their waste treatment investment. The report lists the operation and main-enance problems existing at the plant and makes recommendations for correcting problems and deficiencies.

The general study request originated at EPA headquarters with the specific request from EPA's Regional Office in Atlanta. The study was organized and conducted during September 19 - October 1, 1971, by EPA's Surveillance and Analysis Division, Athens, Georgia. Objectives of the study were to:

- determine influent and effluent waste characteristics;
- determine treatment efficiencies of each treatment unit -- grit chamber, aeration basin, clarifier, chlorination chamber and sludge digestion;
- determine effect of effluent upon the receiving stream, and
- suggest methods which would enhance plant operation and efficiency.

Acknowledgment is gratefully extended to Valdosta and Lowndes County personnel for their assistance in planning and conducting this study.

SUMMARY AND CONCLUSIONS

Waste treatment facilities serving the City of Valdosta, Georgia, consist of a five million gallon per day (MGD) activated sludge plant and a 22-acre oxidation pond. Operation and maintenance of the waste treatment facilities are the responsibility of the Valdosta Department of Water and Sewage.

The sewage treatment plant is a modification of the conventional activated sludge process -- it has no primary sedimentation. The treatment plant was constructed in 1949 as a primary facility and upgraded to the present system in July 1965. The oxidation pond was constructed in March 1967. Both facilities were partially funded with Public Law (PL) 660 grant funds.

The study was conducted during a period of hot, dry weather at which time the flow into the plant averaged 3.6 MGD. However, plant records indicate that wet weather infiltration increases plant flow by as much as 35 percent. The influent contains industrial wastes, municipal wastes, and discharges from local septic tank cleaning services.

The plant is operating below the design capability of an activated sludge plant -- 95 percent removal for total suspended solids and 90 percent for five-day Biochemical Oxygen Demand. The following data indicate the efficiency of plant operation prior to chlorination:

Parameter	Influent (mg/l)	Influent (lbs/day)	Effluent (mg/l)	Effluent (lbs/day)	Percent Removal
Biochemical Oxygen Demand (BOD)	202	6,060	50	1,500	75
Chemical Oxygen Demand (COD)	832	25,000	165	4,960	80
Solids, Settleable (ml/l)	9.6	--	0.7	--	93
Solids, Suspended	517	15,500	67	2,010	87
Solids, Volatile	438	13,200	46	1,380	89
Total Nitrogen-N	17.84	536	10.2	306	43
Total Phosphorus-P	10.37	312	6.9	207	34
Flow (MGD)	3.6		3.6		

Chlorine is used only for the disinfection of the effluent. Plant records indicate that normal chlorine usage averages 6,000 pounds per month; however, during the study, chlorine usage averaged 400 pounds per day or twice the amount normally used. Chlorine produced excellent disinfection and chemical treatment of the effluent. The BOD_5 reduction after chlorination was not determined from chemical analyses because of inaccessibility of sampling location. However, assuming a chemical reduction of 2 mg/l of BOD_5 for each mg/l of chlorine added, the total plant BOD_5 reduction calculated at the discharge point into Sugar Creek was 88 percent.

In general, operation and maintenance problems at the plant are caused by the lack of equipment, inadequately designed units, and a manpower shortage. The lack of operating funds and support from city officials also contribute to poor operation and maintenance. Improvement of the operation and maintenance program will significantly improve the overall plant efficiency.

The majority of the operational problems occur within the aeration basin and sludge digestion system. Probable causes for poor operation and "bulking" within the aeration basin are:

- Insufficient air to maintain a proper oxygen level;
- Inadequate detention time;
- Shock influent loads, and
- Insufficient control of return sludge

Corrective maintenance is needed in every major treatment unit. The plant's flow recording system needs replacing. The drive mechanism for conveying grit to the center of the grit chamber is inoperative. Aeration basin airlines and diffuser heads are clogged and the sprinkler system is partially plugged and ineffective. The sedimentation tank weirs leak, are not level, and need more frequent maintenance. The anaerobic digester boilers are approximately 21 years old and need to be repaired or replaced. The digester heaters break down often and stay down for long periods of time. The lines carrying digester gas to the flame traps are clogged. The grounds are not properly maintained because of dependence on another city department which has proven unsatisfactory.

Correction of the grit chamber maintenance problem, pretreatment for certain industrial discharges and the addition of primary sedimentation will significantly reduce the solids and organic load to the aeration basin and enhance digester operation.

Compounding the plant's operation and maintenance deficiencies are inherent engineering design problems that need immediate correction. A serious problem is the lack of control over sludge returned to the aeration basin. While sludge is wasted from the sedimentation tanks to the digesters, sludge cannot be recirculated to the aeration basin; there may be a three-hour period when no activated sludge is mixed with the influent sewage. There are no facilities for sampling return sludge and wasted sludge, nor is there equipment for metering return sludge to maintain a constant ratio of influent waste to return sludge.

Other treatment unit design inadequacies affecting plant operation are:

- The influent pipe to the Parshall flume is too close to the sedimentation tanks to permit free flow through the flume during high flows.
- Additional weir length was not added to the primary clarifiers when they were converted to secondary clarifiers and weir length is inadequate to accommodate the activated sludge process. At the present discharge rate of 20,000 gallons per day per foot of weir, the clarifiers exceed the recommended level of 15,000 gallons per day per foot of weir.
- Digester capacity is not adequate to handle the waste sludge from the activated sludge process.
- The aeration basin air supply is inadequate for the influent organic waste load and occasional recirculation of septic sludge. Based on the average daily flow during the study period (3.6 MGD) and the design sludge return of 35 percent, the theoretical

retention time in the aeration basin is 9.03 hours; however, the poor sludge age indicate that the retention period is insufficient.

- Provisions were not made for removing accumulated solids from the chlorine contact chamber.

There are seven employees of the Department of Water and Sewage directly involved in the operation and maintenance of Valdosta's waste treatment facilities. According to operational guidelines from EPA headquarters, the plant has a manpower deficiency of 3.5 men. This shortage does not include the operation of the city's oxidation pond. The manpower shortage plus the lack of personnel training has severely hampered operational flexibility.

Water quality problems were observed in the Withlacoochee River below the Valdosta sewage treatment plant discharge. Dissolved oxygen concentrations less than 4.0 mg/l and high nutrient concentrations were observed in the Withlacoochee River at Georgia Highway 94; however, discharges from point sources other than the Valdosta sewage treatment plant are also contributing to the water quality degradation at this sampling point. At the Georgia-Florida state line, water quality is indicative of a relatively clean stream.

A special study was conducted at the city's 22-acre oxidation pond during September 26 through October 2, 1971. Although the pond was organically and hydraulically overloaded, the average BOD_5 removal was 87 percent. The pond, designed for a population equivalent of 4,500 and a flow of 0.45 MGD, was treating 0.62 MGD of wastewater with a BOD population equivalent of 8,100. The pond discharges into Mud Creek, a tributary to the Alapaha River.

RECOMMENDATIONS

1. The Valdosta treatment plant increase its working staff 3.5 men to meet Federal guidelines on staff complements for wastewater treatment plants. An additional man be hired to operate and maintain the oxidation pond.
2. The City increase their sewage treatment plant's operation and maintenance budget to:
   - Repair and/or replace faulty equipment; and,
   - Purchase new equipment necessary to improve the maintenance program and increase laboratory capability.
3. The City improve the plant's on-the-job training program and increase the operational flexibility of the two night shifts.
4. The City use their sewer ordinance, that becomes effective April 7, 1972, to evaluate the industries connected to the city sewer and, if necessary, require pre-treatment of industrial discharges.
5. Incorporate a means of pre-aerating the stale influent wastewater prior to entering the activated sludge aeration basin.
6. Repair the broken drive mechanism on the grit chamber for better settlement and collection of the grit during high flows.
7. A primary clarifier be added to the treatment units. Primary settling will improve solid removals and aeration basin operation.
8. The air distribution system should be altered to provide tapered aeration in the aeration basin. Supplying oxygen to the areas of greatest need will help to eliminate the "bulking" problem.

9. Piping alterations are needed to permit sludge return to the aeration basin while sludge is being wasted to the digesters from the sedimentation tanks. Meters be installed on the return sludge pumps to permit return sludge control and quick closing sampling valves to permit sampling of return sludge.
10. Provisions be made for sampling sludge prior to pumping from the sedimentation tanks to the digesters. This provides the operator with information for better utilization of the digester capacity for solids stabilization.
11. A new sludge digestion heating system be installed or the present system overhauled.
12. Investigate the possibility of short circuiting through the aeration basin. If short circuiting exists, construct transverse baffles every 40 to 50 feet in each chamber.
13. Improve the operation and maintenance of the aeration basin by:
    - Cleaning all the clogged diffuser heads;
    - Modifying the sprinkler system to improve foam control;
    - Repairing all air line leaks;
    - Adjusting the aeration chamber channel gates throughout the day to maintain an equal flow and balanced solids concentration, and
    - Increasing the determinations for D.O. and settleable solids in the aeration chambers to three times per day and total suspended solids to once per day.
14. Reduce the amount of chlorine used for disinfection. Adjust the gas chlorinator for flow to maintain a 0.5 mg/l total chlorine

residual in the effluent. All work shifts must be capable of performing this function.

15. Increase the sludge drying bed capacity.

16. The following routine analyses be performed at the Valdosta plant:

X = Routine
0 = Optional

CHECK LIST OF ROUTINE ANALYSES (2)

Test	SAMPLE							
	Influent	Final Effluent	Raw Sludges	Digesting Sludges	Digested Sludge	Digester Supernatant	Mixed Liquor	Return Sludge
Solids Total	0	0	0	X	X	X		
Suspended	X	X				X	X	X
Volatile Susp.	X	X				0	0	
Settleable							X	
SD1							X	
pH	X	0	X	X	X	X		
Temperature	X			X				
D.O.							X	
BOD	X	X				X		
COD*	X	X						
Phosphorus Total-Phosphate						X		
Ortho-Phos.						0		
Alkalinity								
Volatile Acids								
Cl_2 Residual								
Total Coliform								
Fecal Coliform								

* May be considered routine because of industrial discharges into city sewer.

DESCRIPTION OF STUDY AREA

Valdosta, the ninth largest city in the State of Georgia, is located 15 miles from the Georgia-Florida state line (Figure 1). The city is the county seat of Lowndes County and the trade center for a 16-county region in south Georgia and north-central Florida. Valdosta operates under a council-manager form of government. Water and sewerage systems are owned and operated by the city. In 1970, the city population was 32,303 and the county population 55,112. The Georgia Social Science Association predicts county populations of 57,075 and 61,453 for 1980 and 1990, respectively. Manufacturing employment in the county is almost 6,000 jobs. Presently, 20 percent of these employees are engaged in metals and machinery, 20 percent in forest products, 16 percent in apparel, 15 percent in textiles and 10 percent in food and agriculture. The climate in Lowndes County is typical of other Coastal Plain areas with long hot summers and cool winters. The average annual rainfall is 49 inches.

STREAM STANDARDS

The Alapaha and Withlacoochee Rivers are the two principal streams in Lowndes County. Both are interstate streams and tributaries to the Suwannee River. The Withlacoochee River receives Valdosta activated sludge plant effluent via Sugar Creek. The Alapaha River receives effluent from the city's oxidation pond via Mud Creek. In Georgia, both streams are classified for fish and wildlife uses. At the state line, Florida upgrades both classifications to recreational usage. The adopted stream classification criteria for Georgia and Florida are listed in Table I.

FIGURE I

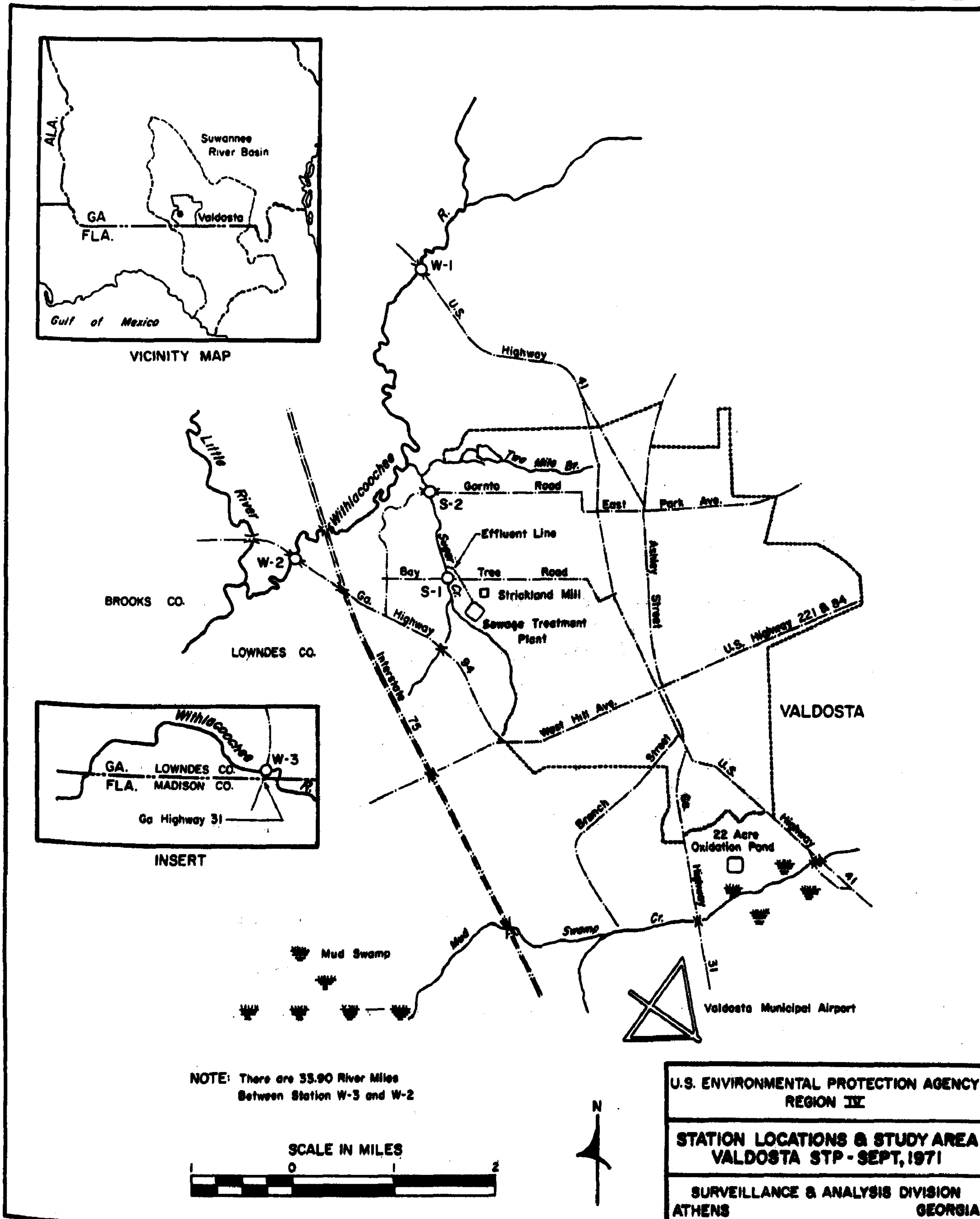

ALA.
Suwannee River Basin
GA
FLA.
Valdosta
Gulf of Mexico
VICINITY MAP
R.
W-1
U.S.
Highway
41
Little River
Withlacoochee
Two Mile Br.
Gornto Road
S-2
East Park Ave.
Effluent Line
Sugar Cr.
W-2
Bay Tree Road
S-1
Strickland Mill
Ashley Street
Sewage Treatment Plant
BROOKS CO.
LOWNDES CO.
Ga. Highway 94
Interstate 75
U.S. Highway 221 & 84
West Hill Ave.
VALDOSTA
Withlacoochee
W-3
GA.
LOWNDES CO.
FLA.
MADISON CO.
Ga Highway 31
INSERT
Branch Street
U.S. Highway
22 Acre Oxidation Pond
Ga. Highway 31
41
Mud Swamp
Mud Swamp Cr.
Valdosta Municipal Airport
NOTE: There are 33.90 River Miles Between Station W-3 and W-2
SCALE IN MILES
1 0 1 2
N
U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IV
STATION LOCATIONS & STUDY AREA VALDOSTA STP - SEPT, 1971
SURVEILLANCE & ANALYSIS DIVISION
ATHENS GEORGIA

Table I

WATER USE CLASSIFICATION AND SPECIFIC USE CRITERIA
STUDY REACH OF WITHLACOOCHEE AND ALAPAHA RIVERS
GEORGIA-FLORIDA

Item	GEORGIA Fishing & Wildlife Criteria Withlacoochee & Alapaha Rivers	FLORIDA Recreation Criteria Withlacoochee, Alapaha and Suwannee Rivers
Temperature ^{o}F	≦93.2 and a 10^{o} rise	Insufficient to damage aquatic life, vegetation, or interfere with classified uses.
Dissolved Oxygen (mg/l)	≦ 4.0	≦ 4.0
pH	6.0 to 8.5	6.0 to 8.5
Bacterial	Fecal coliform monthly avg. ≦5,000/100 ml, =20,000/100 ml 5% of time for 90 days.	Coliform monthly avg. ≦1,000/100 ml, nor to exceed this number 20% of the time any month.
Turbidity	None specified.	≦50 JTU above background.
Toxic Substances	None in concentrations that would harm man, fish and game or other beneficial aquatic life.	Free from substances toxic or harmful to humans, animals, or aquatic life.
Taste, odor and color producing substances	None specified.	No amount sufficient to create a nuisance.

HYDROLOGY

The Alapaha and Withlacoochee River systems, typical of streams in the Coastal Plain, are very sluggish with several swampy areas. The two largest swamps are Green Bay in the northeastern part of the county and Mud Swamp southeast of Valdosta. In contrast to the swampy areas, there is a lime sink region (Karst topography) in the southeast corner of the county. During low flow periods, the Withlacoochee River flows underground through sink holes near U.S. Hwy 41 north of Valdosta, reappearing further downstream.

The headwaters of the Withlacoochee River are 46 miles north of Valdosta near Tifton, Georgia. The drainage area of the Withlacoochee basin above Valdosta is 378 square miles. There are no continuous streamflow recorders in the vicinity of Valdosta; however, partial records documented by the Georgia office of the U. S. Geological Survey showed that during the extreme low flow periods of 1954 there was no flow in the Withlacoochee River at Valdosta.

The Alapaha River at Statenville, 18 miles southeast of Valdosta, has a drainage area of approximately 1,400 square miles. The average daily discharge for 48 years of record is 974 cfs. The record high and low flows are 27,300 cfs and 16 cfs, respectively. The 7-day, 10-year low flow is 26 cfs.

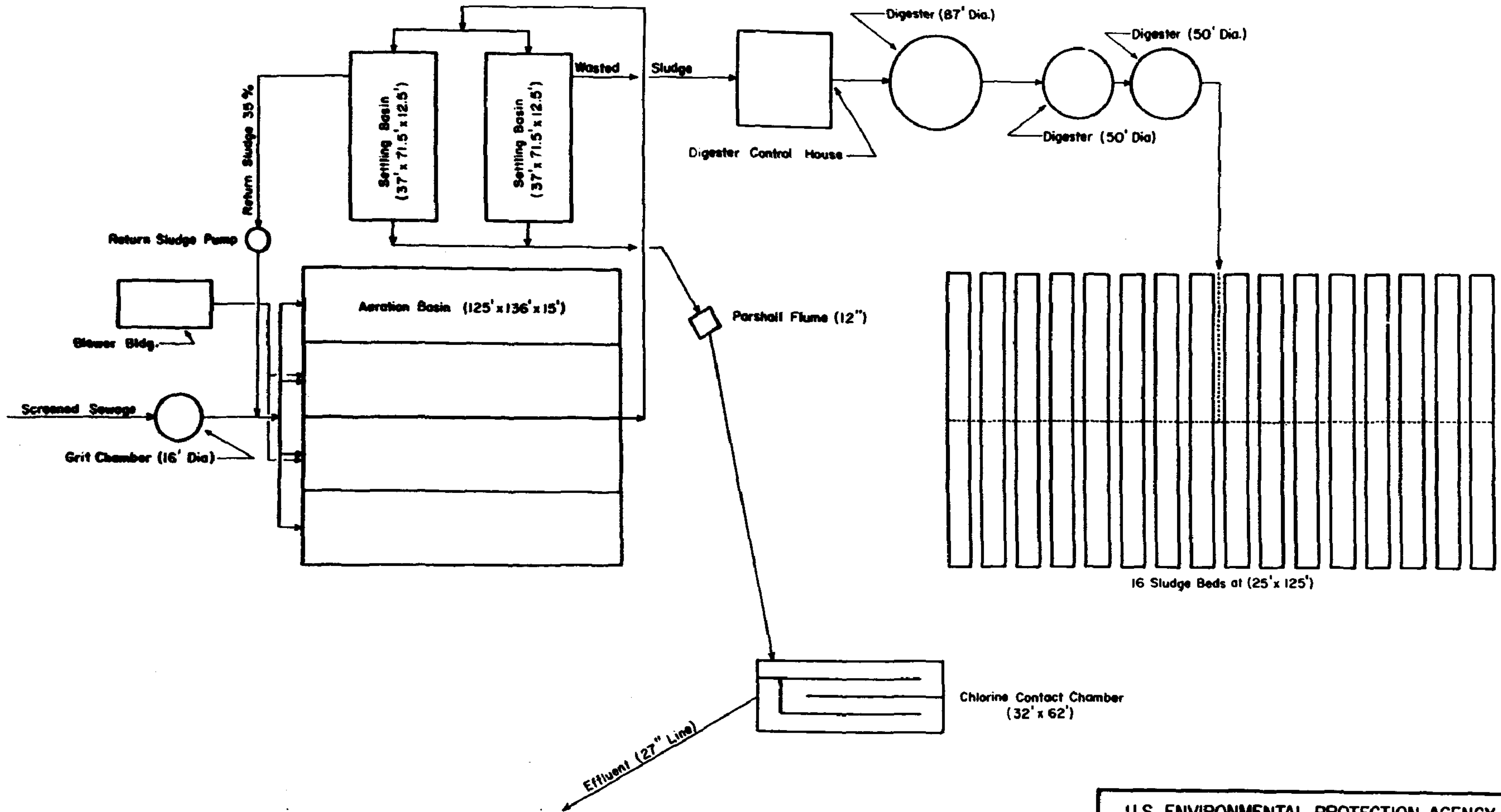
DESCRIPTION OF SEWERAGE AND TREATMENT SYSTEMS

Waste treatment facilities at Valdosta consist of a 5 MGD modified activated sludge plant (MASP) and a 22-acre oxidation pond. The treatment plant was constructed in 1949 as a primary facility and upgraded to the present system in July 1965. The oxidation pond was constructed in March 1967. The expansion of the treatment plant and the construction of the pond were partially funded with Federal assistance under PL 660 grants. The total eligible cost for funding was $900,950. A grant of $270,285 was awarded to Valdosta, of which $232,900 has been paid to date.

MODIFIED ACTIVATED SLUDGE PLANT

Wastewater enters the plant at three inlets. One inlet is a direct line from Strickland Cotton Mill located about 0.25 miles away. The other two inlets are from the city's sewer system. Influent wastes first pass through bar screen and a grit chamber (Figure 2). The plant does not prechlorinate, comminute, or provide primary sedimentation before the wastewater is lifted into the aeration basin which consists of four chambers. The wastewater flow is distributed into each of the aeration chambers by manually operated gates. Return activated sludge is pumped from the secondary clarifiers back to the aeration basin inlet. Compressed air, supplied by three large air blowers (usually one is on stand-by), is bubbled into the sewage through three-inch porous tile diffuser heads located along each tank bottom near one side of the tank wall. This arrangement produces spiral flow; a combination of

FIGURE 2



U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV

PLANT SCHEMATIC
VALDOSTA STP - SEPT, 1971

SURVEILLANCE AND ANALYSIS DIVISION
ATHENS GEORGIA

NOTE: This Schematic is not to Scale longitudinal and rotional motion providing mixing. After aeration, the wastewater flows by gravity into two final clarifiers for solids removal.

The settled sludge, except when pumped to the digesters, is continuously returned to the aeration basin to provide an acclimated sludge for sewage digestion. Scum in the sedimentation tanks is mechanically skimmed and trapped at the scum board. Pipes are available for removing scum; however, during the study, scum was removed manually with scoops made of fine-meshed wire cloth. Scum is hauled to the city's sanitary landfill for disposal. Waste sludge from the sedimentation tanks is pumped to the digesters for further water removal and stabilization. Digester supernatant is pumped to the aeration basin and the digested sludge is discharged to sand drying beds. The dried sludge is ultimately buried at the city's sanitary landfill or used as a soil conditioner by the City. A clay tile underdrain beneath the drying beds returns filtrate to the plant influent.

COLLECTION SYSTEM

All wastewater collected north of Branch Street is transported to the treatment plant; wastewater collection south of Branch Street goes to the oxidation pond (Figure 1). There are four main collection areas in Valdosta. Several smaller collection areas are served by sub-trunk sewers and lift stations that discharge to one of the main lines. There are also small auxiliary lift stations in the fringe areas to handle recent sewer connections. The city has about 11,300 sewer connections; approximately 2,000 connections discharge to the pond and the remainder to the treatment plant. The city has under construction a force main and intercepter which will help to minimize excessive infiltration and will collect additional wastes from the rapidly expanding area in the northeast section of the city. Plant records indicate a 35 percent increase in flow during wet weather.

The prinicpal areas of growth have been away from the treatment plant in the north and northeast sections of the city. The extension of the collection system to serve this growth has increased travel times and is producing a stale waste at the treatment plant inlet.

PERSONNEL

The successful performance of any wastewater treatment plant depends largely upon the training and ability of the men who are responsible for its operation and on the support these men receive from the owner or operating agency. Funds and manpower must be provided for the proper operation and maintenance of any treatment facility. The operators are responsible for the quality of the plant's effluent, service life of the plant and equipment, costs for operation and maintenance, appearance of the buildings and grounds, keeping adequate records and maintaining good public relations.

The Director of the Valdosta Department of Water and Sewage is responsible for departmental activities. Operation and maintenance of the sewage treatment plant is the responsibility of the plant superintendent, a certified B operator with the State of Georgia. Excluding the director, the plant staff includes five operators (one with a C state certification) and one laborer.

Plant operations are conducted in three eight-hour shifts. All plant personnel work a forty-hour week. The plant superintendent works the day shift Monday through Friday, but is always available for problems and in emergency situations. Work schedules are organized to provide two operators and a laborer for the day shift and one operator for each of the remaining night shifts. All maintenance, laboratory functions, and operational changes are conducted during the day shift. Night operators are only responsible for pumping sludge to the digester and notifying the superintendent of any plant emergencies or physical changes which might interfere with plant performance.

The day crew also maintains and operates the city's oxidation pond. Since the pond was not functioning properly during the study, it was necessary for one and sometimes two men to leave their duties at the plant and attend to the pond (Appendix E). This occurred almost daily during the field study. Maintaining the pond left the plant severely understaffed for routine operation and maintenance.

The two employees certified with the State are qualified to conduct and supervise routine laboratory analyses (BOD, suspended solids, volatile solids, volatile acids, dissolved oxygen, etc.). The major limitation in performing these routine determinations is not incompetency of plant personnel but the lack of necessary equipment and facilities to do the job. For example, plant personnel cannot perform volatile solids determinations because there is no muffle furnace.

Preliminary guidelines on staff complements for wastewater treatment plants, not officially released by EPA Headquarters, indicate that the Valdosta treatment plant is inadequately staffed. Although a plant exactly like Valdosta's was not categorized in the guidelines in detail, a similar five MGD plant requires a staff of 11.5 men. Since Valdosta has no primary clarifier, the recommended staff complement was adjusted to 10.5 men (Table II). The 3.5 manpower shortage is evenly distributed across the different occupational categories; however, this does not include the staff requirements for the oxidation pond. Guidelines have not been released for ponds, but observations during the September field study indicated a need for one full-time operator. This increased Valdosta's staff shortage to 4.5 men. The 3.5 man staff shortage

Table II

ADJUSTED STAFF COMPLEMENT FOR ACTIVATED SLUDGE
SECONDARY TREATMENT SLUDGE DIGESTION:
SLUDGE BED OR LAGOONS

Occupation Title	5MGD PLANT Recommended	Valdosta
Superintendent	0.5	1
Operator II	4	3
Operator I	3	2
Laborer	2	1
Laboratory Technician	1	0
Total Staff	10.5	7

Note: Plant components included in this example:

Liquid Treatment

Raw wastewater pumping
Preliminary treatment
Aeration
Final sedimentation
Recirculation pumping
Chlorination

Sludge Treatment

Secondary sludge pumping
Sludge digestion
Sludge beds

Other Plant Components

Yardwork
Laboratory
Administration and General

determined from the operation and maintenance staff complement outline is not a compulsory number but a recommended guideline with sufficient flexibility for adaptation to special situations in specific plants. Each plant will have unique conditions requiring supervisory judgment to provide an optimum staff. Based on field study observations, it is obvious that the Valdosta treatment plant is understaffed.

TRAINING

Training is one phase of the personnel program that cannot be overemphasized. Most wastewater treatment plant operators are hired locally and trained on the job. Management must recognize the benefits which accrue from good operation and must adequately finance and arrange for on-the-job training.

The Valdosta Department of Water and Sewage encourages plant operators to attain certification but this must be done on the employees own time and at his own expense. There is no training program for new employees other than on-the-job training necessary to perform assigned duties. Cross training in the operation and maintenance of the plant is limited to the men on the day shift. The two men on the night shift receive neither cross training for daytime operations nor training in performing the most fundamental plant operations, such as adjusting the chlorine feed and regulating the air supply. Management must recognize and correct these problems by implementing an adequate training program.

The Georgia Water Quality Control Board (GWQCB) operates one short school per year in southern Georgia. In addition, the GWQCB, as a sub-contractor to EPA, has received funds and operated training programs coupled with "on-the-job" training throughout the State for three years. These programs are geared toward improving the present skills of wastewater treatment plant operators. These training programs have been and are available to Valdosta personnel if city support (working time and salary) can be obtained.

DISCUSSION OF STUDY FINDINGS

Dry weather conditions prevailing during the study period apparently minimized infiltration. The average influent flow into the plant was 3.6 MGD (Appendix A). The influent wastewater is comprised of industrial and domestic wastes and septic tank sludge discharged at the plant by tank trucks owned by local septic tank cleaning services. Four major industries discharge untreated waste to the city sewer (Table III). The city approximates their total flow at 500,000 gallons per day.

TABLE III

KNOWN INDUSTRIAL DISCHARGES INTO CITY SEWER

Industry	Product	Employment	Waste Discharge
Strickland Cotton Mills	Cotton Fabrics	600	100,000 gal/day**
South Georgia Pecan Co.*	Pecan Processing	130	Unknown
Cracking' Good Bakers, Inc.	Cookies, Crackers	200	Unknown
Gold Kist Say Div.	Soybean Processing	76	Unknown

* Seasonal operation.
** Treatment plant flow meter records.

Waste characteristics for these industries are unknown; however, the city enacted a sewer ordinance on April 7, 1971, requiring all connected industries to submit a report on their waste effluent by April 7, 1972 (Appendix B). The report will contain the average daily discharge and a waste constituent characterization. The ordinance requires future industries desiring sewer service to submit a report to the city prior to connection. Based on the submitted report, the city engineer will determine the city's capabilities for treating the wastes and pretreatment requirements. Septic tank sludge is delivered by three separate companies and averages about 18,000 gallons per month with large daily variations. The city charges one cent per gallon to treat this sludge.

Table IV exhibits the average influent and effluent wastewater characteristics, loadings, and percent reductions for the plant during the study. Appendix C contains all sampling data collected during the study. The average influent BOD_5 was 202 mg/1 (6,060 lbs/day) with BOD_5 reduction prior to chlorination averaging 75 percent. Heavy chlorination, averaging 400 lbs/day during the study period, oxidized additional organic material, further reducing the BOD_5. Since stoichiometrically each mg/1 of chlorine added to sewage will reduce the BOD_5 by two mg/1, the calculated overall BOD_5 reduction was 88.0 percent.(1) This calculated reduction was substantiated somewhat by stream BOD_5 concentrations measured below the plant. After a 25 percent dilution by the receiving stream, all observed BOD_5 concentrations were less than 4.4 mg/1. The average influent COD concentration was 832 mg/1 (25,000 lbs/day) and the average influent suspended solids concentration was 517 mg/1 (15,500 lbs/day). Volatile suspended solids, generally assumed to represent the organic matter, averaged 438 mg/1 (13,200 lbs/day). The high solids and COD concentrations indicate the presence of industrial wastewaters. Although the percent reduction of suspended and volatile solids was 87 and 89 percent, respectively, because of the high influent loadings, the plant effluent contained 2,010 and 1,380 lbs/day, respectively. Settleable solids were reduced from 9.6 to 0.7 ml/1, a 93 percent reduction.

Table IV

SUMMARY OF INFLUENT AND EFFLUENT WASTEWATER CHARACTERISTICS
VALDOSTA SEWAGE TREATMENT PLANT

Parameters	Influent Conc.	Influent Loading (lbs/day)	Effluent Conc.	Effluent Loading (lbs/day)	Reduction % Removal
	(mg/1)		(mg/1)		
BOD_5	202	6,060	50	1,500	75
COD	832	25,000	165	4,960	80
TOC	129	3,880	32	960	75
SOLIDS					
Settleable	9.6	--	0.7	—	93
Suspended	517	15,500	67	2,010	87
Volatile	438	13,200	46	1,380	89
pH	7.1	—	7.1	—	—
NITROGENOUS COMPOUNDS-N					
TKN	17.5	525	10.0	300	43
NH_3	11.9	357	8.1	243	32
NO_3-NO_2	0.34	10.2	0.20	6.0	44
Total Phos.	10.4	312	6.9	207	34
Cyanides	<0.01	<0.30	0.04	1.23	--
	(μg/1)		(μg/1)		
Phenols	65	1.95	120	3.70	--
Mercury	1.8	0.054	0.60	0.019	--
Zinc	440	13.2	100	3.09	--
Copper	120	3.6	40	1.23	--
Chromium	20	0.60	<20	<0.62	—
Cadmium	<20	<0.60	<20	<0.62	—
Iron	<50	<1.50	<50	<1.54	--
Lead	170	5.10	170	5.25	—
Nickel	<80	2.4	<80	2.4	—
Manganese	50	1.5	40	1.2	—

The low concentrations of pheno

observed in the waste during sampling should not have had a toxic effect on the biological activity of the activated sludge process. Phenols and cyanides had a higher effluent than influent concentration which may have resulted from the method of sampling and/or may indicate batch discharges into the collection system. Batch discharges of toxic material may be toxic to the activated sludge process.

SCREENING AND GRIT REMOVAL

There are two series of manually-cleaned bar screens with a bar spacing of one to two inches. Additional requirements for bar screens which are satisfactorily met at Valdosta are:

- The flow velocity through a screen should be about one foot per second (fps) for average flow and should not exceed 2.5 fps.
- The invert of the flow channel should be from three to six inches below the invert of the incoming sewer.
- The slope of hand-cleaned screens should be from 30^{o} to 45^{o} from the horizontal.
- Screens should have a drainage area onto which solids can be raked until sufficiently dewatered for ultimate disposal.

A Dorr Company Degriter mechanism for grit removal is employed at the plant's circular grit chamber. Design specifications (Table V) are adequate; however, the rotating scraper mechanism that moves the grit to the center of the chamber did not function -- the drive mechanism was broken. Grit accumulated in the chamber and was not removed. At high flows, grit was conveyed to the aeration chamber. This may have contributed

Table V

DESIGN CRITERIA
VALDOSTA SEWAGE TREATMENT PLANT

Item	Specification
Design Flow	5.0 mgd
Grit Removal	
Type	Mechanical collector with washer
Channels	1
Size	16' dia.
Velocity	1 fps
Time	20 sec
Aeration Basin--(4 cell) plug flow)	
Design Flow	5.0 mgd
Volume	244,800 cu ft
Detention Time	5.4 hrs
Secondary Clarifier No. 1	
Surface Area	2,650 sf
Overflow Rate	940 gpd/sf
Secondary Clarifier No. 2	
Surface Area	2,650 sf
Overflow Rate	940 gpd/sf
Sludge Recirculation Pumps	
Secondary Clarifier 1	694 gpm
Secondary Clarifier 2	694 gpm
Air Supply--3 blowers	3,400 cu ft/min each
Chlorination	
Gas Feeder	500 #/day
Contact Chamber	20 min
Sludge Removal	
Digesters 1 & 2	143,000 cu ft ea
Digester 3	426,000 cu ft
Sludge Pumps	2 @ 80 gpm
Sludge Drying Beds	16 @ 125 ft x 25 ft

to the high solids in the aeration basin influent. Grit from the grit chamber and screened trappings were deposited at the city's sanitary landfill.

AERATION BASIN

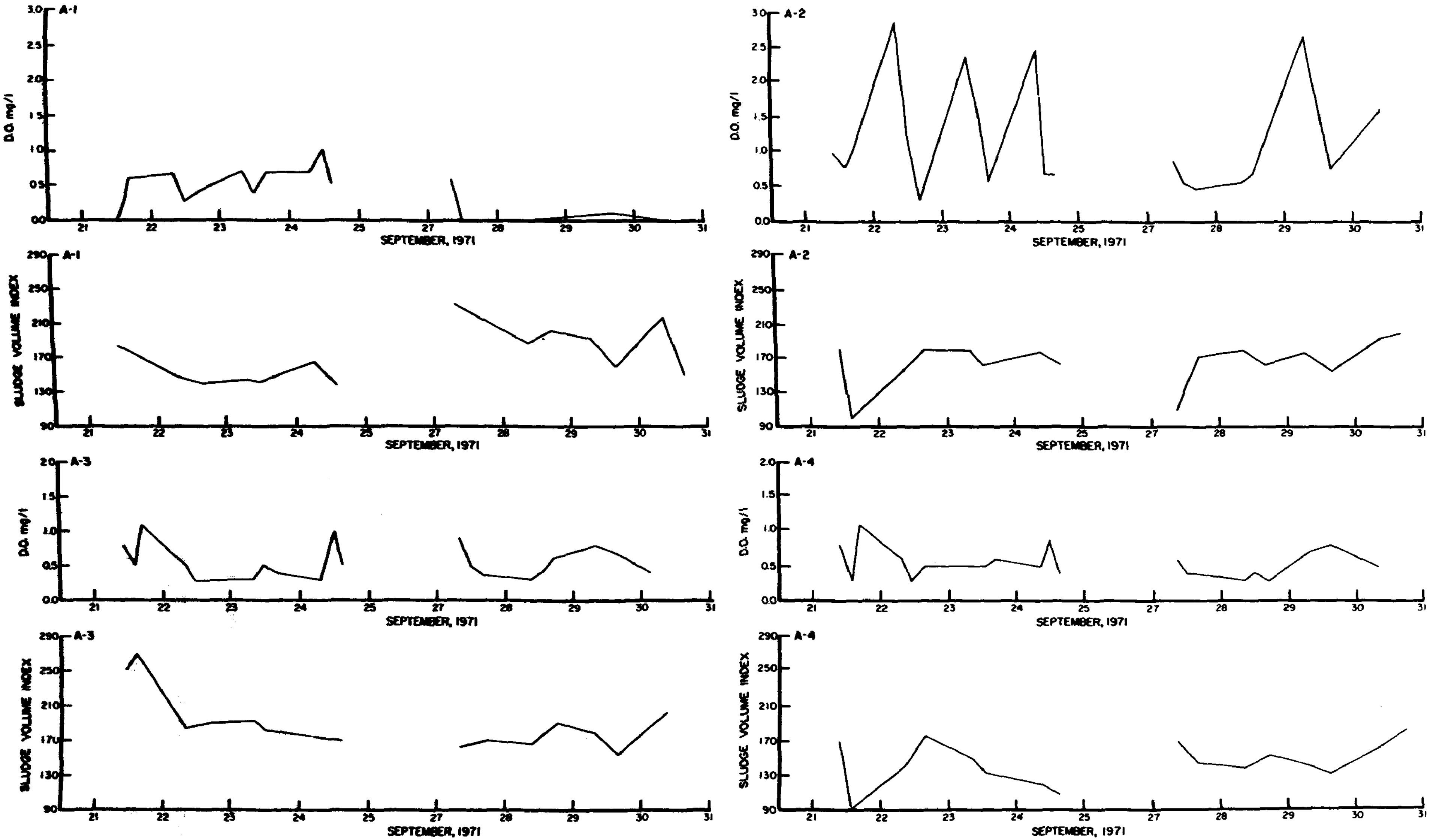
The modified activated sludge process involves both sorption and oxidation. Sorption is controlled partly by the suspended solids concentration in the mixed liquor and oxidation by microbiological processes utilizing oxygen and organics in the waste. Some causes of imbalance in activated sludge systems are:

- Inadequate oxygen supply;
- Presence of toxic wastes;
- Presence of septic sewage, or sludge, or a high carbonaceous waste in the influent;
- Excessive grease content in the influent;
- Inadequate aeration period, and
- Short circuiting in the aeration tank.

Some of the preceding causes were observed in varying degrees at the Valdosta plant.

Inadequate oxygen levels were observed in the aeration basin. A satisfactory dissolved oxygen (D.O.) operating level is 2.0 mg/l. Dissolved oxygen concentrations in the four aeration chambers are illustrated in Figure 3. Dissolved oxygen in aeration chamber A-1 was never above 1.0 mg/l, and during the second week of sampling, the chamber was on the verge of going septic with only trace levels of oxygen for almost 3 days. During the first week of the survey, D.O. in aeration chamber

FIGURE 3
VARIATION IN DISSOLVED OXYGEN AND SLUDGE VOLUME INDEX
AERATION BASIN CHAMBERS
VALDOSTA STP - SEPT, 1971



A-2 was erratic; low night time flows allowed early morning D.O. concentrations to increase to 2.5 mg/1, but dropped below 1.0 mg/1 during day time flow. During the second week, chamber A-2 followed the same general pattern. Dissolved oxygen concentrations in aeration chambers A-3 and A-4 exceeded 1.0 mg/1 only once during the study. These low oxygen levels were caused by inadequate plant design and compounded by operation and maintenance deficiencies. The aeration system lacks built-in design flexibility because:

- Flow was not equally proportioned between the four aeration basins.
- The quantity of diffused air to the aeration chamber could not be properly regulated.
- One of the three air blowers had been previously disconnected for repairs and the only way it could be reconnected was to shut down all of the blowers.
- Air was diffused in equal amounts along the entire length of the chamber instead of supplying more air at the influent end where the demand is greatest.

High air requirements and long aeration periods are generally needed for strong municipal or industrial wastes and for the production of a highly nitrified waste. The recommended air requirements for the conventional activated sludge process are 768-1000 cubic feet per pound of influent BOD_5 (9). The Valdosta treatment plant has three blowers rated at 3400 cubic feet per minute each. Usually, a maximum of two blowers are in use at any one time and are operated at only 25 percent capacity to prevent overloading the motors. Assuming two blowers in operation at 25 percent capacity, the air supplied to the aeration basin was 404 cubic feet per pound of influent BOD_5. However, available air to the activated sludge micro-organisms was less due to air leaks and clogged diffusers.

Low concentrations of toxic wastes found in the plant's influent are not believed high enough to deleteriously affect the activated sludge process.

The presence of stale sewage, stale sludge and a high solids concentration in the influent causes an imbalance in the aeration basin. Although the average influent waste characteristics do not indicate a high BOD_5 (202 mg/l), the 517 mg/l suspended solids and 832 mg/l COD concentrations are high for municipal waste and reflect the presence of industrial wastes. Figure 4 shows the influent variation in eight-hour increments of COD and BOD_5 concentrations with flows. Figure 5 exhibits the daily influent mean concentration of total suspended and total volatile suspended solids. Once each week the influent concentration of solids and COD were observed to be twice the concentration of the two week study average. This evidence of shock loading indicates a slug discharge from one of the industries or possibly an excessive amount of septic tank sludge. Slug discharges overload the activated sludge system and can cause poor settling and "bulking" in the clarifiers.

Another problem related to the aeration basin operation is the inability to return sludge to the aeration units while pumping sludge to the digesters. The effectiveness of the activated sludge process relies on the availability of an acclimated sludge to digest the raw

FIGURE 4
INFLUENT BOD AND COD VARIATION WITH FLOW
VALDOSTA STP-SEPT, 1971

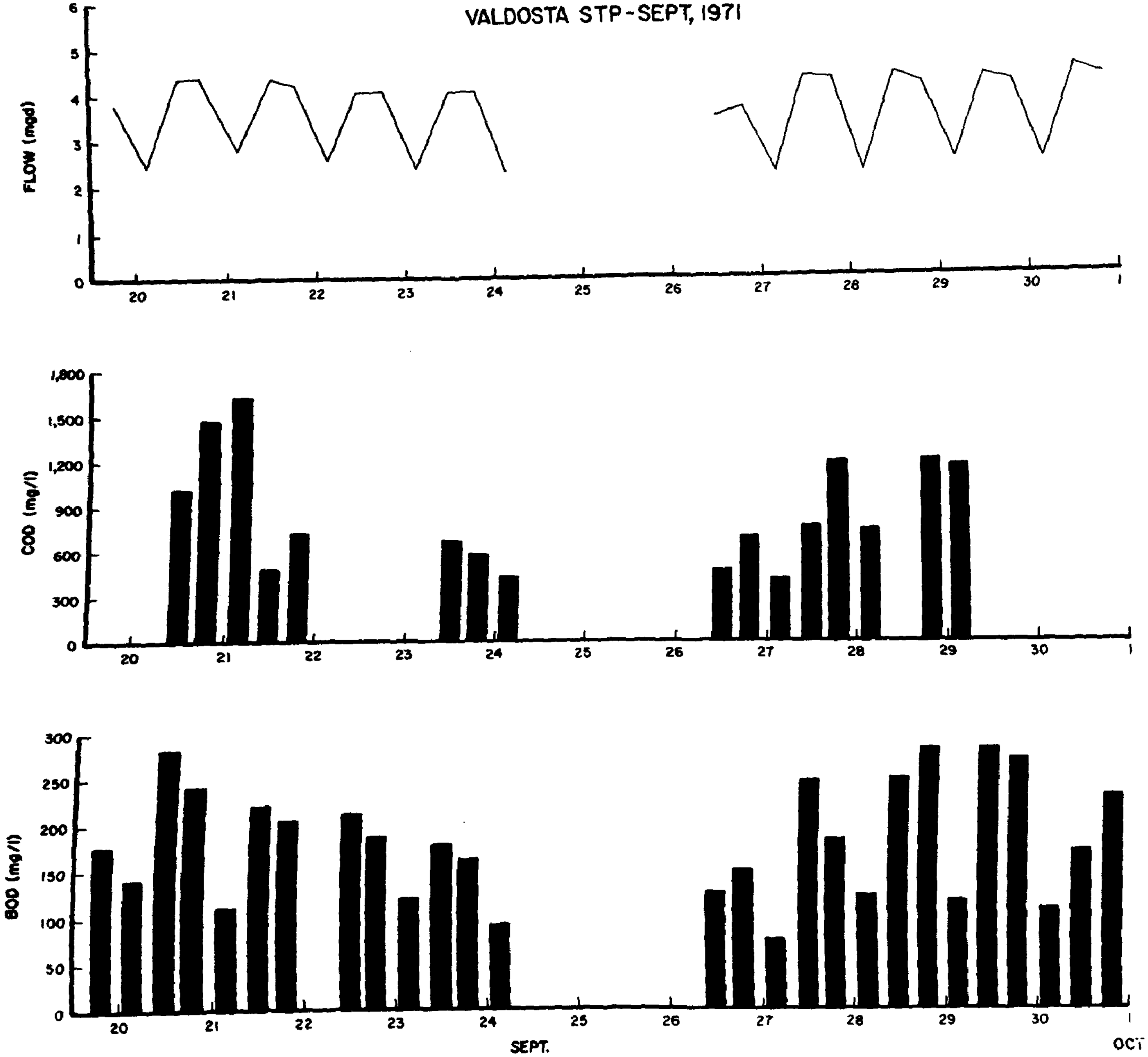
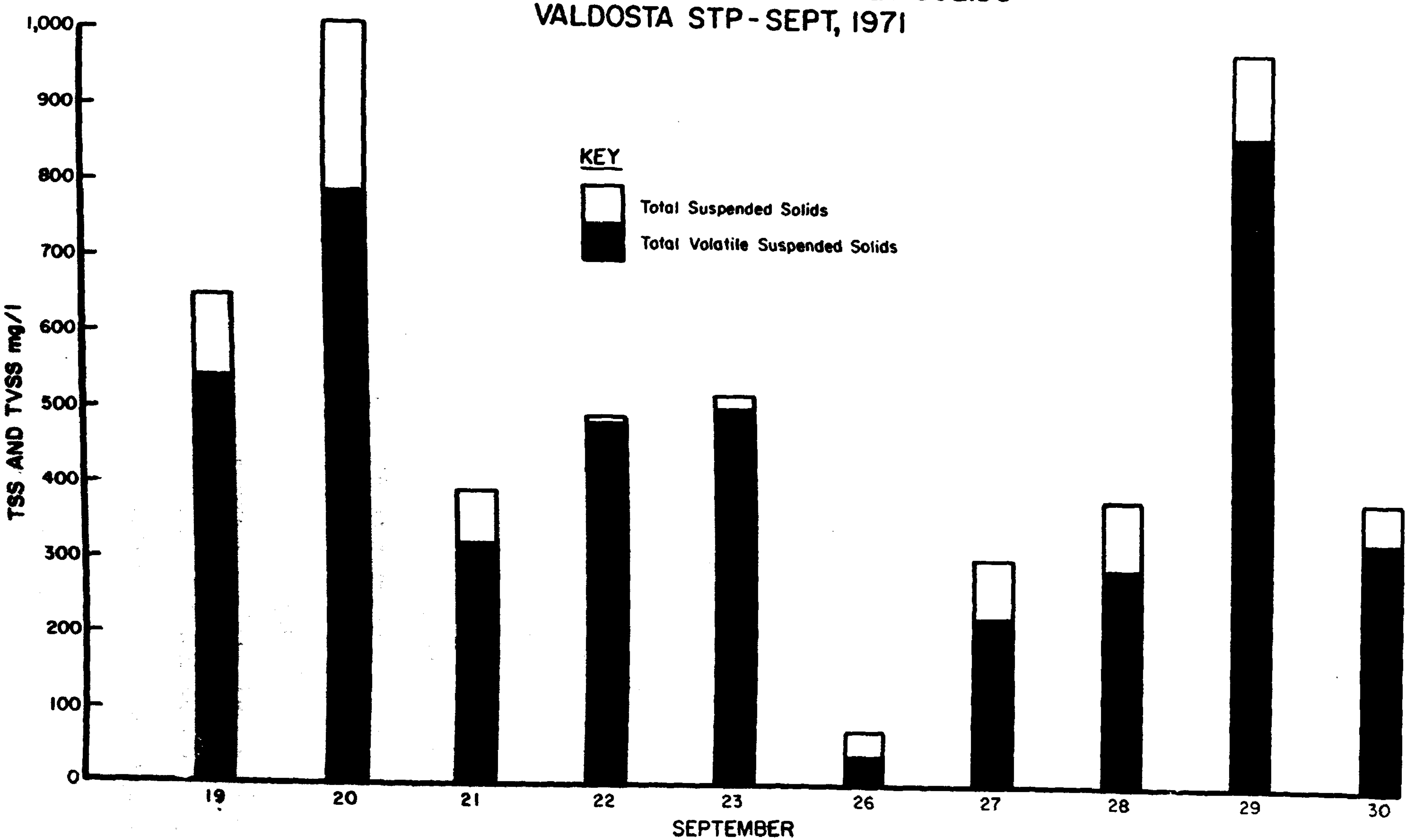


FIGURE 5
AVERAGE INFLUENT TOTAL SUSPENDED SOLIDS
AND TOTAL VOLATILE SUSPENDED SOLIDS
VALDOSTA STP - SEPT, 1971



waste. When sludge is pumped from the Number 1 clarifier to the digester, sludge cannot be returned to aeration basins one and two. The same is true for the Number 2 clarifier and aeration basins three and four. At times, the inflexibility for sludge pumping delays sludge return for three hours.

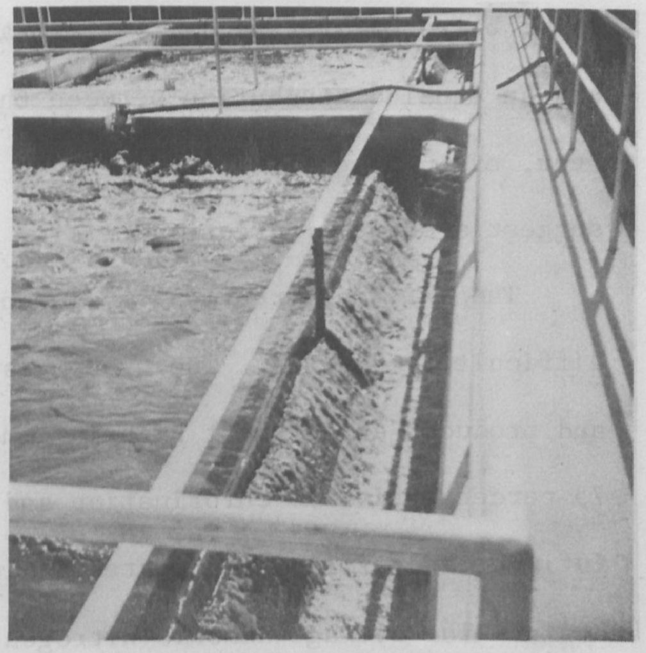
Recent expansions of the city's sewerage system into the northeast section of Valdosta has extended the collection system 13 miles from the treatment plant (as the waste flows). Because of excessive travel time and occassional high strength industrial wastes discharged into the city sewer, on occasions, the influent was observed to be stale.

Observations revealed that the return sludge from the clarifier and the clarifier effluent were always devoid of oxygen. Return sludge requires between 1.0 to 2.0 mg/l of dissolved oxygen to prevent imbalance in the aeration basins. On September 26 and 27 the clarifiers were covered with a thick foam blanket which inhibited settling and was odorous (Illustration 1). The foam resulted from anaerobic digestion of the bottom sludge. The lack of digester capacity for waste sludge on September 23 thru the 27 permitted the foaming condition to occur.

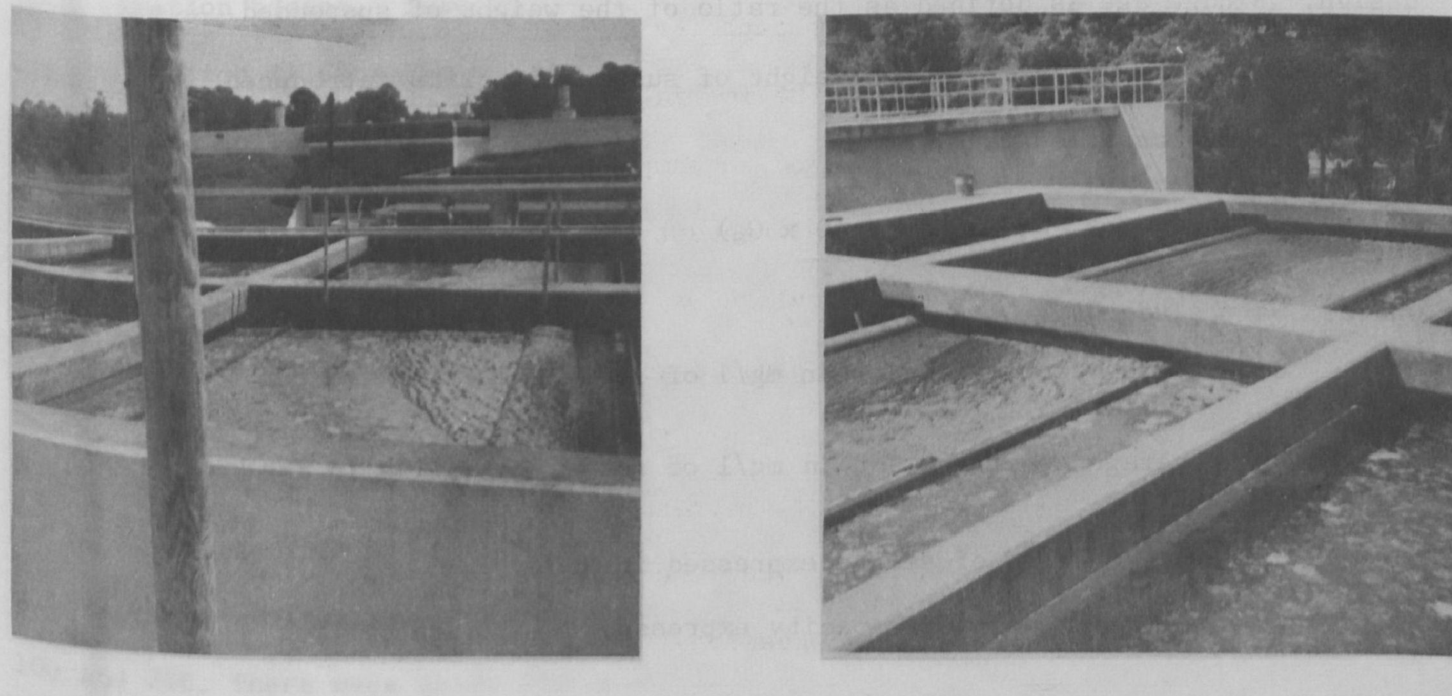
No grease analyses were performed on samples at the plant; however, excessive grease was observed in the influent. On one occasion during the second week of the survey, the metered sewer line transporting wastes from the Strickland cotton mill was plugged with grease, and grease balls were observed floating in the treatment plant influent. Maintenance men from the cotton mill were using plumbing snakes and a commercially-prepared strong alkaline solvent to clear the line. According to plant personnel, excessive grease was an occasional occurrence.

ILLUSTRATION 1
PLANT FACILITIES

Building that contains chlorine room, office and laboratory.



Aeration basin overflow weir



Foam accumulation on final clarifiers
September 27, 1971

Possible short circuiting through the aeration basin may be contributing to an inadequate aeration period. The theoretical retention time, based on average daily flow rates, normal return sludge circulation and an equal distribution between the four basins, is 9.03 hours. However, effluent quality, sludge age, and possible short circuiting suggest a shorter retention time.

The existing treatment system produces a "bulked" sludge which is difficult to dewater. The system is also vulnerable to shock loading and produces an effluent high in ammonia. The low BOD_5 reduction of 75 percent prior to chlorination and the small nutrient variation between influent and effluent indicates inadequate operation of the aeration basin. The average ammonia nitrogen concentration changes very little from influent (11.9 mg/l) to effluent (8.1 mg/l).

Sludge age is another criteria used to evaluate activated sludge plant operation and is an important consideration in aeration basin design. Sludge age is defined as the ratio of the weight of suspended solids in the mixed liquor to the weight of suspended solids introduced daily into the aeration tank, or

$$Sa = (V \times Ca) / (Q \times C_s)$$

where: Sa = sludge age

Ca = average concentration in mg/l of suspended solids in the aerator.

C_s = average concentration in mg/l of suspended solids in the sewage.

Q = rate of flow of sewage expressed in MGD.

V = volume of aerator capacity expressed in million gallons.

Sludge age is, in essence, the detention of sludge floc in the aeration chamber. The size of the aeration basin is an important variable in attaining a desirable sludge age. In conventional operations, a sludge age of three to four days is necessary; anything less settles poorly. Sludge age is determined by using the average plant flow and the average concentration of mixed liquor suspended solids (MLSS) for each basin. Study data indicated the following for each of the aeration basins:

Basin Number	Sludge Age (Days)	SVI
A-1...	3.36	172
A-2...	1.22	124
A-3...	1.87	189
A-4...	1.88	184
MEAN	2.08	167

The difference in sludge ages from Basin A-1 and Basins A-2, A-3, and A-4 suggest that incoming flow is not equally proportioned between the four aeration basins. Insufficient sludge ages are reflected in Figure 3 which illustrates the sludge volume index exhibited in each basin. The Mohlman sludge volume index (SVI) is the volume in milligram per liter occupied by one gram dry weight of sludge after settling the mixed liquor for 30 minutes in a one liter graduated cylinder:

$$SVI = \frac{\text{Settled Volume of Sludge (percent) } 10{,}000}{\text{MLSS (mg/l)}}$$

A good settling sludge may have a Mohlmann index well below 100. An index of 200 is indicative of a sludge with poor settling characteristics. Although the average Mohlmann index for all aeration basins was between 100 and 200, there were daily fluctuations above 200.

The plant's "spiral flow" method of air diffusion in the aeration tank may be reducing the theoretical detention time. As discussed earlier (plant design section), spiral flow is more economical to install and operate but may be less effective with strong sewage or industrial wastes. There is a larger contact period between sludge floc and air bubbles utilizing the longitudinal and rotary motion established by spiral circulation. One disadvantage of this aeration method is that there may be little exchange of sewage between a central core of sewage which is displaced rapidly through the length of the tank and the peripheral sewage, which is displaced relatively slow. This phenomenon may exist at the Valdosta plant and should be investigated. Short circuiting may be eliminated by the construction of transverse baffles.

SEDIMENTATION

No primary sedimentation is provided. Secondary settling separates the suspended activated sludge remaining in the aeration basin effluent. When the plant was modified to provide activated sludge treatment, the primary tanks were converted to continuous-flow, mechanically-cleaned secondary basins.

Controlling principles in the design of final sedimentation tanks in the activated sludge process differ somewhat from the principles applicable in the design of primary sedimentation tanks. The possibility of density currents and other inherent characteristics in activated sludge make it necessary to include the following design criteria (2), most of which are met at the Valdosta plant:

- Details of influent arrangements do not greatly affect the quality of the effluent, provided that the influent velocity is slow enough that baffles are not required. Detention periods vary in practice. Rates of flow are 600 to 1,000 gallons per day per square foot of tank surface.
- Effluent weirs are to be located away from the upturn of the density current. This varies from half to two-thirds of the distance from the influent to the end of the tank. Plants greater than 1.0 MGD should preferably not exceed weir loadings of 15,000 gallons per day per linear foot.
- The sludge drawoff should be near the tank inlet. A sludge well should be provided or appropriate equipment installed for viewing and sampling the sludge. Piping flexibility should permit both the withdrawal of waste sludge and the recirculation of sludge.
- There is an optimum tank depth to maintain an effective sludge blanket. Final clarifiers should not be less than eight feet deep.

The final sedimentation operation at the Valdosta plant may be described as follows:

- Retention times are adequate, and the present overflow rate is 680 gallons per day per square foot for each tank.
- The effluent weir is located on the end wall of the tank opposite the inlet end.
- Sludge flow is directed toward the tank inlet where the sludge

drawoff point is located.

- The tank depth of 12.5 feet is adequate.

Problems may be encountered with the present design because:

- The weir overflow rate of 20,000 gallons per day per linear foot may carry over excess solids;
- Of an inability to recirculate sludge to the aeration basin while sludge is being pumped to the digesters, and
- There is no sludge well or appropriate equipment to view and sample sludge prior to pumping to the digesters.

SLUDGE DIGESTION

At the Valdosta treatment plant, effective sludge handling and disposal procedures are handicapped by inadequate digester and sludge drying bed capacity. The plant's three digesters are operated on a draw-and-fill basis and have a maximum usable capacity of 712,000 cubic feet. Two different methods used to estimate the expected volume of sludge discharged into the digesters show that they are overloaded. A rule of thumb method for estimating digester capacity is 12 cubic feet per capita and indicates a 862,356 cubic feet requirement (3). A more sophisticated method of estimating the volume of sludge uses solids loading, dry solids removed, and solids content to the digester; the expected volatile solids removal and volume reduction indicates 899,800 cubic feet are required for current loadings.

No analytical tests are performed on the return sludge, digesting sludge, wasted sludge to the digesters, or the stabilized sludge from the digesters. The boilers heating the anaerobic digesters are approximately 21 years old and in need of repair. They operate on methane gas produced in the digesters. The boilers break down often and stay down for extended periods of time. The lines carrying gas to the flame traps are clogged up. The inefficient heating system dictates a longer sludge digestion period than the digester capacity will allow. Plants without heated digesters usually increase their digester capacity by 50 percent.

The digested sludge exhibited good physical characteristics -- black tarry appearance and a slight musty odor. The pH was 7.9, indicating a low volatile acids content. The volatile solids content was 53 percent, which is higher than the desired range of 40 to 45 percent. The stabilized sludge was difficult to dewater. An average of 20 days was required for sludge drying when deposited to a depth of six inches on the sand beds. Usually, sludge is deposited at a 8- to 12-inch depth and requires about two weeks of drying time. The plant's 50,000 square feet of drying bed area has capacity for 37,500 cubic feet of sludge per month. Based on a population equivalent of 35,700 and the recommended sludge drying bed area for the activated sludge process of 1.75 square feet per capita, the sludge drying beds should contain 63,000 square feet of drying area.

The inefficient digester heating system and inadequate sludge drying bed capacity effects both solids handling and plant effluent. Sludge cannot be pumped from the digester to the drying beds as often as needed because of inadequate bed space. Consequently, sludge cannot be pumped regularly from the clarifiers to the digesters. Final results of these inadequacies are poor clarifier and anaerobic digester efficiency which adversely effect both the plant effluent and the quality of stabilized sludge.

DISINFECTION

Liquid chlorine applied with a solution-feed, vacuum-type chlorinator is used for disinfection. Chlorine is stored in one-ton cylinders. The gas chlorination equipment is housed in a separate room with an exhaust fan and several windows. A gas mask located in the offices is available in case of accidental spills or line ruptures. Chlorine is used only for effluent disinfection and is applied at the Parshall flume. The chlorine contact chamber provided about 20 minutes of contact time for the chlorinated wastewater with an additional 30 minutes of contact time afforded by approximately one-half mile of outfall sewer, which conveys the effluent to Sugar Creek. Plant operating data indicate the average monthly chlorine purchase was 6,000 pounds, which is equivalent to a daily usage of 200 lbs/day. This is half the amount of chlorine used during the study (400 lbs/day). During peak flows, 400 lbs/day of chlorine produced a total chlorine residual greater than 1.5 mg/l.

Table VI shows the total and fecal coliform reductions obtained at the plant. All data are listed in Appendix C. The plant achieved excellent disinfection with only one high effluent value -- 20,000 fecal coliform/100 ml from the morning composite on September 27. The reason for this high value was that plant personnel had not noticed the chlorine tank was empty, and it was late morning before a full tank was connected.

Table VI

DAILY COLIFORM BACTERIA REDUCTION
THROUGHOUT THE TREATMENT PLANT
(Expressed as Percent)

	STATIONS					
	VP-1 to VP-7		VP-7 to VP-8		VP-1 to VP-8	
Date (1971)	Total Coliforms	Fecal Coliforms	Total Coliforms	Fecal Coliforms	Total Coliforms	Fecal Coliforms
9/27	67.0*	57.0	74.7	98.0	92.0	99.9
9/28	92.0	82.0	99.8	99.7	99.9	99.9
9/29	93.0	85.0	99.9	99.9	99.9	99.9
9/30	78.0	48.0	99.9	99.9	99.9	99.9
10/1	83.0	76.0	99.9	99.9	99.9	99.9

* Calculated from Geometric Means

PLANT OPERATION AND MAINTENANCE

Maintenance involves the work devoted to keeping a plant operating at a satisfactory level. It can be classified as preventive maintenance, which constitutes work and precautions taken to prevent breakdown, and corrective maintenance, which involves repairs after breakdown. The plant operator receives the devices and instruments prepared for him by the designer and has the responsibilities of making them work. An experienced operator who knows his plant and keeps abreast of unit operations can satisfactorily operate a plant with a minimum amount of analytical determinations and flow measurements. However, laboratory analysis and flow control are essential for continued outstanding plant performance. Plant supervision is most successful when primary efforts are directed towards better plant performance.

OPERATION

In an activated sludge plant variables that influence plant performance and that are partly or entirely under the control of the operator include:

- Concentration of solids in the mixed liquor;
- Volume of air used;
- Aeration period;
- Dissolved oxygen in aeration and settling tanks;
- Rate of return sludge, and
- Chlorine residual in the effluent.

The following is a list of operational problems observed at the Valdosta plant.

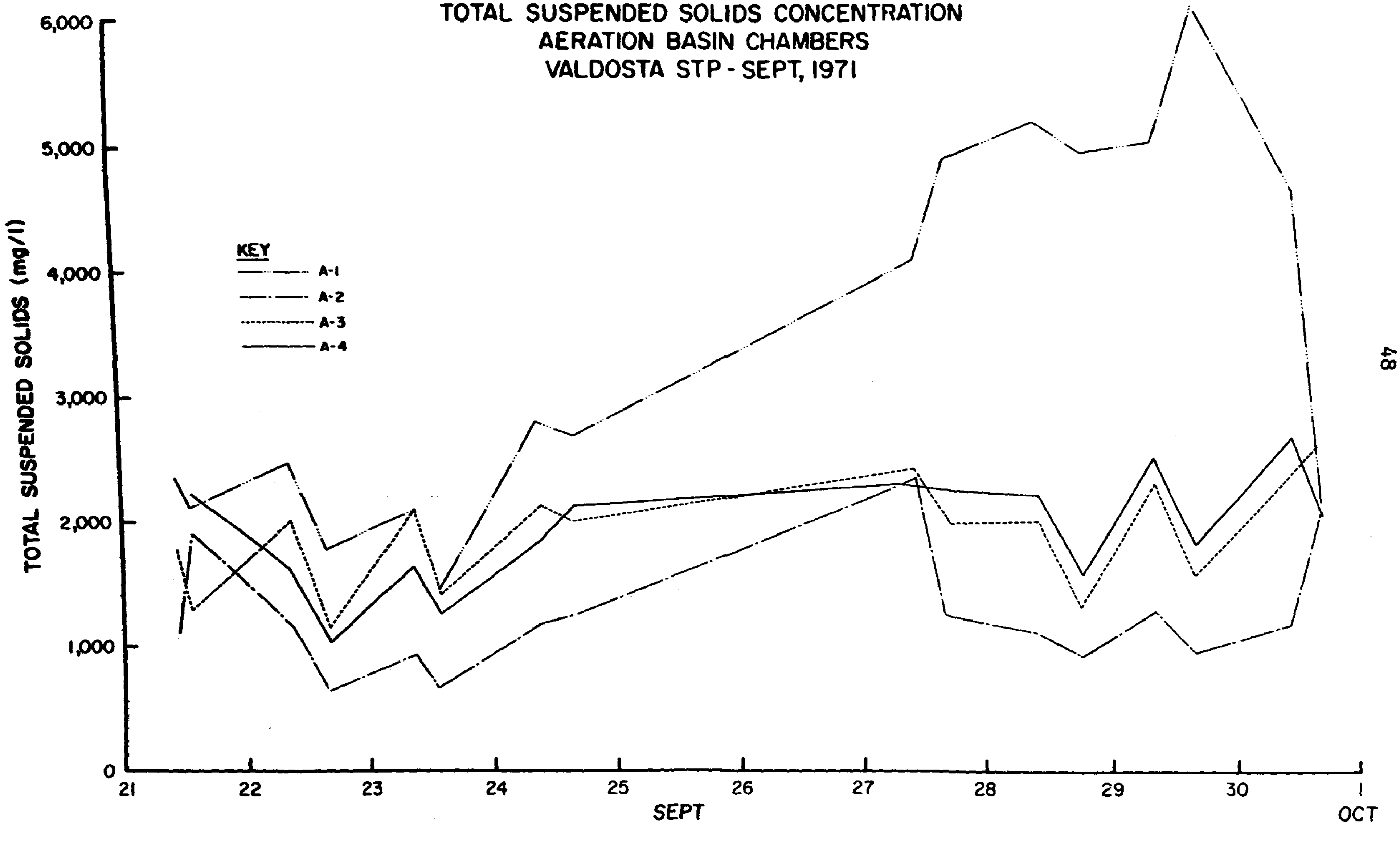
Aeration Tank

- Flow gates were not adjusted by the operators for varying hydraulic conditions; therefore, influent sewage was not equally proportioned between the four aeration basins. Figure 6 shows the total suspended solids variation observed in each basin. Differences of one and two thousand mg/l of total suspended solids were common. The optimum solids concentration is between 1,500 to 2,500 mg/l.
- The air supply was never regulated because one blower was down and the other two blowers were operated at approximately 25 percent capacity to keep the motors from overloading. There is no accurate available means of determining the quantities of air supplied.
- There was insufficient testing within the aeration chambers to determine changes in solids and dissolved oxygen and detect possible influent shock loads.
- Return sludge was not adjusted to flow because pumps are not regulated or metered.

Sedimentation

- The detention time was adequate but bulking problems existed.
- Analytical determinations are not performed on the return sludge or wasted sludge.

FIGURE 6
TOTAL SUSPENDED SOLIDS CONCENTRATION
AERATION BASIN CHAMBERS
VALDOSTA STP - SEPT, 1971



- Insufficient digester capacity resulted in septic sludge in the clarifiers. This condition produced gas bubbles, inhibited settling, created odor, and provides a poor quality return sludge.

Sludge Digestion

- Effective operation of the sludge digestion system is precluded by inadequate digester capacity for plant needs. The boilers heating the digesters are old and frequently down for long periods of time.

Chlorination

- There was no regulation of the chlorine injected into the effluent. The chlorine dosage remained at 400 lbs/day for all flow rates.

MAINTENANCE

Adequate tools and equipment necessary for an effective corrective maintenance program are needed at the Valdosta plant. Plans and specifications are not available for the plant prior to the activated sludge modification in 1965. The plant does not have the necessary lawn equipment for ground upkeep and must rely upon the city's grounds department. Grounds were not well groomed during the survey and high grass made it difficult and hazardous at night to walk in the vicinity of the chlorine contact chamber and the influent manholes near the grit chamber. There are no overhead hoists to lift heavy motors for conducting repairs. Repairs on the grit chamber rotation mechanism, the influent lift pump, the digester heater, and aeration basin have been delayed because of insufficient funds.

Observations at the Valdosta treatment plant indicated that a better maintenance program would improve the operation of the following:

- Grit Chamber - The rotation mechanism that transports the grit to the center of the chamber for mechanical removal was not operating. The drive mechanism was inoperable.
- Influent Lift Pumps - Only one of the two pumps lifting the influent to the aeration chamber was functioning. Spare parts were not available to repair the inoperative pump.
- Aeration Chamber - Only two of the three blowers were working. The third blower was repaired but required shutting off the other two blowers and disassembling before connection could be made. There were significant air leaks in each of the 16 inch lines. About 20 percent of the diffuser heads were partially or completely clogged. The foam control sprinkler system was ineffective because more than half of the sprinkler openings were partially or completely plugged.
- Secondary Sedimentation - The clarifier overflow weirs leaked badly; were not level, and were not hosed down enough to keep fungal growths from accumulating. The drawoff device at the scum board was not operational on the No. 1 clarifier and required hand skimming. Hand rails and more lighting should be installed for personnel safety.
- Flow Measurement - Both the totalizer and the daily flow charts were found to be in gross error and in need of repair or replacement.

- Chlorination - The chlorine contact chamber had an accumulation of solids and needed cleaning.
- Sludge Digestion - The digester heater is approximately 21 years old and frequently breaks down for extended periods of time. The lines carrying excess gas to the flame traps are stopped up.

WATER QUALITY IN SUGAR CREEK AND WITHLACOOCHEE RIVER

The streams in the study area are small and sluggish. No precipitation occurred during the study period, and daytime temperatures often exceeded 90 degrees. These conditions contributed to the low stream flow prevailing during the study period. Only one standard violation occurred under these conditions -- the dissolved oxygen in the Withlacoochee River at Georgia Highway 94 bridge (station W-2) was 3.1 mg/l on October 1. A summary of all the water quality data is included in Table VII. Although all parameters measured varied from station to station, the high nutrient values observed in Sugar Creek, downstream from the Valdosta sewage treatment plant discharge, probably reflects the effect of the plant discharge better than any other observation.

Water temperatures ranged from 19 to 26.5 degrees centigrade with the average at all stations around 23 to 24 degrees. The pH ranged from 5.9 to 7.1, and total organic carbon concentrations varied from 5 to 30 mg/l.

Except for the dissolved oxygen violation mentioned at station W-2, where four of the five observations were equal to or less than 4 mg/l, dissolved oxygen ranged from a high of 8.5 mg/l in Sugar Creek upstream from the sewage treatment plant discharge to a low of 4.5 mg/l in the Withlacoochee River at the Georgia-Florida state line (station W-3). A small waste stabilization pond serving a mobile home court discharges into the Withlacoochee River upstream from the observed dissolved oxygen violation. An evaluation of this discharge along with any other discharges into the river in this area should be made before an adequate

TABLE VII

WATER QUALITY DATA SUMMARY
SUGAR CREEK-WITHLACOOCHEE RIVER
September-October 1971

Station No. and Location	Range	Temp. °C	Dissolved Oxygen (mg/l)	BOD_5 (mg/l)	pH	TOC (mg/l)	Nitrogenous Compounds-N (mg/l) TKN	NH_3	NO_3-NO_2	Total Phosphorus-P (mg/l)	Coliform Bacteria/100 ml (MF) Total	Fecal
S-1, Sugar Creek @ Bay Tree	Max.	25.0	8.5	1.4	6.9	8	0.30	0.50	5.90	0.58	62,000	740
Rd. Bridge, Upstream From	Min.	19.0	7.9	0.4	6.6	5	0.16	0.05	2.00	0.20	500	7
Valdosta STP Outfall	Mean	22.9	8.1	0.8	6.8	6	0.22	0.14	3.50	0.41	20,000	360
											*6,700	*180
S-2, Sugar Creek @ Gornto	Max.	26.5	7.7	4.4	7.1	30	8.40	6.50	2.00	7.68	1,200	860
Rd. Bridge, Downstream	Min.	22.0	6.1	1.6	6.9	19	5.40	4.00	0.67	1.78	7	2
From Valdosta STP Outfall	Mean	25.0	6.9	2.8	7.0	22	6.69	4.90	1.02	3.88	500	180
											*190	*14
W-1, Withlacoochee River @	Max.	24.0	5.3	0.8	6.3	24	0.48	0.05	0.32	1.08	3,100	220
U.S. Hwy. 41, 3-1/2 Miles	Min.	22.0	5.0	0.4	5.9	16	0.26	0.03	0.20	0.42	200	7
Upstream From Sugar Creek	Mean	23.2	5.1	0.6	6.2	20	0.39	0.04	0.27	0.64	1,000	82
Confluence											*620	*50
W-2, Withlacoochee River @	Max.	24.5	4.5	3.6	6.7	21	4.40	2.56	0.45	2.20	215,000	3,900
Ga. Hwy 94, 2-1/2 Miles	Min.	22.0	3.1	0.4	6.4	17	1.76	0.75	0.22	1.00	600	40
Downstream From Confluence	Mean	22.9	3.9	1.6	6.6	19	2.96	2.10	0.29	1.60	57,000	1,200
of Sugar Creek											*8,500	*470
W-3, Withlacoochee River	Max.	24.5	4.9	0.9	7.2	19	0.24	0.06	0.32	0.68	300	20
@ Ga. Hwy. 31, Near Florida-	Min.	23.0	4.5	0.8	6.4	11	0.05	0.05	0.28	0.60	46	10
Georgia State Line	Mean	23.8	4.7	0.8	6.8	15	0.15	0.06	0.30	0.64	170	15
											*120	*14

* Geometric Mean Values

assessment of the cause of the low dissolved oxygen reported at this station can be made.

The Georgia Fertilizer Company is located upstream from the sewage treatment plant and contamination from this plant is indicated by the average nitrate-nitrite concentration of 3.5 mg/l observed at station S-1. Total nitrogen observed at the Sugar Creek sampling station downstream from the plant averaged 12.6 mg/l and total phosphorus averaged 3.88 mg/l. The Withlacoochee River at Georgia Highway 94 also showed an increase in nutrients; however, these values returned to background levels at station W-3.

The average BOD_5 in Sugar Creek increased by 2 mg/l downstream from the Valdosta sewage treatment plant. The unusually heavy dosage of chlorine at the plant combined with a long chlorine contact time chemically reduced the effluent BOD_5 and prevented excessive water quality degradation during the study period. Mean background BOD_5 concentrations in Sugar Creek and the Withlacoochee River were less than 1 mg/l. The BOD_5 of 1.6 mg/l observed at Georgia Highway 94 bridge also reflects the introduction of organic material; however, the BOD_5 values observed near the Georgia-Florida state line were indicative of background values.

The Sugar Creek sampling station upstream from the sewage treatment plant had mean total and fecal coliform bacteria densities of 6,700 and 80/100 ml, respectively. This high total coliform density could be attributable to urban run-off in the Sugar Creek watershed. Downstream from the sewage treatment plant discharge, the bacterial density dropped to 190 and 14/100 ml for total and fecal coliform, respectively. This decrease is a result of the high residual chlorine in the effluent. Background total and fecal coliform densities of 620 and 49/100 ml, respectively, were also low at the control station on the Withlacoochee River. The river at Georgia Highway 94 showed elevated bacterial levels; however, levels in the river near the Georgia-Florida line indicated the bacterial quality of the water was very good.

REFERENCES

1. Manual of Instruction for Operators of Wastewater Treatment Plants, Commonwealth of Pennsylvania, Department of Public Instruction, Public Service Institute, p. 14-2.

2. Recommended Standards for Sewage Works, A Report of Committee of the Great Lakes-Upper Mississippi River Board of Sanitary Engineers, 1971 Revised Edition.

3. Sewerage and Sewage Treatment, Babbit and Bauman, p. 584, 1967.

4. Moore, B., "The Detection of Paratyphoid Carriers in Towns by Means of Sewage Examination," Bulletin Hyg., 24, 187, 1941.

5. Spino, D. F., "Elevated Temperature Technical for the Isolation of Salmonella from Streams." Appl. Microbiology, 14, No. 4, 591, 1966.

6. Edwards, P. R. and W. H. Ewing, Identification of Enterobacteriaceae, Burgess Publication Co., Minneapolis, Minnesota, 1962.

7. Oswald, W. J., "Status of Oxidation Pond Processes," presented at the Southeast Water Laboratory, Athens, Georgia, October 18, 1971.

8. Little, J. A., B. J. Carroll, R. Gentry, "Bacteria Removal in Oxidation Pond," Presented at Second International Symposium for Waste Treatment Lagoons, Kansas City, Missouri, 1970.

9. "Performance Evaluation of Wastewater Treatment Plants", A Manual for the EPA, Contract No. 68-01-0107.

APPENDIX A

PLANT FLOW

PLANT FLOW

The plant's flow records were inaccurate. The flow meter and totalizer were in error and in need of repair and/or replacement. An accurate flow measurement of the plant's discharge was made by:

- Placing a stage recorder in the Parshall flume still well.
- Referencing the water level in the still well to the Parshall flume's flowing depth at the inlet section.

This method of measuring the flow was used for five days. The flow pattern established by this method of measurement and the volume of water discharged were compared to the daily flow charts for the two-week study period. This comparison showed an adjustment of the plant's flow charts of:

- 0.8 MGD to the hourly incremental flows from 0730 to 2230 hours.
- 1.1 MGD to the hourly incremental flows from 2330 to 0730 hours.

The two-week average daily flow was computed at 3.6 MGD. This value was substantiated by stream discharge measurements above and below the plant's outfall in Sugar Creek. The plant and stream flow data are presented on Page A-2.

PLANT AND STREAM FLOW DATA

Location	Date	Time	Flow (MGD) 0730-1530	1530-2330	2330-0730
Plant Effluent	9-18		4.0	4.1	--
Plant Effluent	9-19		3.8	3.8	2.6
Plant Effluent	9-20		4.4	4.4	2.5
Plant Effluent	9-21		4.4	4.3	2.8
Plant Effluent	9-22		*	*	2.6
Plant Effluent	9-23		4.0	4.1	2.4
Plant Effluent	9-24		*	*	2.8
Plant Effluent	9-26		3.4	3.6	*
Plant Effluent	9-27		4.3	4.2	2.2
Plant Effluent	9-28		4.3	4.1	2.2
Plant Effluent	9-29		4.2	4.1	2.4
Plant Effluent	9-30		4.4	4.2	2.4
Plant Effluent	10-1		--	--	2.5
Plant Effluent		Max.	4.4	4.4	2.2
Plant Effluent		Min.	3.4	3.6	2.8
Plant Effluent		Mean	4.1	4.1	2.4
Sugar Creek at Bay Tree Rd. Br.	9-26 10-1	1700 hrs. 1010 hrs.	1.28 0.92		
Sugar Creek at Gornto Rd. Br.	9-26 10-1	1820 hrs. 1100 hrs.	4.14 2.18		

* Electrical Failure at Plant.

APPENDIX B

VALDOSTA CITY SEWER ORDINANCE

AN ORDINANCE REGULATING THE USE OF PUBLIC AND PRIVATE SEWERS AND DRAINS, PRIVATE SEWAGE DISPOSAL, THE INSTALLATION AND CONNECTION OF BUILDING SEWERS, AND THE DISCHARGE OF WATERS AND WASTES INTO THE PUBLIC SEWER SYSTEM(S): AND PROVIDING PENALTIES FOR VIOLATIONS THEREOF: IN THE CITY OF VALDOSTA, COUNTY OF LOWNDES, STATE OF GEORGIA.

Be it ordained and enacted by the Council of the City of Valdosta State of Georgia as follows:

ARTICLE I

Definitions

Unless the context specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

Sec. 1. "BOD" (denoting Biochemical Oxygen Demand) shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five (5) days at 20° C, expressed in milligrams per liter.

Sec. 2. "Building Drain" shall mean that part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer, beginning five (5) feet (1.5 meters) outside the inner face of the building wall.

Sec. 3. "Building Sewer" shall mean the extension from the building drain to the public sewer or other place of disposal.

Sec. 4. "Combined Sewer" shall mean a sewer receiving both surface runoff and sewage.

Sec. 5. "Garbage" shall mean solid wastes from the domestic and commercial preparation, cooking, and dispensing of food, and from the handling, storage, and sale of produce.

Sec. 6. "Industrial Wastes" shall mean the liquid wastes from industrial manufacturing processes, trade, or business as distinct from sanitary sewage.

Sec. 7. "Natural Outlet" shall mean any outlet into a watercourse, pond, ditch, lake, or other body of surface or groundwater.

Sec. 8. "Person" shall mean any individual, firm, company, association, society, corporation, or group.

Sec. 9. "pH" shall mean the logarithm of the reciprocal of the weight of hydrogen ions in grams per liter of solution.

Sec. 10. "Properly Shredded Garbage" shall mean the wastes from the preparation, cooking, and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than one-half (1/2) inch (1.27 centimeters) in any dimension.

Sec. 11. "Public Sewer" shall mean a sewer in which all owners of abutting properties have equal rights, and is controlled by public authority.

Sec. 12. "Sanitary Sewer" shall mean a sewer which carries sewage and to which storm, surface, and groundwaters are not intentionally admitted.

Sec. 13. "Sewage" shall mean a combination of the water-carried wastes from residences, business buildings, institutions, and industrial establishments, together with such ground, surface, and stormwaters as may be present.

Sec. 14. "Sewage Treatment Plant" shall mean any arrangement of devices and structures used for treating sewage.

Sec. 15. "Sewage Works" shall mean all facilities for collecting, pumping, treating, and disposing of sewage.

Sec. 16. "Sewer" shall mean a pipe or conduit for carrying sewage.

Sec. 17. "Shall" is mandatory:; "May" is permissive.

Sec. 18. "Slug" shall mean any discharge of water, sewage, or industrial waste which in concentration of any given constituent or in quantity of flow exceeds for any period of duration longer than fifteen (15) minutes more than five (5) times the average twenty-four (24) hour concentration of flows during normal operation.

Sec. 19. "Storm Drain" (sometimes termed "storm sewer") shall mean a sewer which carries storm and surface waters and drainage, but excludes sewage and industrial wastes, other than unpolluted cooling water.

Sec. 20. "City Engineer" shall mean City Engineer of the City of Valdosta, or his authorized deputy, agent, or representative.

Sec. 21. "Suspended Solids" shall mean solids that either float on the surface of, or are in suspension in water, sewage, or other liquids, and which are removable by laboratory filtering.

Sec. 22. "Watercourse" shall mean a channel in which a flow of water occurs, either continuously or intermittently.

ARTICLE II

Use of Public Sewers Required

Sec. 1. It shall be unlawful for any person to place, deposit, or permit to be deposited in any unsanitary manner on public or private property within the City of Valdosta, or in any area under the jurisdiction of said City, any human or animal excrement, garbage, or other objectionable waste.

Sec. 2. It shall be unlawful to discharge to any natural outlet within the City of Valdosta, or in any area under the jurisdiction of said City, any sewer or other polluted waters, except where suitable treatment has been provided in accordance with subsequent provisions of this ordinance.

Sec. 3. Except as hereinafter provided, it shall be unlawful to construct or maintain any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of sewage.

Sec. 4. The owner of all houses, buildings, or properties used for human occupancy, employment, recreation, or other purposes, situated within the City and abutting on any street, alley, or right-of-way in which there is now located or may in the future be located a public sanitary or combined sewer of the City, is hereby required at his expense to install suitable toilet facilities therein, and to connect such facilities directly with the proper public sewer in accordance with the provisions of this ordinance, within (ninety (90) days) after date of official notice to do so, provided that said public sewer is within two hundred (200) feet (61 meters) of the property lines.

Sec. 5. The owner must connect to the City water system as a prerequisite to receiving sewer service, provided a City water line is within 200 feet (61 meters) of the property line.

ARTICLE III

Private Sewage Disposal

Sec. 1. Where a public sanitary or combined sewer is not available under the provisions of Article II, Section 4, the building sewer shall be connected to a private sewage disposal system complying with the privisions of this article.

Sec. 2. Before commencement of construction of a private sewage disposal system the owner shall first obtain a written permit signed by the Lowndes County Health Officer.

Sec. 3. A permit for a private sewage disposal system shall not become effective until the installation is completed to the satisfaction of the Lowndes County Health Officer. He shall be allowed to inspect the work at any stage of construction and, in any event the applicant for the permit shall notify the Lowndes County Health Officer when the work is ready for final inspection, and before any underground portions are covered. The inspection shall be made within (48) hours of the receipt of notice by the Lowndes County Health Officer.

Sec. 4. The type, capacities, location, andlayout of a private sewage disposal system shall comply with all recommendations of the Department of Public Health of the State of Georgia. No septic tank or cesspool shall be permitted to discharge to any natural outlet.

Sec. 5. At such time as a public sewer becomes available to a property served by a private sewage disposal system, as provided in Article II, Section 4, a direct connection shall be made to the public sewer in compliance with this ordinance, and any septic tanks, cesspools, and similar private sewage disposal facilities shall be abandoned and filled with suitable material.

Sec. 6. The owner shall operate and maintain the private sewage disposal facilities in a sanitary manner at all times, at no expense to the City.

Sec. 7. No statement contained in this article shall be construed to interfere with any additional requirements that may be imposed by the Health Officer.

Sec. 8. When a public sewer becomes available, the building sewer shall be connected to said sewer within ninety (90) days, and the private sewage disposal system shall be cleaned of sludge and filled with clean bank-run gravel or dirt.

ARTICLE IV

Building Sewers and Connections

Sec. 1. No unauthorized person shall uncover, make any connections with or opening into, use, alter, or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the City Engineer.

Sec. 2. There shall be two (2) classes of building sewer permits: (a) for residential and commercial service, and (b) for service to establishments producing industrial wastes. In either case, the owner or his agent shall make application on a special form furnished by the City. The permit application shall be supplemented by any plans, specifications, or other information considered pertinent in the judgement of the City

Engineer. A permit and inspection fee of Five (5) dollars for a residential or commercial building sewer permit and twenty-five (25) dollars for an industrial building sewer permit shall be paid to the City at the time the application is filed.

All residential and commercial permit applications shall be submitted to the Water and Sewer Director, who will review, and, if in order, will approve and forward one copy to Customer Service, one copy to County Health Officer, one copy to the Plumbing Inspector, and one copy to the applicant. All industrial permit applications shall be submitted to the City Engineer, who shall review, and if approved distribute copies as for residential and commercial permits. Any person discharging industrial wastes into the public sewer system at the time of passage of this ordinance, shall submit a permit application, in the required form, within one year from the date of passage of this ordinance. The Customer Service Department shall not accept payment for sewer taps unless approved by the Water and Sewer Director or the City Engineer as privided herein.

Sec. 3. All costs and expense incident to the installation and connection of the building sewer shall be borne by the owner. The owner shall indemnify the City from any loss or damage that may directly or indirectly be occasioned by the installation of the building sewer.

Sec. 4. A separate and independent building sewer shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court yard, or driveway, the building sewer from the front building may be extended to the rear building and the whole considered as one building sewer, provided both buildings are under the same ownership.

Sec. 5. Old building sewers may be used in connection with new buildings only when they are found, on examination and test by the City Engineer to meet all requirements of this ordinance.

Sec. 6. The size, slope, alignment, materials of construction of a building sewer, and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling the trench, shall all conform to the requirements of the building and plumbing code or other applicable rules and regulations of the City and State. In the absence of code provisions or in amplification thereof, the materials and procedures set forth in appropriate specifications of the A.S.T.M. and W.P.C.F. Manual of Practice No. 9 shall apply.

Sec. 7. Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain shall be lifted by an approved means and discharged to the building sewer.

Sec. 8. No person shall make connection of roof downspouts, exterior foundation drains, areway drains, or other sources of surface runoff or groundwater to a building sewer or building drain which in turn is connected directly or indirectly to a public sanitary sewer.

Sec. 9. The connection of the building sewer into the public sewer shall conform to the requirements of the building and plumbing code or other applicable rules and regulations of the City, or the procedures set forth in appropriate specifications of the A.S.T.J. and the W.P.C.F. Manual of Practice No. 9. All such connections shall be made gastight and watertight. Any deviation from the prescribed procedures and materials must be approved by the City Engineer before installation.

Sec. 10. The applicant for the building sewer permit shall notify the City Plumbing Inspector when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made under the supervision of the City Plumbing Inspector or his representative.

Sec. 11. All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the City Engineer.

ARTICLE V

Use of the Public Sewers

Sec. 1. No person shall discharge or cause to be discharged any stormwater, surface water, groundwater, roof runoff, subsurface drainage, uncontaminated cooling water, or unpolluted industrial process waters to any sanitary sewer.

Sec. 2. Stormwater and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as combined sewers or storm sewer, or to a natural outlet approved by the City Engineer. Industrial cooling water or unpolluted process waters may be discharged, on approval of the City Engineer, to a storm sewer, combined sewer, or natural outlet.

Sec. 3. No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewers:

(a) Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas.

(b) Any waters or wastes containing toxic or poisonous solids, liquids, or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage treatment process, constitute a hazard to humans or animals, create a public nuisance, or create any hazard in the receiving waters of the sewage treatment plant, including but not limited to cyanides in excess of two (2) mg/l as CN in the Wastes as discharged to the public sewer.

(c) Any waters or wastes having a pH lower than 5.5, or having any other corrosive property capable of causing damage or hazard to structures, equipment, and personnel of the sewage works.

(d) Solid or viscous substances in quantities or of such size capable of causing obstructions to the flow in sewers, or other interference with the proper operation of the sewage works such as, but not limited to, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, unground garbage, whole blood, paunch manure, hair and fleshings, entrails andpaper dishes, cups, milk containers, etc. either whole or ground by garbage grinders.

Sec. 4. No person shall discharge or cause tobe discharged the following described substances, materials, waters, or wastes if it appears likely in the opinion of the City Engineer that such wastes canharm either the sewers, sewage treatment process, or equipment, have an adverse effect on the receiving stream, or can otherwise endanger life, limb, public property, or constitute a nuisance. In forming his opinion as to the acceptability of these wastes, the City Engineer will give consideration to such factors as the quantities of subject wastes in relation to flows and velocities in the sewers, materials of construction of the sewers, nature of the sewage treatment process, capacity of the sewage treatment plant, degree of treatability of wastes in the sewage treatment plant, and other pertinent factors. The substances prohibited are:

(a) Any liquid or vapor having a temperature higher than one hundred fifty (150) °F (65° C).

(b) Any water or waste containing fats, wax, grease, or oils, whether emulsified or not, in excessof one hundred (100) mg/l or containing substances which may solidify or become viscous at temperatures between thirty-two (32) and one hundred fifty (150) °F (0 and 65° C).

(c) Any garbage that has not been properly shredded. The installation and operation of any garbage grinder equipped with a motor of three-fourths (3/4) horsepower (0.76 hp metric) or greater shall be subject to the review and approval of the City Engineer.

(d) Any waters or wastes containing strong acid iron pickling wastes, or concentrated plating solutions whether neutralized or not.

(e) Any waters or wastes containing iron, chromium, copper, zinc, and similar objectionable or toxic substances; or wastes exerting an excessive chlorine requirement, to such degree that any such material received in the composite sewage at the sewage treatment works exceeds the limits established by the City Engineer for such materials, as listed below.

The limits fixed herein may be used as a guide in design and plant control, but may be altered by the City Engineer in the event of a cumulative overload on a particular drainage basin or the sewage treatment plant.

Fixed Upper Limits for Constituents	Parts Per Million by Weight
Cadmium	5.0
Chromium	3.0
Copper	3.0
Cyanide	0.0
Nickel	0.1
Silver	5.0
Tin	5.0
Zinc	3.0
Phenol	0.5

(f) Any waters or wastes containing phenols or other taste or odor-producing substances, in such concentrations exceeding limits which may be established by the City Engineer as necessary, after treatment of the composite sewage, to meet the requirements of the State, Federal, or other public agencies of jurisdiction for such discharge to the receiving waters.

(g) Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the City Engineer in compliance with applicable State or Federal regulations.

(h) Any waters or wastes having a pH in excess of (9.5).

(i) Materials which exert or cause:

(1) Unusual Concentrations of insert suspended solids (such as, but not limited to, Fullers earth, lime slurries, and lime residues) or if dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate).

(2) Excessive discoloration (such as, but not limited to, dye wastes and vegetable tanning solutions).

(3) Unusual BOD, chemical oxygen demand, or chlorine requirement, in such quantities as to constitute a significant load on the sewage treatment works.

(4) Unusual volume of flow or concentration of wastes constituting "slugs" as defined herein.

(j) Waters or wastes containing substances which are not amenable to treatment or reduction by the sewage treatment processes employed or are amenable to treatment only to such degree that the sewage treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters

Sec. 5. If any waters or wastes are discharged, or are proposed to be discharged to the public sewers, which waters contain the substances or posses the characteristics enumerated in Section 4 of this Article, and which in the judgement of the City Engineer, may have a deleterious effect upon the sewage works, processes, equipment, or receiving waters, or which otherwise create a hazard to life or constitute a public nuisance, the City Engineer may:

(a) Reject the wastes

(b) Require pretreatment to an acceptable condition for discharge to the public sewers

(c) Require control over the quantities and rates of discharge and/or

(d) Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges under the provisions of Article X of this Ordinance

(e) Require any combination of (b), (c) and (d) above

If the City Engineer permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the City Engineer, and subject to the requirements of all applicable codes, ordinances, and laws.

Sec. 6. Grease, oil, and sand interceptors shall be provided when, in the opinion of the City Engineer, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand, or other harmful ingredients; except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of a type and capacity approved by the City Engineer, and shall be located as to be readily and easily accessible for cleaning and inspection.

Sec. 7. Where preliminary treatment or flow-equalizing facilities are provided for any waters or wastes, they shall be maintained continously in satisfactory and effective operation by the owner at his expense.

Sec. 8. When required by the City Engineer, the owner of any property serviced by a building sewer carrying industrial wastes shall install a suitable control manhole together with such necessary meters and other appurtenances in the building sewer to facilitate observation, sampling, and measurement of the wastes. Such manhole, when required, shall be accessibly and safely located, and shall be constructed in accordance with plans approved by the City Engineer. The manhole shall be installed by the owner at his expense, and shall be maintained by him so as to be safe and accessible at all times.

Sec. 9. All measurements, tests, and analyses of the characteristics of waters and wastes to which reference is made in this ordinance shall be determined in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater", published by the American-Public Health Association, and shall be determined at the control manhole provided, or upon suitable samples taken at said control manhole. In the event that no special manhole has been required, the control manhole shall be considered to be the nearest downstream manhole in the public sewer to the point at which the building sewer is connected. Sampling shall be carried out by customarily accepted methods to reflect the effect of constituents upon the sewage works and to determine the existence of hazards of life, limb, and property, (The particular analyses involved will determine whether a twenty-four (24) hour composite of all outfalls of a premise is appropriate or whether a grab sample or samples should be taken. Normally, but not always, BOD and suspended solids analyses are obtained from 24 hour composites of all outfalls whereas pH's are determined from periodic grab samples).

Sec. 10. No statement contained in this article shall be construed as preventing any special agreement or arrangement between the City and an industrial concern whereby an industrial waste of unusual strength or character may be accepted by the City for treatment, subject to payment therefor, by the industrial concern, as provided in Article X of this ordinance.

ARTICLE VI

Protection from Damage

Sec. 1. No unauthorized person shall maliciously, willfully, or negligently break, damage, destroy, uncover, deface, or tamper with any structure, appurtenance, or equipment which is a part of the sewage works. Any person violating this provision shall be subject to immediate arrest under charge of disorderly conduct.

ARTICLE VII

Powers and Authority of Inspectors

Sec. 1. The City Engineer and other duly authorized employees of the City, bearing proper credentials and identification, shall be permitted to enter all properties for the purposes of inspection, observation, measurement, sampling, and testing in accordance with the privisions of this ordinance. The City Engineer or his representatives shall have no authority to inquire into any processes including metallurgical, chemical, oil, refining, ceramic, paper, or other industries beyond that point bearing on the kind and source of discharge to the sewers or waterways or facilities for waste treatment.

Sec. 2. While performing the necessary work on private properties referred to in Article VII, Section I above, the City Engineer or duly authorized employees of the City shall observe all safety rules applicable to the premises established by the company.

Sec. 3. The City Engineer and other duly authorized employees of the City bearing proper credentials and identification shall be permitted to enter all private properties through which the City holds a duly negotiated easement for the purposes of, but not limited to inspection, observation, measurement, sampling, repair, and maintenance of any portion of the sewage works lying within said easement. All entry and subsequent work, if any, on said easement shall be done in full accordance with the terms of the duly negotiated easement pertaining to the private property involved.

ARTICLE VIII

Penalties

Sec. 1. Any person found to be violating any provision of this ordinance except Article VI shall be served by the City with written notice stating the nature of the violation and providing a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in such notice, permanently cease all violations.

Sec. 2. Any person who shall continue any violation beyond the time limit provided for in Article VIII, Section I, shall be guilty of a misdemeanor, and or conviction thereof shall be fined in the amount not exceeding fifty (50) dollars for each violation. Each day in which any such violatinn shall continue shall be deemed a separate offense.

Sec. 3. Any person violating any of the provisions of this ordinance shall become liable to the City for any expense, loss, or damage occasioned the City by reason of such violation.

ARTICLE IX

Validity

Sec. 1. All ordinances or parts of ordinances in conflict herewith are hereby repealed. Specifically, Sections 31-28 through 31-34 of the Valdosta City Code is hereby repealed.

Sec. 2. The invalidity of any section, clause, sentence, or provision of this ordinance shall not affect the validity of any other part of this ordinance which can be given effect without such invalid part or parts.

ARTICLE X

Industrial Sewer Surcharges

Sec. 1. As provided in Article V, Section 10, Industrial Waste may be accepted into the Public Sewers, even though such waste does not meet the requirements of Article V, if the City Engineer determines that said waste can be accepted without adverse effect on the City Sewage Works. Provided, however, that the person discharging such waste shall be charged and assessed a surcharge, in addition to any sewer service charges, if the wastes have a concentration greater than the following "normal" concentration.

(a) A BOD of 250 parts per million

(b) A suspended solids content of 250 parts per million

Sec. 2. When either or both total suspended solids and BOD of Industrial Waste accepted for admission to the City Sewage Works exceeds the values of these constituents for normal sewage, the excess concentration in either or both, as the case may be, shall be evaluated in terms of normal sewage, and shall be subject to a surcharge derived in accordance with the following formula;

$$\text{Surcharge} = \frac{\frac{A}{250} + \frac{B}{250}}{2} \times C$$

Where: A = BOD in parts per million

B = Suspended solids in parts per million

C = Normal sewer service charge calculated in accordance with existing rates

Note: The values of $\frac{A}{250}$ and/or $\frac{B}{250}$ shall in no case be less than unity.

Sec. 3. Billing procedure. Industrial waste surcharges provided for in this article shall be prepared and rendered with the regular water bill.

Sec. 4. The volume of flow used in computing industrial waste surcharges shall be based upon metered, estimated, or prorated water consumption as shown in the records of the City Water Department. In the event that a person discharging waste into the City Sanitary Sewer System produces evidence that a significant portion of the total volume of water used for all purposes does not reach the City sanitary sewer, an estimated percentage of total water consumption to be used in computing charges may be agreed upon between the City Engineer and the person discharging industrial waste into said sewer. If unmetered water supplies are used by the person discharging industrial wastes into the City sanitary sewer, or in the event that a reasonable approximation of flows cannot be obtained otherwise, the volume of flows shall be determined by actual measurement, utilizing a flow meter provided by the person discharging the industrial waste, and approved by the City Engineer. Measurements of flow shall be taken and recorded for a period of not less than seven days, and repeated every six months.

Sec. 5. The industrial waste of each person discharging same into the City sanitary sewers shall be subject to periodic inspection and a determination of character and concentration of said waste shall be made semi-annually, or more often, as may be deemed necessary by the City Engineer. Samples shall be collected in such a manner as to be representative of the actual quality of the waste, as provided in Article V, Section 9 of this ordinance.

ARTICLE XI

Ordinance in Force

Sec. 1. This ordinance shall be in full force and effect from and after its passage, approval, recording, and publication as provided by law.

Sec. 2. BE IT ORDAINED by the Mayor and Council of the City of Valdosta, and it is hereby ordained by the authority of the same, that ______

____

SO ORDAINED, this ____7th______ day of April______________, 1971.

APPENDIX C

STUDY DATA

INFLUENT DATA
VALDOSTA SEWAGE TREATMENT PLANT
STATION NO. VP-1

Date	Time	Flow (MGD)	pH	BOD (mg/1)	COD (mg/1)	TOC (mg/1)	SOLIDS Settleable (mg/1)	SOLIDS Suspended (mg/1)	SOLIDS Volatile Susp. (mg/1)	TKN (mg/1)	NH_3 (mg/1)	NO_2-NO_3 (mg/1)	Total Phosphorus (mg/1)
9/19/71	1700-2400	3.8 1/	6.6	174 1/		75 1/							
9/19/71-9/20/71	1700-0800						7.0	648	544	17.3	11.5	0.05	
9/20/71	2400-0800	2.6	6.8	139		70							
	0800-1600	4.4	7.1	280	1040	180							
	1600-2400	4.4	6.8	240	1465	175							
WEIGHTED MEAN		3.8		232	1252 1/	153							
9/20/71-9/21/71	0800-0800							1008	788	13.5	8.50	0.04	10.57
9/21/71	2400-0800	2.5	7.0	109	1630	51							
	0800-1600	4.4	6.9	220	507	80							
	1600-2400	4.3	6.8	200	694	130							
WEIGHTED MEAN		3.7		188	829	93							
9/21/71	0800-2300						11.0	390	320	20.1	13.5	0.78	12.60
	2400-0800	2.8											
9/22/71	0800-1600		6.9	210		120							
	1600-2400		6.8	190		130							
WEIGHTED MEAN		2.8 1/		200 1/		125 1/							
9/22/71-9/23/71	0800-0800						6.0	490	480	18.2	12.5	0.47	9.90
9/23/71	2400-0800	2.6	6.9	115		140							
	0800-1600	4.0	7.0	172	660	330							
	1600-2400	4.1	7.0	160	570	90							
WEIGHTED MEAN		3.6		154	614 1/	192							
9/23/71-9/24/71	0800-0800						10.0	520	500	19.7	12.5	0.97	10.50
9/24/71	2400-0800	2.4	6.9	89	421	65							
WEIGHTED MEAN		2.4 1/		89 1/	421 1/	65 1/							
9/26/71	0800-1600	3.4	6.9	125	472	240							
	1600-2400	3.6	6.9	149	696	95							
WEIGHTED MEAN		3.5 1/		137 1/	587 1/	165 1/							
9/26/71-9/27/71	0800-0800						11.0	70	40	19.3	13.5	0.97	9.80
9/27/71	2400-0800		7.0	76	392	90							
	0800-1600	4.3	6.9	245	752	130							
	1600-2400	4.2	6.8	182	1170	140							
WEIGHTED MEAN		4.2 1/		184	834	125							
9/27/71-9/28/71	0800-0800						8.5	300	220	17.6	11.5	<0.01	10.67
9/28/71	2400-0800	2.2	6.8	122	729	115							
	0800-1600	4.3	6.7	250		93							
	1600-2400	4.1	6.8	280	1180	92							
WEIGHTED MEAN		3.5		235	1023 1/	97							
9/28/71-/29/71	0800-0800						9.0	380	290	16.8	12.5	<0.01	10.90
/29/71	2400-0800	2.2	6.8	116	1150	43							
	0800-1600	4.2	6.7	280		175							
	1600-2400	4.1	6.7	270		120							
WEIGHTED MEAN		3.5		242	1150 1/	126							
/29/71-/30/71	0800-0800							980	870	18.0	13.5	0.02	9.80
/30/71	2400-0800	2.4	6.8	108		51							
	0800-1600	4.4	6.8	171		94							
	1600-2400	4.2	6.7	230		170							
WEIGHTED MEAN		3.7		180		114							
/30/71-0/01/71	0800-0800						14.0	380	330	14.5	10.0	0.04	9.20
0/01/71	2400-0800	2.4	6.8	89		58							
WEIGHTED MEAN		2.4 1/		89 1/		58 1/							
MEAN		3.6		202	832	129	9.6	517	438	17.5	11.9	0.34	10.37
MAXIMUM		3.8		242	834	192	14.0	1008	870	20.1	13.5	0.97	12.60
MINIMUM		3.5		154	829	93	6.0	70	40	13.5	8.5	<0.01	9.20

TE: BOD, TOC, and COD are flow weighted daily means.
Values not included in mean for study period.

EFFLUENT DATA
VALDOSTA SEWAGE TREATMENT PLANT

STATION NO. VP-7

Date	Time	Flow (MGD)	pH	BOD (mg/l)	COD (mg/l)	TOC (mg/l)	SOLIDS Settleable (mg/l)	SOLIDS Suspended (mg/l)	SOLIDS Volatile Susp. (mg/l)	Total Phosphorus (mg/l)	TKN (mg/l)	NH_3 (mg/l)	NO_2-NO_3 (mg/l)	Total Chlorine Residual[1/] (mg/l)
9/20/71	0800-1600	4.4	7.3	42	88	36								
	1600-2400	4.4	7.4	56	104	40								
WEIGHTED MEAN		4.4[2/]		49[2/]	96[2/]	38[2/]								
9/20/71	1700													2.0
9/20/71-9/21/71	0800-0800							128	44	6.92	10.8	8.0	0.04	
9/21/71	2400-0800	2.5	7.3	50	112	40								
	0800-1600	4.4	7.0	50	272	76								
	1600-2400	4.3	7.0	44	160	86								
WEIGHTED MEAN		3.7		48	193	71								
9/21/71	1150													1.5
	1350													1.5
	1600													1.5
9/21/71-9/22/71	0800-0800						0.8	100	68	6.62	10.1	7.5	0.04	
9/22/71	2400-0800	2.8	7.2	46	156	33								
	0800-1600	4.1[4/]	7.0	54		18								
	1600-2400	4.1[4/]	7.1	48		36								
WEIGHTED MEAN		3.7[2/]		50[2/]	156[2/]	36[2/]								
9/22/71	0850													>2.0
	1600													2.0
9/22/71-9/23/71	0800-0800						0.3	68	68	6.47	10.0	7.5	0.03	
9/23/71	2400-0800	2.6	7.1	30		26								
	0800-1600	4.0	7.0	44	96	31								
	1600-2400	4.1	7.1	42	102	31								
WEIGHTED MEAN		3.6		40	75[2/]	30								
9/23/71	0820													>2.0
	1625													>2.0
9/23/71-9/24/71	0800-0800						1.4	52	52	4.0	9.6	7.0	0.03	
9/24/71	2400-0800	2.4	7.2	40	80	22								
WEIGHTED MEAN		2.4[2/]		40[2/]	80[2/]	22[2/]								
9/24/71	0850													>2.0
	1230													>2.0
	1530													>2.0
9/26/71	0800-1600	3.4	6.9	38	120	35								
	1600-2400	3.6	7.0	32	108	31								
WEIGHTED MEAN		3.5[2/]		35[2/]	114[2/]	33[2/]								
9/26/71-9/27/71	0800-0800						0.5	24	24	3.43	9.1	7.5	0.04	
9/27/71	2400-0800	2.5[6/]	7.1	44	156	41								
	0800-1600	4.3	7.1	38	180	33								
	1600-2400	4.2	7.1	52	136	30								
WEIGHTED MEAN		3.7		45	158	34								
9/27/71	0820													<0.1
	1220													1.5
	1410													>1.5
	1610													>1.5
9/27/71-9/28/71	0800-0800						1.0	72	60	9.05	11.1	9.0	0.69	
9/28/71	2400-0800	2.2	7.0	15	168	40								
	0800-1600	4.3	7.1	53	144	31								
	1600-2400	4.1	7.2	43	104	25								
WEIGHTED MEAN		3.5		41	136	31								
9/28/71	0800													>2.0
	1000													>1.5
	1210													>1.5
9/28/71-9/29/71	0800-0800						0.2	68	40	9.3	10.4	10.0	0.31	
9/29/71	2400-0800	2.2	7.2	50	180	28								
	0800-1600	4.2	7.0	85		31								
	1600-2400	4.1	7.0	66		25								
WEIGHTED MEAN		3.5		70	180[2/]	28								
9/29/71	1200													2.9
9/29/71-9/30/71	0800-0800							80	48	9.5	10.6	9.5	0.42	
9/30/71	2400-0800	2.6	6.5	<10[3/]		33								
	0800-1600	4.5	7.0	37		38								
	1600-2400	4.2	7.1	50		35								
WEIGHTED MEAN		3.7		57		35								
9/30/71	1400													>1.5
9/30/71-10/1/71	0800-0800						Trace	8.0	8.0	7.2	8.0	6.5	0.17	
10/1/71	2400-0800	2.4	7.1	33		32								
WEIGHTED MEAN		2.4[2/]		33[2/]		32[2/]								
MEAN		3.6		50	162	38	0.7	67	46	6.9	10.0	8.1	0.20	
MAXIMUM		4.4		70	193	73	1.4	128	68	9.5	10.8	10.0	0.69	
MINIMUM		3.5		35	75	28	0.2	8	8	3.43	8.0	6.5	0.03	
Wt. Loaded #/day Avg.				1500	4960	1140								

NOTE: BOD, TOC, AND COD are flow weighted daily means.

1/ Total chlorine residual values were collected at Station VP-8, which is after the chlorine contact tank. All other values are for Station VP-7, which is before the chlorine contact tank.

2/ Values not included in mean for study period.

3/ No depletion - possible toxicity.

4/ Average flow for indicated time period.

INFLUENT WASTEWATER CHARACTERISTICS
VALDOSTA ACTIVATED SLUDGE PLANT

Date 1971	Flow Avg. MGD	BOD 1/ (mg/l)	BOD 1/ (#/day)	COD 1/ (mg/l)	COD 1/ (#/day)	TOC 1/ (mg/l)	TOC 1/ (#/day)	Solids: Settleable (ml/l)	Solids: Susp. (mg/l)	Solids: Vol. (mg/l)	Nitrogenous Comp. (N): TKN (mg/l)	Nitrogenous Comp. (N): NH_3 (mg/l)	Nitrogenous Comp. (N): NO_2+NO_3 (mg/l)	Total Phos. (mg/l)
9/19 2,3,4/	3.8	174	5,510			75	2,380	7.0	648	544	17.3	11.5	0.05	
9/20 4/	3.8	232	7,320	1252	39,680	153	4,850		1,008	788	13.5	8.5	0.04	10.57
9/21	3.7	188	5,770	829	25,580	93	2,870	11.0	390	320	20.1	13.5	0.78	12.60
9/22 2,3,4/	2.8	200	6,840			125	4,270	6.0	490	480	18.2	12.5	0.47	9.90
9/23 4/	3.6	154	4,600	614	18,430	192	5,760	10.0	520	500	19.7	12.5	0.97	10.50
9/24 2,3,4/	2.4	89	1,780	421	8,430	65	1,300							
9/26 2,3,4/	3.5	137	4,000	587	17,130	165	4,820	11.0	70	40	19.3	13.5	0.97	9.80
9/27 2/	4.1	184	5,500	834	25,000	125	3,750	8.5	300	220	17.6	11.5	<0.01	10.67
9/28 4/	3.5	235	6,830	1023	29,860	97	2,830	9.0	380	290	16.8	12.5	<0.01	10.30
9/29 4/	3.5	242	7,030	1150	33,570	126	3,680		980	870	18.0	13.5	0.02	9.80
9/30 4/	3.7	180	5,530			114	3,520	14.0	380	330	14.5	10.0	0.04	9.20
10/1 2,3,4/	2.4	89	1,780			58	1,160							
Mean	3.6	202	6,060	832	25,000	129	3,880	9.6	517	438	17.5	11.9	0.34	10.37
Max	3.8	242	7,320	834	25,580	192	5,760	14.0	1,008	870	20.1	13.5	0.97	12.60
Min	3.5	154	4,600	829	25,000	93	2,830	6.0	70	40	13.5	8.5	<0.01	9.20

1/ Concentrations are flow weighted averages from 8-hour composite samples.
2/ Not included in flow mean, max, and min; insufficient data.
3/ Not included in BOD_5 and TOC mean, max, and min; insufficient data.
4/ Not included in COD mean, max, and min; insufficient data.

NOTE: Solids concentrations are results of a 24-hour composite sample. Metals concentrations represent grab sample collected once daily.

EFFLUENT WASTEWATER CHARACTERISTICS
VALDOSTA ACTIVATED SLUDGE PLANT

Date 1971	Flow (MGD)	BOD_5 (mg/1)	COD (mg/1)	TOC (mg/1)	Solids: Settleable (ml/1)	Solids: Susp (mg/1)	Solids: Vol (mg/1)	Nitrogenous Comp. (N): TKN (mg/1)	Nitrogenous Comp. (N): NH_3 (mg/1)	Nitrogenous Comp. (N): NO_2+NO_3 (mg/1)	Total Phos (mg/1)
9/20 1/	4.4	49	96	38	--	128	44	10.8	8.00	0.04	6.92
9/21	3.7	48	193	73	0.8	100	68	10.1	7.5	0.04	6.62
9/22 1/	3.7	50	156	36	0.3	68	68	10.1	7.5	0.03	6.47
9/23 2/	3.6	40	75	30	1.4	52	52	9.6	7.0	0.03	4.0
9/24 1/	2.4	40	80	22	--	--	--	--	--	--	--
9/26 1/	3.5	35	114	33	0.5	24	24	9.1	7.5	0.04	3.43
9/27	3.7	45	158	34	1.0	72	60	11.1	9.0	0.69	9.05
9/28	3.5	41	134	31	0.2	68	40	10.4	10.0	0.31	9.3
9/29 2/	3.5	70	180	28	--	80	48	10.6	9.5	0.42	9.5
9/30	3.7	57	--	35	--	8	8	8.0	6.5	0.17	7.2
10/1 1/	2.4	33	--	32	--	--	--	--	--	--	--
Mean	3.6	50	162	38	0.7	67	46	10.0	8.1	0.20	6.9
Max	4.4	70	193	73	1.4	128	68	10.8	10.0	0.69	9.5
Min	3.5	35	75	28	0.2	8	8	8.0	6.5	0.03	3.43
Avg Wt Loaded (lbs/day)		1,500	4,960	1,140							

NOTE: BOD, TOC, and COD Avg Weight Loaded Averages.
1/ Not included in flow, BOD, COD, TOC mean.
2/ Not included in COD mean.

DATA FROM MID-POINT OF AERATION BASIN NO. 1
VALDOSTA SEWAGE TREATMENT PLANT
SAMPLING STATION A-1

Date	Time	pH	Dissolved Oxygen (mg/l)	Percent Settleable Solids	Suspended Solids (mg/l)	SVI
9/20/71	1535	--	1.0	12	875	
9/21/71	1030	--	0.0	43	2,340	184
	1325	6.9	0.2	36.5	2,110	173
	1640	7.0	0.6	33	--	--
9/22/71	0835	7.0	0.7	36.5	2,486	147
	1150	--	0.3	29.5	--	--
	1530	7.1	0.4	25	1,791	140
9/23/71	0840	7.0	0.7	30	2,063	145
	1240	7.0	0.4	20.5	1,451	141
	1650	7.0	0.7	48.5	--	--
9/24/71	0825	7.1	0.7	46	2,795	165
	1205	6.6	1.0	41	--	--
	1515	7.1	0.5	37	2,684	138
9/27/71	0935	6.9	0.6	95	4,095	232
	1210	6.9	0.0	97	--	--
	1630	7.0	--	99	4,891	--
9/28/71	0935	7.0	0.0	98	5,206	188
	1230	6.8	0.0	98	--	--
	1750	6.9	--	98	4,944	198
9/29/71	0730	6.9	--	96.5	5,015	192
	1530	6.9	0.1	96.5	6,110	158
9/30/71	1000	6.9	0.0	99	4,599	215
	1550	--	--	32	2,033	157
	MEAN	--	0.4	60.7	3,413	172
	MAXIMUM	7.1	1.0	99.0	6,110	232
	MINIMUM	6.9	0.0	20.5	1,451	138

DATA FROM MID-POINT OF AERATION BASIN NO. 2
VALDOSTA SEWAGE TREATMENT PLANT
SAMPLING STATION A-2

Date	Time	pH	Dissolved Oxygen (mg/1)	Percent Settleable Solids	Suspended Solids (mg/1)	SVI
9/20/71	1537	--	1.3	13	802	
9/21/71	1031	--	1.0	15.5	1,099	141
	1326	7.1	0.8	12	1,906	63
	1641	7.0	1.0	9	--	--
9/22/71	0836	7.1	2.9	13.5	1,174	115
	1151	--	1.2	10.5	--	--
	1531	7.2	0.4	9	641	140
9/23/71	0841	7.0	2.4	13	938	139
	1241	7.2	1.5	8.0	654	122
	1651	7.1	0.6	18	--	--
9/24/71	0826	7.0	2.5	16	1,187	135
	1206	6.8	0.7	14	--	--
	1516	7.1	0.7	14	1,241	113
9/27/71	0936	6.9	0.9	16	2,325	69
	1211	7.0	0.6	17	--	--
	1631	7.1	0.5	16	1,234	130
9/28/71	0936	7.0	0.6	15	1,100	136
	1231	7.0	0.7	13.5	--	--
	1751	7.2	1.1	11	915	120
9/29/71	0731	6.9	2.7	17	1,274	133
	1531	7.1	0.8	11	980	112
9/30/71	1001	7.0	1.6	18	1,195	151
	1551	--	--	35	2,146	157
	MEAN	--	1.2	14.5	1,244	124
	MAXIMUM	7.2	2.9	32.0	2,325	157
	MINIMUM	6.8	0.4	8.0	641	69

DATA FROM MID-POINT OF AERATION BASIN NO. 3
VALDOSTA SEWAGE TREATMENT PLANT

SAMPLING STATION A-3

Date	Time	pH	Dissolved Oxygen (mg/1)	Percent Settleable Solids	Suspended Solids (mg/1)	SVI
9/20/71	1539	--	1.6	13	956	
9/21/71	1032	--	0.8	45	1,784	252
	1327	7.1	0.5	35	1,297	270
	1642	7.0	1.1	29	--	--
9/22/71	0837	7.2	0.5	36.5	2,000	182
	1152	--	0.3	30	--	--
	1532	7.3	0.3	22	1,152	191
9/23/71	0842	7.1	0.3	41	2,106	195
	1242	7.1	0.5	25	1,398	179
	1652	7.1	0.4	28.5	--	--
9/24/71	0827	7.1	0.3	37	2,129	174
	1207	7.0	1.0	34	--	--
	1517	7.2	0.5	34	2,017	169
9/27/71	0937	7.1	0.9	39	2,400	162
	1212	7.1	0.5	37.5	--	--
	1632	7.1	0.4	34	1,989	171
9/28/71	0937	7.2	0.3	34	2,007	169
	1232	7.1	0.4	28.5	--	--
	1752	7.2	0.6	25	1,325	189
9/29/71	0732	7.0	0.8	40	2,264	177
	1532	7.1	0.7	24	1,535	156
9/30/71	1002	7.3	0.4	45	2,376	189
	1552	--	--	53	2,611	203
	MEAN	--	0.5	34.4	1,899	189
	MAXIMUM	7.3	1.1	53.0	2,611	270
	MINIMUM	7.0	0.3	22.0	1,152	156

DATA FROM MID-POINT OF AERATION BASIN NO. 4
VALDOSTA SEWAGE TREATMENT PLANT

SAMPLING STATION A-4

Date	Time	pH	Dissolved Oxygen (mg/1)	Percent Settleable Solids	Suspended Solids (mg/1)	SVI
9/21/71	1033	--	0.8	31.5	1,500	210
	1328	7.1	0.3	29.5	2,233	132
	1643	7.0	1.1	26	--	--
9/22/71	0838	7.2	0.6	29	1,610	180
	1153	--	0.3	24	--	--
	1533	7.2	0.5	21.5	1,010	213
9/23/71	0843	7.1	0.5	31	1,643	189
	1243	7.1	0.5	22	1,276	172
	1653	7.1	0.6	25.5	--	--
9/24/71	0828	7.1	0.5	29	1,810	160
	1208	7.0	0.9	30	--	--
	1518	7.2	0.4	31	2,110	147
9/27/71	0938	7.1	0.6	48	2,302	208
	1213	7.2	0.4	46	--	--
	1633	7.0	0.4	41	2,217	185
9/28/71	0938	7.1	0.3	39	2,200	177
	1233	7.1	0.4	34	--	--
	1753	7.2	0.3	30	1,572	191
9/29/71	0733	7.0	0.7	45	2,477	182
	1533	7.1	0.8	31	1,817	171
9/30/71	1003	7.1	0.5	54	2,662	203
	1553	--	--	46	2,125	216
	MEAN	--	0.5	33.8	1,910	184
	MAXIMUM	7.2	1.1	54.0	2,662	216
	MINIMUM	7.0	0.3	21.5	1,010	132

AERATION BASIN EFFLUENT DATA
VALDOSTA SEWAGE TREATMENT PLANT
STATION NO. VP-5

Date	Time	pH	BOD (mg/1)	COD (mg/1)	SOLIDS Settleable (Percent)	Suspended (mg/1)	Vol. Susp. (mg/1)
9/19/71	1600-2400	--	480	--	--	--	--
9/19-20	1700-0700	--	--	--	55	1,670	1,333
9/20/71	2400-0800	--	>540	--	--	--	--
	0800-1600	6.9	480	2,000	--	--	--
	1600-2400	6.8	460	3,160	--	--	--
9/20-21	0800-0800	--	--	--	--	1,470	700
9/21/71	2400-0800	6.9	640	3,040	--	--	--
	0800-1600	6.8	--	3,110	--	--	--
	1600-2400	6.8	--	3,000	--	--	--
9/21-22	0800-0800	--	--	--	28	2,320	1,840
9/22/71	2400-0800	6.9	--	2,900	--	--	--
	0800-1600	6.7	--	--	--	--	--
	1600-2400	6.7	--	--	--	--	--
9/22-23	0800-0800	--	--	--	31	680	--
9/23/71	2400-0800	6.9	--	--	--	--	--
	0800-1600	6.7	--	1,620	--	--	--
	1600-2400	7.0	44	160	--	--	--
9/23-24	0800-0800	--	--	--	33	1,340	980
9/24/71	2400-0800	6.9	--	2,120	--	--	--
9/26/71	0800-1600	6.7	--	2,760	--	--	--
	1600-2400	6.7	--	2,920	--	--	--
9/26-27	0800-0800	--	--	--	47	2,500	1,860
9/27/71	2400-0800	6.9	--	2,760	--	--	--
	0800-1600	6.5	--	--	--	--	--
	1600-2400	6.7	--	--	--	--	--
9/27-28	0800-0800	--	--	--	40.5	1,820	1,420
9/28/71	2400-0800	6.8	--	--	--	--	--
	0800-1600	6.7	--	--	--	--	--
	1600-2400	6.7	--	--	--	--	--
9/28-29	0800-0800	--	--	--	37	2,200	1,660
9/29/71	2400-0800	6.8	--	--	--	--	--
	0800-1600	6.5	--	--	--	--	--
	1600-2400	6.7	--	--	--	--	--
9/29-30	0800-0800	--	--	--	--	2,080	1,500
9/30/71	2400-0800	6.8	--	--	--	--	--
	0800-1600	6.5	--	--	--	--	--
	1600-2400	6.5	--	--	--	--	--
9/30-10/1	0800-0800	--	--	--	53	440	180
10/1/71	2400-0800	6.7	--	--	--	--	--
Mean						1,652	1,275

WATER QUALITY DATA
SUGAR CREEK & WITHLACOOCHEE RIVER
(Sept.-Oct., 1971)

Station No. & Location	Date 1971	Time	Flow MGD	Temp. °C	D.O. (mg/l)	pH	BOD_5 (mg/l)	TOC (mg/l)	TKN (mg/l)	NH_3 (mg/l)	NO_2-NO_3 (mg/l)	Total Phos. (mg/l)
S-1. Sugar Creek at Bay	9/26		1.28									
Tree Road bridge up-	9/27	1315		25.0	7.9	6.9	0.6	5	0.21	0.05	2.00	0.58
stream from Valdosta	9/28	1215		24.0	7.9	6.9	1.4	6	0.30	0.06	5.90	0.42
S.T.P. outfall	9/29	1410		24.5	7.9	6.9	0.8	6	0.22	0.50	3.80	0.30
	9/30	0910		19.0	8.5	6.6	0.8	5	0.20	0.05	2.10	0.55
	10/1	0930	0.92	22.0	8.5	6.9	0.4	8	0.16	0.05	3.60	0.20
MEAN			1.13	22.9	8.1	6.8	0.8	6	0.22	0.14	3.50	0.41
MAX.				25.0	8.5	6.9	1.4	8	0.30	0.50	5.90	0.58
MIN.				19.0	7.9	6.6	0.4	5	0.16	0.05	2.00	0.20
S-2. Sugar Creek at	9/26		4.14									
Gornto Road bridge,	9/27	1230		26.5	6.1	7.1	4.4	19	7.8	5.50	2.00	1.78
downstream from	9/28	1200		25.5	7.0	7.1	2.1	30	5.85	4.50	0.95	3.76
Valdosta S.T.P. outfall	9/29	1435		26.5	6.5	7.1	3.8	19	8.40	6.50	0.80	3.80
	9/30	0845		22.0	7.7	6.9	1.6	--	6.00	4.00	0.67	7.68
	10/1	1100	2.18	24.5	7.1	7.0	2.0	20	5.40	4.00	0.66	2.40
MEAN			3.16	25	6.9	7.0	2.8	22	6.69	4.9	1.02	3.88
MAX.				26.5	7.7	7.1	4.4	30	8.40	6.5	2.0	7.68
MIN.				22.0	6.1	6.9	1.6	19	5.40	4.0	0.67	1.78
W-1. Withlacoochee River	9/27	1135		24.0	5.1	6.3	0.4	22	0.26	0.05	0.20	0.70
at U.S. Hwy. 41, 3½ miles	9/28	1135		24.0	5.0	6.3	0.5	20	0.36	0.05	0.22	1.08
upstream from Sugar Creek	9/2 9	1220		23.0	5.3	6.2	0.8	24	0.38	0.04	0.31	0.50
confluence	9/30	0810		22.0	5.0	5.9	0.8	18	0.47	0.03	0.29	0.42
	10/1	0925		--	5.0	6.3	0.4	16	0.48	0.03	0.32	0.50
MEAN				23.2	5.1	6.2	0.6	20	0.39	0.04	0.27	0.64
MAX.				24.0	5.3	6.3	0.8	24	0.48	0.05	0.32	1.08
MIN.				22.0	5.0	5.9	0.4	16	0.26	0.03	0.20	0.42
W-2. Withlacoochee River	9/27	1200		24.0	4.5	6.6	0.4	21	2.10	0.75	0.26	1.00
at Ga. Hwy. 94, 2.5 miles	9/28	1345		24.5	4.0	6.4	3.6	18	1.76	2.56	0.45	1.40
downstream from confluence	9/29	0940		22.0	4.0	6.6	3.0	18	2.80	1.70	0.23	2.00
of Sugar Creek	9/30	0615		22.0	3.9	6.5	3.3	19	3.75	2.50	0.28	2.20
	10/1	0730		22.0	3.1	6.7	—	17	4.40	3.00	0.22	1.20
MEAN				22.9	3.9	6.6	2.6	19	2.96	2.10	0.29	1.6
MAX.				24.5	4.5	6.7	3.6	21	4.40	2.56	0.45	2.2
MIN.				22.0	3.1	6.4	0.4	17	1.76	0.75	0.22	1.0
W-3. Withlacoochee River	9/28	1430		24.5	4.5	7.2	0.9	11	0.05	0.05	0.32	0.60
at Ga. Hwy. 31, near	9/30	0530		23.0	4.9	6.4	0.8	9	0.24	0.06	0.29	0.68
Fla.-Ga. State Line												
MEAN				23.8	4.7	6.8	0.8	10	0.15	0.06	0.31	0.64
MAX.				24.5	4.9	7.2	0.9	11	0.24	0.06	0.32	0.68
MIN.				23.0	4.5	6.4	0.8	9	0.05	0.05	0.29	0.60

SUMMARY OF COLIFORM BACTERIA DATA FOR ENTIRE STUDY

Station	TOTAL COLIFORMS/100 ml				FECAL COLIFORMS/100 ml				No. Samples
	Max.	Min.	A. Mean	G. Mean	Max.	Min.	A. Mean	G. Mean	
VP-1	1,800,000,000	370,000	110,000,000	41,000,000	16,000,000	200,000	4,900,000	2,100,000	42
VP-7	38,000,000	2,400,000	8,600,000	5,600,000	9,000,000	66,000	1,400,000	630,000	13
VP-8	380,000	100	37,000	2,600	20,000	10	2,100	130	13
S-1	62,000	500	20,000	6,700	740	7	360	180	5
S-2	1,200	7	500	190	860	2	180	14	5
W-1	3,100	200	1,000	620	220	7	82	50	5
W-2	215,000	600	57,000	8,500	3,900	40	1,200	470	5
W-3	300	46	170	120	20	10	15	14	2
VL-1	130,000,000	2,000,000	68,000,000	36,000,000	91,000,000	30,000	26,000,000	7,000,000	8
VL-2	70,000,000	1,000,000	24,000,000	6,000,000	12,400,000	100,000	4,000,000	717,000	8

INFLUENT DATA
VALDOSTA WASTE STABILIZATION POND
STATION NO. VL-1

Date	Time	Flow MGD	pH	BOD (mg/l)	COD (mg/l)	TOC (mg/l)	Settleable Solids (mg/l)	Solids: Suspended (mg/l)	Solids: Volatile (mg/l)	TKN (mg/l)	NH_3 (mg/l)	NO_2-NO_3 (mg/l)	T Phos. (mg/l)	Phenols (mg/l)	Cn (mg/l)	Mercury ug Hg/L	DO (mg/l)
9/26-27	1400-1100	0.56	7.5	142	1032	150	5.5	250	220	18.6	11.5	1.17	7.8				
9/27-28	1100-1030	0.64	7.1	360	920	200	2.5	295	230	20	10.0	0.06	10.4				
9/28-29	1100-1135	0.66	7.1	320	936	150	4.5	450	280	12.8	8.0	0.02	9.0				
9/29-30	1135-0715	0.62	7.3	300	--	150	7.0	--	--	13.6	10.0	0.02	9.9				
9/30-10/1	0800-0800	0.60	7.0	210	--	163	2.5	195	180	15.5	12.0	<0.01	10.5				
9/29	1000-1300													840	<0.01	0.8	
	MEAN	0.62	7.2	266	963	163	4.4	298	228	16.1	10.3	0.26	9.5				
	MAX.	0.66	7.5	360	1032	200	7.0	450	280	20.0	12.0	1.17	10.5				
	MIN.	0.56	7.0	142	920	150	2.5	195	180	12.8	8.0	0.01	7.8				

EFFLUENT DATA
VALDOSTA WASTE STABILIZATION POND
STATION NO. VL-2

Date	Time	Flow MGD	pH	BOD (mg/l)	COD (mg/l)	TOC (mg/l)	Settleable Solids (mg/l)	Solids: Suspended (mg/l)	Solids: Volatile (mg/l)	TKN (mg/l)	NH_3 (mg/l)	NO_2-NO_3 (mg/l)	T Phos. (mg/l)	Phenols (mg/l)	Cn (mg/l)	Mercury ug Hg/L	DO (mg/l)
9/26-27	1400-1100		7.9	28	228	70	0.5 1/	125 1/	100	8.9	3.0	<0.01	7.5				
9/27-28	1100-1100		7.8	31	260	80	Trace 1/	145 1/	145	9.0	3.0	0.01	8.1				4.9
9/28-29	1100-1120		7.6	39	256	78	Trace 1/	165 1/	145	8.0	4.0	0.01	7.5				6.4
9/29-30	1120-0715		7.6	32	—	68	Trace 1/	90 1/	75	7.8	4.5	<0.01	7.5				0.3
9/29	1330																13.2
9/30	1135																12.1
9/30	1235																11.6
9/30	1335																13.5
9/30	1435																15.2
9/30-10/1	0800-0800		7.9	24	—	73	Trace 1/	115 1/	95	9.4	3.5	<0.01	8.0				
9/29	1000-1300													50	<0.01	<0.2	
	MEAN		7.8	31	248	74		128	112	8.6	3.6	0.01	7.7				9.6
	MAX.		7.9	39	260	80		165	145	9.4	4.5	0.01	8.1				15.2
	MIN.		7.6	24	228	68		90	75	7.8	3.0	0.01	7.5				0.3

1/ Floating and suspended algae in sample.

APPENDIX D

SAMPLING PROCEDURE - ANALYTICAL METHODS - SAMPLE STATIONS

APPENDIX D

SAMPLING PROCEDURE - ANALYTICAL METHOD - SAMPLING LOCATIONS

SAMPLING PROCEDURE

Composite samples at stations VP-1, VP-5, and VP-7 were collected at one-hour intervals for a 24-hour period using Serco automatic samplers. The special study on the stabilization pond was conducted during September 27 through October 1. Samples from the influent (station VL-1) and effluent (station VL-2) of the stabilization pond were collected by using Protex automatic samplers set to collect an aliquot of sample at five-minute intervals for a 24-hour composite sample. All composite samples were analyzed for total suspended solids and total volatile suspended solids, total kjeldahl nitrogen (TKN), ammonia (NH_3), nitrate-nitrite (NO_3-NO_2), total phosphorus (P), Five-Day Biochemical Oxygen Demand (BOD_5), Total Organic Carbon (TOC), and Chemical Oxygen Demand (COD). Stream samples were collected daily and subjected to all of the above analyses except solids and additional determinations for dissolved oxygen and temperature. All stream samples were collected at mid-stream and mid-depth and preserved by cooling until returned to the treatment plant for analysis Samples shipped to the Southeast Water Laboratory at Athens, Georgia, for analysis were preserved in the field laboratory. Samples for metals, phenols, and cyanides were collected once during the survey at stations VP-1, VP-8, VL-1, and VL-2. These samples were collected by grabbing samples at two-hour intervals for a six-hour composite sample. Dissolved oxygen, settleable solids, and suspended solids were collected in the aeration basin at A-1, A-2, A-3, and A-4 early morning, noon, and late afternoon on a grab basis. Dissolved oxygen determinations on the effluent prior to chlorination were determined twice per day. Suspended solids were determined once on the wasted sludge to the digester and the stabilized sludge to the drying beds. Two samples were collected on the digester supernatant and analyzed for settleable solids and pH.

Bacteriological samples at the treatment plant were collected at stations VP-1, VP-7, and VP-8 every two hours for two 32-hour periods and composited according to flow. Bacteriological samples from the pond were collected at stations VL-1, and VL-2 once at hourly for a four-hour period. They were not composited according to flow. Stream samples for bacteriological determinations were collected once daily for five days. All bacterial samples were either placed in an ice chest or refrigerated until time of analysis.

Qualitative determinations for the presence of Salmonella were made at stations VP-1, VP-7, VP-8, S-1, S-2, VL-1, and VL-2 using the modified swab technique of Moore.[1/] The swabs were suspended just beneath the water surface for a period of five days.

ANALYTICAL METHODS

The following analyses were performed at the Southeast Water Laboratory in Athens, Georgia. TOC, TKN, NH_3, NO_3-NO_2, phenols, Cn, phosphorus, and metals.

Solids, BOD_5, COD, and pH were analyzed in the field.

1. Biochemical Oxygen Demand (BOD_5), "EPA Methods for Chemical Analysis of Water and Waste," 1971 (pp. 15-16).

1/ Moore, B. "The Detection of Paratyphoid Carriers in Towns by Means of Sewage Examination," Bulletin Hyg., 24, 187, 1941.

Dilution water was used from station W-1.

2. Chemical Oxygen Demand (COD) - Dichromate Reflux... 0.25N; Standard Methods for the Examination of Water and Wastewater, 13th Edition, p. 495 Method 220 (1971).
3. Total Organic Carbon (TOC) "EPA Methods for Chemical Analysis of Water and Wastes" 1971 (pp. 221-229).
4. Solids, Non-Filterable (Suspended), "EPA Methods for Chemical Analysis of Water and Wastes" pp. 278-279.
5. Solids, Volatile -- "EPA Methods for Chemical Analysis of Water and Wastes" pp. 282-283.
6. Solids, Settleable -- Standard Methods for the Examination of Water and Wastewater, 14th Edition, pp 539, Section 224F (1971).
7. Total Kjeldahl Nitrogen -- (Automatic Phenolate Method), "EPA Methods for Chemical Analysis of Water and Wastes" 1971 (pp. 157-163).
8. Ammonia Nitrogen -- (Automated Method) "EPA Methods for Chemical Analysis of Water and Wastes" 1971 (pp 141-147).
9. Nitrate-Nitrite Nitrogen -- (Automated Cadmium Reduction Method) "EPA Methods for Chemical Analysis of Water and Wastes" 1971 (pp 176-184).
10. Phosphorus -- (Automated Single Reagent Method), "EPA Methods for Chemical Analysis of Water and Wastes" 1971 (pp 246-258).
11. pH -- Laboratory pH meter with glass electrodes.
12. Dissolved Oxygen (DO) modified Winkler with Full Bottle

Technique. "EPA Methods for Chemical Analysis of Water and Wastes" 1971 (pp 53-59).

13. Residual Chlorine -- HACH Chlorine Test Kit.

All samples sent to the Southeast Water Laboratory were preserved according to the directions listed on pages 1-4 of the "EPA Methods for Chemical Analysis of Water and Wastes," 1971.

BACTERIOLOGICAL METHODS

Chlorinated samples were dechlorinated using ten percent sodium thiosulfate. Total and fecal coliform bacteria densities were determined using the membrane filter techniques as outlined in Standard Methods for the Examination of Water and Wastewater, 13th Edition, 1971 (pp 678-685). The Moore[1/] technique for qualitative Salmonella detection was used as listed in Standard Methods for Examination of Water and Wastewater, 13th Edition, pp 698-703. The inoculated enrichment was incubated 18 to 24 hours at 41.5°C according to the procedure of Spino.[2/] After primary enrichment, an inoculum was streaked onto Bismuth Sulfite Agar (BS), XLD Agar, Taylor (XLD), and Hektoen Enteric Agar (HE) plates and incubated at 35°C for 18 to 24 hours.[2/] Identification methods were carried out as described by Edwards and Ewing[3/] with the exception of the Cytochrome Oxidase Method. Oxidase activity was determined using Patho-Tec-Co reagent impregnated paper strips.

1/ Moore, B. "The Detection of Paratyphoid Carriers in Towns by Means of Sewage Examination," Bulletin Hyg., 24, 187, 1941.

2/ Spino, D. F., "Elevated Temperature Technical for the Isolation of Salmonella from streams. Appl. Microbiology, 14, No. 4, 591, 1966.

3/ Edwards, P. R. and Ewing, W. H., Identification of Enterobacteriaceae. Burgess Publication Company, Minneapolis, Minnesota, 1962.

SAMPLING STATION LOCATIONS

Treatment Plant

VP-1*	Influent to Valdosta Plant at pump house where all wastes have mixed.
VP-5*	Aeration basin effluent.
VP-7*	Plant effluent at Parshall flume prior to chlorination.
VP-8	Chlorinated effluent at chlorine contact chamber discharge.
A-1	Aeration chamber one at the mid point.
A-2	Aeration chamber two at the mid point.
A-3	Aeration chamber three at the mid point.
A-4	Aeration chamber four at the mid point.

Stabilization Pond

VL-1*	Influent to waste stabilization pond at Parshall flume.
VL-2*	Effluent from waste stabilization pond at the control gate.

Stream

S-1	Sugar Creek at Bay Tree Road bridge located above the treatment plant outfall.
S-2	Sugar Creek at Gornto Road bridge about 1/2 mile below the plant outfall.
W-1	Withlacoochee River at U. S. Hwy. 41 bridge located north of Valdosta about 3 1/2 miles above the Sugar Creek confluence.
W-2	Withlacoochee River at Georgia Hwy. 94 bridge located about 2 1/2 miles below the Sugar Creek confluence.
W-3	Withlacoochee River at Georgia Hwy. 31 bridge located at the Georgia-Florida state line.

* 24-Hour Composites

APPENDIX E

WASTE STABILIZATION POND STUDY

WASTE STABILIZATION POND STUDY

In conjunction with the evaluation of the operation and maintenance of the Valdosta modified activated sludge plant, a special study was conducted on the city's 22-acre waste stabilization pond during September 26 through October 2, 1971.

The pond, located in south Valdosta, was constructed during March 1967. It receives all wastewater collected south of Branch Street (Figure 1). The effluent from the pond is discharged unchlorinated into Mud Creek, a tributary of the Alapaha River. The pond was designed for a population equivalent of 4,500 and a flow of 0.45 MGD. During the study, the influent average daily flow was 0.62 MGD and had a population equivalent of 8,100.[1/] The average influent COD was 963 mg/l or 4,980 lbs/day indicating the presence of some industrial wastes. All data collected are presented in Appendix C and a summary of the influent and effluent data is presented on Page E-2. The average BOD_5 removal was 87 percent, but the remaining parameters were below the standard removal efficiencies for a properly operated and designed stabilization pond. The average total nitrogen and total phosphorus reductions were 48 and 18 percent, respectively. Studies show that normal nutrient reductions should be 80 percent for total nitrogen and 40 percent for total phosphorus.[2/] The overall total and fecal coliform densities showed 83 and 90 percent reductions

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1/ .17 pound of BOD = 1 population equivalent.

2/ Oswald, W. J., "Status of Oxidation Pond Processes," presented at the Southeast Water Laboratory, Athens, Georgia, October 18, 1971.

WASTE DATA SUMMARY
VALDOSTA WASTE STABILIZATION POND

Range	Flow (MGD)	pH	BOD_5 (mg/l)	COD (mg/l)	TOC (mg/l)	Solids (mg/l) Tot.Susp.	Solids (mg/l) Tot.Vol.	Nitrogenous Compounds-N (mg/l) TKN	NH_3	NO_3-NO_2	Total Phosphorus-P (mg/l)	Coliform Bacteria/100 ml (MF) Total	Fecal
Max.	.66	7.5	360	1,030	200	450	280	20.0	12.0	1.17	10.5	130,000,000	91,000,000
Min.	.56	7.0	142	920	150	195	180	12.8	8.0	0.01	7.8	2,000,000	30,000
rithmetic Mean	.62	7.2	266	963	163	298	228	16.1	10.3	0.26	9.5	68,000,000	26,000,000
												36,000,000*	7,000,000*
oad (lbs/day)			1,380	4,980	843	1,540	1,180	83	53.0	2.4	49		
—													
ax.		7.9	39	260	80	165	145	9.4	4.5	0.01	8.1	70,000,000	12,400,000
in.		7.6	24	228	68	90	75	7.8	3.0	0.01	7.5	1,000,000	100,000
ithmetic Mean		7.8	30	248	74	126	109	8.6	3.6	0.01	7.7	24,000,000	4,000,000
												6,000,000*	717,000*
Load (lbs/day)			155	1,280	380	652	562	44	19	0.05	40		
Percent Reduction			87	74	50	51	45	45	64	56	18	83	90

* Geometric Mean

respectively. Bacterial reductions should be in excess of 99 percent in a properly functioning pond.[3/] Two serotypes of Salmonella were isolated from the pond effluent. The presence of Salmonella in a water is proof not only of fecal contamination, but conclusively establishes the disease-producing potential of the water. Algal count determinations on 24-hour effluent composites collected during September 28 and 30 indicated 36,022 cells/ml total live algae for the 28th, with 14,588 of these blue-green algae, and 36,969 cells/ml total count for the 30th, with 10,873 of these being blue-greens. These counts are too low for the pond to function properly, and the presence of blue-greens in dominance is indicative of high organic loading. Algal matting problems were observed during the study creating a nuisance odor problem (see Illustration 2).

It is concluded that the pond was not operating efficiently because it was organically and hydraulically overloaded. Industrial wastes were contributing to this and possibly having a toxic influence on the biological activity within the pond. The low algal counts and surface cover of blue-green algae has reduced the pond efficiency. Algal matting resulting from algae die-offs caused an almost daily nuisance odor problem.

It is recommended that:

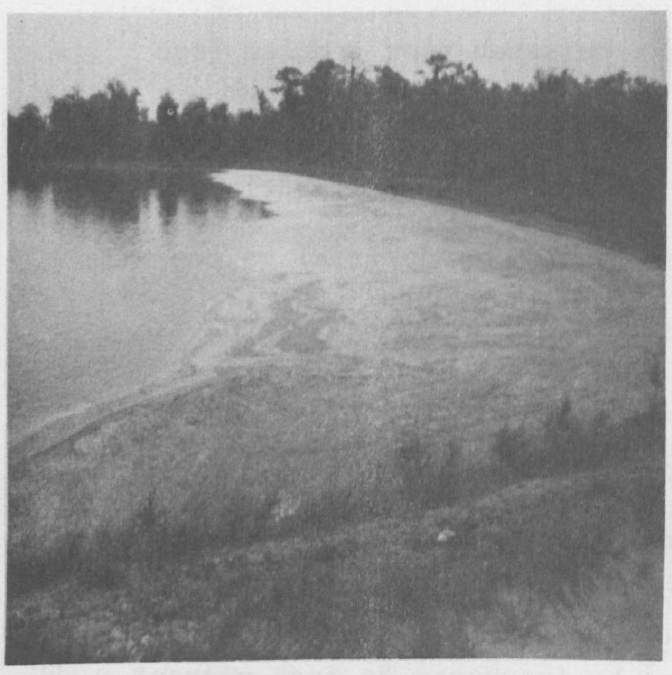
1. The pond's design capacity be increased to meet present conditions and the projected 10-year growth;

3/ Little, J. A., B. J. Carroll, R. Gentry, "Bacteria Removal in Oxidation Pond," Presented at Second International Symposium for Waste Treatment Lagoons, Kansas City, Missouri, 1970.

2. One man be assigned to the pond to provide maintenance (e.g., cutting the grass, cleaning the bar screen, mixing the pond) and operations duties; and,

3. The city use their sewer ordinance to determine the waste contributions from the connected industrial waste sources and require pretreatment, if necessary.

ILLUSTRATION 2
OXIDATION POND



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