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SURVEY OF WASTEWATER CHARACTERISTICS

Chester F. Pauls

Environmental Health Laboratory
McClellan Air Force Base, California

April 1973

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USAF ENVIRONMENTAL HEALTH LABORATORY
McClellan Air Force Base, California

SURVEY OF WASTEWATER CHARACTERISTICS
Beale Air Force Base, California

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ABSTRACT

A wastewater survey of Beale AFB was accomplished. The characteristics of the photo processing wastewater, the operations area wastewater, and the influent and effluent wastewater of the domestic sewage treatment plant were determined. Maintenance areas were visited and recommendations to improve methods of control and treatment of industrial waste materials are specified. A corrosion problem in the sewerage system serving the operations area was investigated and recommendations to alleviate this problem are presented.

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SECTION I

INTRODUCTION

1. Background.

On 5 Sep 1972 Beale AFB requested Hq SAC (DEE ltr) to arrange for a water pollution/industrial waste survey to be accomplished at Beale AFB. On 10 Oct 1972 this request was approved by Hq AFLC, Office of the Surgeon, and forwarded to the Environmental Health Laboratory, McClellan AFB (EHL-M) for accomplishment.

During the first week of Jan 1973, Mr. Bill Engle, Hq USAF, Civil Engineering, advised the EHL-M that a proposed project to upgrade the sewage treatment plant (STP) at Beale AFB had been approved for the fiscal year 1974 Military Construction Program. Subsequent conversations with Mr. Stan Yashumoto of the Western Region, Regional Civil Engineering Office revealed that the results of our survey were required in early April 1973 to provide information necessary to design the proposed improvements to Beale's STP. Based on these considerations, the survey was scheduled for the period 20 Feb 73 through 3 Mar 73.

Beale AFB is located in the gently rolling hills of the eastern Sacramento Valley basin between the Yuba River on the north and the Bear River on the south. The Marysville area lies 10 miles (16 km) west of the base and the housing area, in Beale Heights, on the eastern perimeter of the installation, is in the lower foothills of the Sierra Nevada Mountains.

The base provides facilities and logistics support for one strategic aerospace division, one aerospace wing, one strategic aerospace reconnaissance wing, one medical group, one field training detachment, and other assigned units. An estimate of base population and projected changes is provided in Appendix I.

The base is divided geographically into three separate areas: The operations area includes parking ramps, hangars, and maintenance facilities for base and transient aircraft, aircraft systems components, and ground support equipment; the cantonment area includes offices, recreational facilities, dormitories, commissary, base exchange, vehicular maintenance facilities, Civil Engineering shops, 220 residential trailer spaces, and the 9th Strategic Reconnaissance Wing (SRW) photographic film processing facility. The housing area consists of 1543 single family units, the base hospital, Officer and NCO Clubs, transient officers' quarters, and base exchange gas station. An additional 200 housing units are programmed for completion no later than FY 1975 and additional 50 trailer spaces are programmed for construction in FY 1973.

With the exception of the 9th SRW photo processing wastes and a few septic systems, all base wastewater is conveyed to and treated at the domestic STP located on the southwest edge of the base. The existing STP provides "secondary" treatment by means of a high rate trickling filter process with anaerobic sludge digestion and post chlorination for disinfection. The sanitary sewerage system leading from the operations area has been subject to a considerable amount of corrosion and wide fluctuations in pH readings. The domestic STP effluent discharges to Hutchison Creek which is an intermittent stream with no natural flow during the dry weather season of May through October. Hutchison Creek leaves the confines of the base at a point approximately 3/4 miles (1.2 km) below the STP outfall, traverses 4 miles (6.4 km) through irrigated pastures to its confluence with Reeds Creek (which drains the base operations area) thence an additional 3 miles (4.8 km) to its termination in Plumas Lake.

The nature of the discharge from the domestic STP is governed by the State of California Central Valley Region, Regional Water Quality Control Board (RWQCB) in Resolution No. 129, dated 15 May 1952. This resolution is contained in Appendix I.

Wastes generated by the 9th Strategic Reconnaissance Wing (9th SRW) photographic processing operation in Bldg 2145 are pumped to a separate treatment facility adjacent to the domestic STP. Photo waste treatment consists of alum flocculation and sedimentation, pressure sand filtration, 5 micron polishing filtration, and deep well injection. RWQCB Resolution No. 65/66-114 adopted 15 Apr 1966 governs the nature of the discharge from the photo waste treatment facility. Resolution 65/66-114 is also contained in Appendix I.

Base personnel have been advised (State Water Resources Control Board ltr, 20 Aug 1971) that installation of the additional housing currently programmed will necessitate that the base obtain a new wastewater discharge resolution governing the domestic STP effluent. In addition, base civil engineering personnel are concerned that the injection wells will require rehabilitation or redrilling in order to continue the existing deep well disposal practice. They anticipate a requirement for an alternative disposal method for the photographic process wastewater in the event that the RWQCB or public opinion prevents continuation of the deep well injection disposal method. Further, base civil engineering personnel assert that the RWQCB will not provide an updated discharge resolution unless the character of the waste stream to be treated by Beale's Waste Treatment Facility is delineated.

2. Survey Purpose.

This survey was accomplished in order to determine the cause of the excessive corrosion in the sewerage system leading from the operations area and to characterize the waste streams from:

a. The operations area.
b. The SR-71 photo processing operation.
c. The combined waste stream entering the domestic STP.

These results can then be utilized by base personnel to obtain an EPA discharge permit and to provide data for upgrading the treatment facility to meet the revised discharge standards.

SECTION II

SURVEY TECHNIQUE

1. General.

The wastewater survey at Beale AFB was accomplished in three general phases:

a. Phase I - Background investigation and operations area wastewater pH fluctuation investigation.

b. Phase II - Wastewater analysis at selected sampling stations.

c. Phase III - Investigation of major wastewater generating activities.

Beginning 15 Jan 73, preliminary information was gathered and evaluated. In addition, beginning 5 Feb 73, the Base Bioenvironmental Engineer installed and maintained an EHL-M provided recording pH meter in the influent line to the wet well of Lift Station 1050 which serves the operations area. This device was operated until 2 Mar 73 and significant pH variations occurring during this period were recorded. During the period 20 Feb to 3 Mar 1973 sampling stations were established at selected locations and samples were collected and analyzed to determine the character of selected base waste streams. During the period 28 Feb to 3 Mar 73 the significant wastewater producing operations on Beale were visited and their operations and waste disposal techniques were observed.

2. Sampling Station Locations and Sample Collection Technique.

a. Sampling Station A was established in the sanitary sewer line serving the operations area. During the period 20-24 Feb 1973 samples were obtained from Manhole No. 13. These samples were composited hourly for 24 hour periods on a constant volume basis. On 26 Feb sampling Station A was relocated to Manhole No. 90 which was equipped with a Palmer Bowlus Flume and a Stephens Recorder to measure flow rate. Subsequent samples from Station A were composited hourly for 24 hour periods on a flow proportional basis. All samples were obtained at Station A by means of an ISCO Model No. 1391 discreet sampler which was cycled to obtain a 450 ml sample every 15 minutes for a total of four discreet samples each hour. Of the four samples collected each hour, three contained preservatives for specific chemical analysis and the fourth was unpreserved. The interior base of the sampler was packed with ice to keep all samples cool.

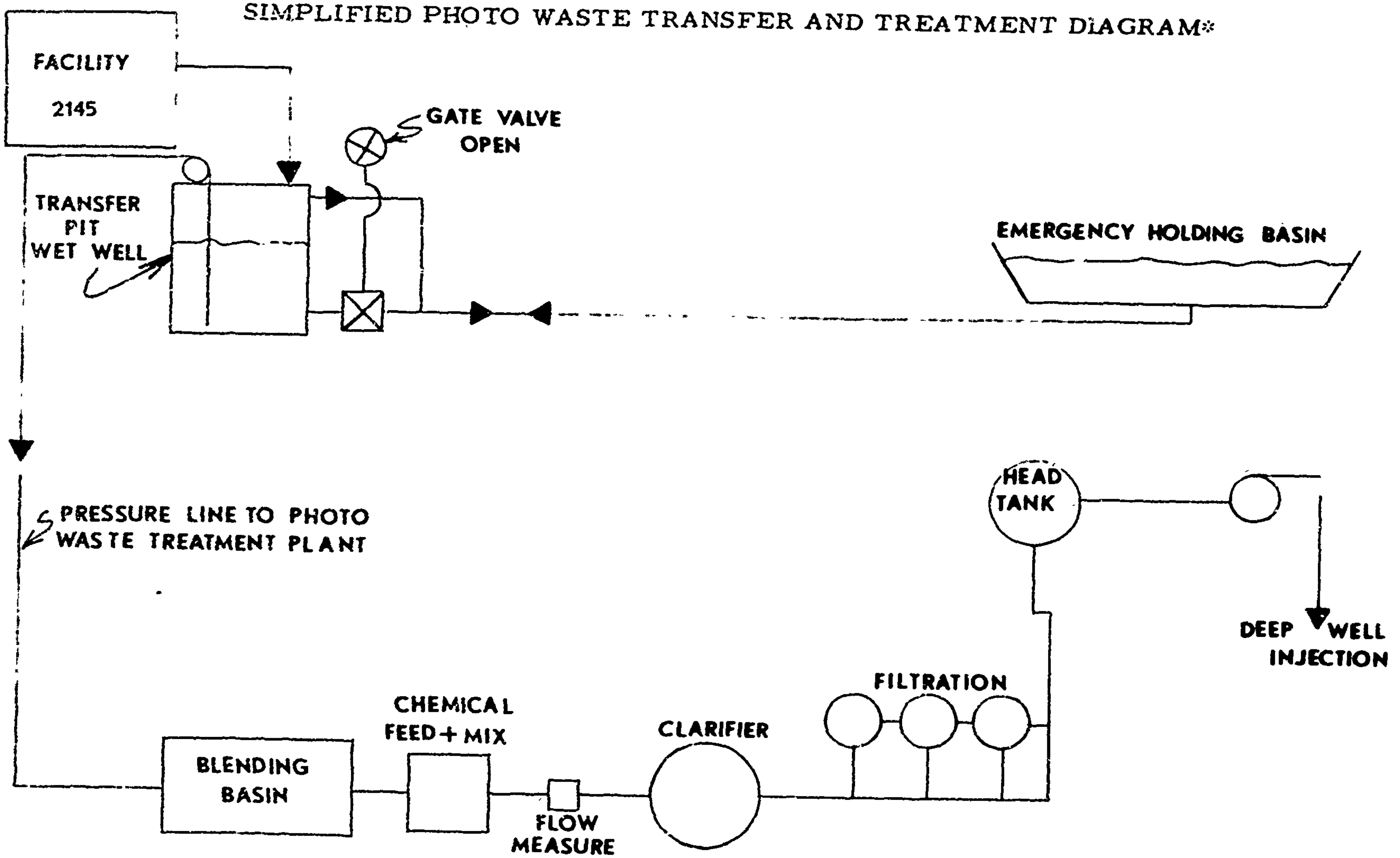
b. Station B was established at the Parshall Flume of the domestic STP. The samples from this location depict the character of the combined, untreated, domestic waste stream originating from the operations, cantonment, and housing areas. Samples were manually collected hourly for a 24 hour period based on flow rate at the time of collection. Flow rate was determined from the output of the flow meter located inside the STP control building. Tests conducted on the flow recorder after the survey period confirmed the accuracy of its instantaneous flow rate output.

c. Station C was established at the effluent weir of the chlorine contact basin of the domestic STP. Samples from this location depict the character of the domestic wastewater after treatment. Samples collected from this location were composited hourly for 24 hour periods, proportional to flow rate at the Parshall Flume.

d. Station D was established at the point where the photographic processing waste enters the photo waste treatment plant blending basin. During the preliminary visits to Beale AFB the transfer of photo wastes to the photo waste treatment plant was accomplished with the piping system in the configuration depicted in Figure 1. In this configuration the wastewater level in the transfer pit wet well corresponds to the level in the emergency holding basin and wastewater was transferred to the

Figure 1.

SIMPLIFIED PHOTO WASTE TRANSFER AND TREATMENT DIAGRAM*



* Not to scale

treatment plant manually as the level in the treatment plant blending basin lowered. It was determined that in order to obtain representative samples of the wastewater generated each day it would be necessary to close the valve leading to the emergency holding basin and to allow one transfer pump (nominal capacity = 145 gpm) to operate automatically according to the wastewater level in the transfer pit wet well. A sampling manifold set to deliver a continuous sample whenever the transfer pump was operating was installed at the treatment plant influent line to yield a flow proportional sample. A breakdown in communication within the Civil Engineering Organization and a malfunction in the sampling manifold precluded sample collection as planned. The valve separating the emergency holding basin and the transfer pit wet well was not closed and properly sealed until 25 Feb 73. Since there was wastewater in the emergency holding basin which was not isolated from the waste generated daily, the samples collected between 21 Feb and 26 Feb do not exactly represent the wastes generated from the daily workload during this period. Difficulties encountered with the sampling manifold during this period caused the sample collection rate to fluctuate. Samples collected between 21 and 26 Feb must, therefore, be considered as extended grab samples. Beginning 26 Feb 73 the emergency holding basin was isolated and removed from the flow pattern. The transfer pump operated automatically based on the wastewater level in the transfer pit wet well. Prior to the start of sample collection on 27 Feb 73 the sampling procedure was changed. Subsequent samples were collected hourly at the influent line to the photo waste treatment plant on a constant volume basis from 0800 - 1800 hours. These samples are considered representative of the workload occurring during the daily sampling period.

3. Sample Analysis.

Table I depicts the analysis performed on the samples collected from each of the four sampling locations. All samples were analyzed according to the techniques contained in Standard Methods[1]. All samples collected at Stations B, C, and D were preserved in accordance with the recommendations of Table 2 in Methods For Chemical Analysis of Water and Wastes-1971[2]. Samples obtained from Station A were individually preserved for COD, CN, and phenol. A fourth Station A sample was also collected and refrigerated but was otherwise unpreserved. Metals analysis was performed on an aliquot of this sample. All samples were analyzed within the time period specified in Table 2 of Reference 2 with the exception of pH and those samples collected during the weekend period. Samples collected on weekends were analyzed the following Monday. Composited samples were generally collected beginning at 0700 hours and completed at 0600 hours of the following day. Samples were then transported to the EHL-M Analytical Division for analysis.

TABLE I

SAMPLE ANALYSIS

Analysis		Stations
Total Dissolved Solids	(TDS)	A, B, C, D
Volatile Dissolved Solids	(VDS)	A, B, C, D
Suspended Solids	(SS)	A, B, C, D
Surfactants		A, B, C, D
Total Cyanide		D
Cyanide		B, D
Specific Conductivity	(Spec. Cond.)	A, B, C, D
Oils and Grease	(O & G)	A, B, C
Pesticides		B
Biochemical Oxygen Demand	(BOD)	A, B, C, D
Chemical Oxygen Demand	(COD)	A, B, C, D
Cadmium		A, B, C, D
Chromium		A, B, C, D
Copper		A, B, C, D
Iron		A, B, C, D
Lead		A, B, C, D
Zinc		A, B, C, D
Boron		A, B, C, D
Barium		A, B, C, D
Silver		A, B, C, D
Ammonia Nitrogen	(NH_3-N)	B, C, D
Organic Nitrogen	(Org-N)	B, C, D
Nitrates	(NO_3)	B, C, D
Total Nitrogen	(Tot-N)	B, C, D
Ortho Phosphate	(Ortho-PO_4)	B, C, D
Total Phosphate	(Tot-PO_4)	B, C, D
Mercury		A, B, C, D
Nickel		A, B, C, D
Hydrogen Ion Concentration	(pH)	A, B, C, D
Manganese		A, B, C, D
Sodium		B, D
Potassium		B, D
Calcium		B, D
Magnesium		B, D
Sulfates		B, D
Alkalinity ($CaCO_3$)	(Alk)	B, D
Chloride		B, D
Phenols		A, B, C
Sulfide		B
Sulfite		D

SECTION III

RESULTS

1. Background Investigation and Operations Area Wastewater pH Fluctuation Investigation.

a. A review of selected information contained in the domestic STP operating logs (AF Forms 1462 and 1463) for the period Jan - Dec 1972 is presented in Table II. This historical information is valuable since it provides a feel for the mean value of those parameters usually considered most important in the design and evaluation of a domestic waste treatment process.

b. It was observed on several occasions that when the flow rate entering the domestic STP exceeded approximately 3 mgd, the bypass line was opened and untreated wastewater was discharged to Hutchison Creek. The STP has a capacity of 5 mgd however, it does not have emergency power immediately available in the event of a power failure. Mr. Akins, the STP Foreman, asserts that when the influent flow rate exceeds 3 mgd there is insufficient time available after a power failure to connect the standby power system before the dry well of the influent lift station is flooded thereby damaging the pump motors and precluding any waste treatment until the motors can be repaired.

c. A review of SR-71 photo waste flow quantities is presented in Table III. This information was taken from the treatment facility monthly operating logs maintained by base personnel from 1968 through the present. Table IV depicts the current average workload of the 9th SRW photo processing operation located in Facility 2145. Table V lists the chemical use rates associated with the photo processes used by the 9th SRW provided by Capt Inyard, Base Bioenvironmental Engineer, in response to our presurvey letter requesting specific information. Table VI presents information relative to the chemical composition of KODAK processing solutions for both black and white and color processes. This information was taken from pages 19 and 20 of KODAK Publication J-28[3].

d. Significant information about the source of the corrosion problem encountered in the sewerage system serving the operations area was obtained with the recording pH meter installed and maintained by Capt Inyard at Lift Station 1050. Space does not permit all of the graphs obtained to be included in this report however, a typical section of the pH trace is reproduced in Figure 2. This recording was made by a Rustrak

TABLE II

AVERAGE MONTHLY DOMESTIC STP OPERATING CHARACTERISTICS

Jan - Dec 1972

Month	Characteristic							
	BOD (mg/l)		Solids (mg/l)			Flow (mgd)		
	Raw	Final	SS Raw	SS Final	Sett. Raw*	Max Rate**	Min Rate	Tot. Treated
Jan	192	29	160	21	5	1.74	0.581	1.47
Feb	160	17	158	16	6	1.90	0.681	1.53
Mar	207	25	143	11	6	1.75	0.501	1.46
Apr	183	19	162	8	7	1.76	0.520	1.47
May	171	18	151	9	6	1.83	0.587	1.51
Jun	166	18	163	14	4	1.87	0.644	1.56
Jul	149	18	138	11	6	1.74	0.656	1.47
Aug	131	10	135	12	5	1.64	0.582	1.40
Sep	140	18	141	11	5	1.79	0.612	1.47
Oct	143	11	168	16	5	1.64	0.571	1.34
Nov	144	19	141	18	5	2.12	0.878	1.56
Dec	171	16	124	12	4	1.88	0.879	1.61
Mean	163	18	150	13	5	1.81	0.641	1.49

* Settleable Solids Raw = ml/l

** It should be noted that these are the average monthly maximum flow rates. The instantaneous maximum flow rate during the rainy season can be considerably higher due to excessive infiltration.

TABLE III

MONTHLY QUANTITY OF PHOTOWASTE TREATED (Thousand Gals)

Month	Year						Mean Yearly
	1968	1969	1970	1971	1972	1973	
January	653.9	872.4	704.1	440.8	588.6	580.6	
February	940.2	768.6	837.3	377.7	804.0	1012.9	
March	734.5	792.9	520.4	835.7	787.8		
April	1135.4	858.5	841.1	788.6	746.7		
May	1195.8	766.6	785.1	528.9	848.4		
June	1008.1	330.1	650.5	586.0	721.4		
July	889.2	311.7	121.5	687.1	373.1		
August	490.7	553.5	482.2	543.3	765.8		
September	291.9	256.4	629.8	803.4	462.2		
October	391.9	578.3	757.4	362.3	740.6		
November	1070.4	610.0	579.0	951.9	805.2		
December	1516.1	520.1	638.7	685.8	476.2		
Mean	859.8	601.6	628.9	632.6	676.7		679.9

TABLE IV

9th SRW AVERAGE MONTHLY PHOTO PROCESSING WORKLOAD

Film Characteristics			Process Rate	Average Processed	
Type	Code	Width	Ft/Min	Monthly (Ft)	Film Area (Ft^2)
Color	S.O. 242	9.5"	15.5	1,000	792
Color	2443	9.5"	15.5	200	158
B & W	3414	9.5"	35	14,000	11,060
	3414	70 mm	35	14,000	3,210
B & W	3400	9.5"	30	10,000	7,916
	3400	70 mm	30	2,000	458
B & W	2430	9.5"	50	170,000	134,300
	2430	70 mm	50	170,000	34,000
B & W	3494	5"	25	3,200	1,330
B & W	2405	5"	35	320	133

TABLE V

PHOTOGRAPHIC PROCESSING SOLUTION USE RATES (gal/ft^2)

Solution	Film Type							
	3400	3414	2430	2493	2405	3494	2443	S.O. 242
Black and White								
Developer	.0062	.0095	.0045	.0050	.0047	Not Specified		Not Specified
Stop	.0062	.0095	.0045	.0050	.0047			
Fixer*								
Color								
Prehardener							.0244	
Neutralizer							.0272	
1st Developer							.0407	
1st Stop							.0598	
Color Developer							.0407	
Bleach							.0136	
Fix							.0400	
Stabilizer							.0136	
Rinse Water**	25 gpm	25 gpm	25 gpm	25 gpm	25 gpm	25 gpm	25 gpm	

* Fixer is regenerated, replenished, and recycled. When contaminants build to an excessive level the fixer is desilvered and approximately 700 gals is batch dumped. The dumping has an average frequency of once every two months.

** All processing machines use rinse water at a rate of 25 gpm.

TABLE VI

IONS OR COMPOUNDS THAT MAY BE FOUND IN KODAK PROCESSING SOLUTIONS FOR BLACK AND WHITE AND COLOR PROCESSING*

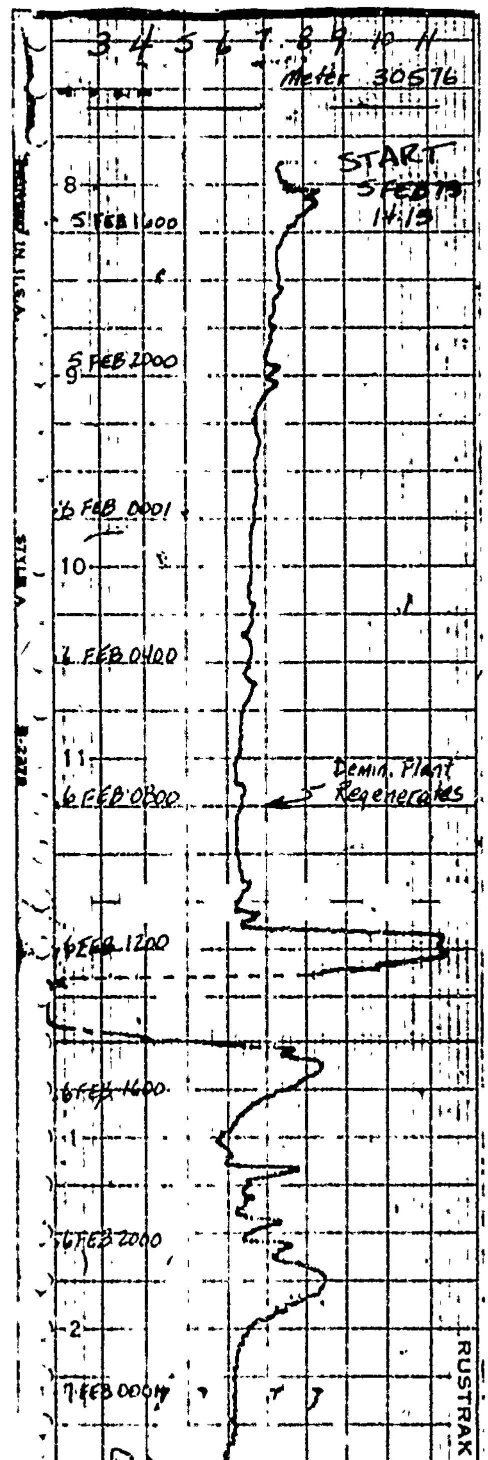
Type of Solution and pH Range	Concentration Range in Grams/Liter		
	10 to 100	1 to 10	Less than 1
Prehardeners, Hardeners, and Prebaths pH 3 to 10	Sulfate Acetate	Formaldehyde Aluminum Trivalent Chromium Succinaldehyde Formaldehyde Bisulfite Sequestering Agent Carbonate Ion	Antifoggant (e.g., 5-nitrobenzimidazole nitrate)
Developers pH 9 to 12	Sulfite Borate Phosphate Carbonate Sulfate	Bromide Developing Agents (hydroquinone or other) Coupling Agents (Kodachrome process) Sequestering agent Hydroxylamine Diethylhydroxlamine Benzyl alcohol Hexylene glycol Citrazinic acid, sodium salt Ethylenediamine Polyethylene glycols	Thiocyanate Iodide Antifoggant Tertiary Butylamine borane Citrate
Stop Baths pH 2 to 4	Acetate Sulfate	Aluminum Borate Citrate	

TABLE VI (Cont.)

Type of Solution And pH Range	Concentration Range in Grams/Liter		
	10 to 100	1 to 10	Less than 1
Ferricyanide Bleaches pH 5 to 8	Ferricyanide Ferrocyanide Bromide Sulfate	Bicarbonate Nitrate Phosphate Borate Polyethylene Glycols Thiocyanate	
Fixing Baths pH 4 to 8	Chloride Thiosulfate Ammonium	Aluminum Bisulfite Sulfite Bicarbonate Borate Acetate Bromide Silver thiosulfate complex Ferrocyanide Formalin Sequestering agent	
Neutralizers pH 5	Bromide Sulfate Hydroxylamine	Acetate	
Stabilizers pH 7 to 9	Formaldehyde	Zinc Sulfate Phosphate Citrate Benzoate Sequestering agent	Wetting agent

Figure 2.

TYPICAL pH TRACE - LIFT STATION 1050



Model 30 recording pH meter. The meter was calibrated by Capt Inyard and the probe was placed in the wet well of Lift Station No. 1050. After a predetermined period the meter was calibration checked with buffer solution and the recorder was replaced with a recharged instrument. Captain Inyard then annotated the graph as depicted in Figure 2.

2. Wastewater Analysis at Selected Sampling Stations.

a. Tables VII and IX present the results of chemical analyses performed on samples collected at Stations B and C during the period of 20-25 Feb 1973. Tables VIII and X present the results of chemical analyses performed on samples collected from Stations B and C during the period 26 Feb-2 Mar 1973. The results are presented in this manner because during the period 20 through 25 Feb 1973 the total daily flow received at the domestic STP was considerably closer to the average or normal flow of 1.49 mgd than it was during the remaining period. During the period 26 Feb-2 Mar heavy rain and subsequent infiltration raised the total daily flow. (The average daily flow for the period 20-25 Feb and 26 Feb-2 Mar was 1.84 and 3.16 mgd respectively). The results presented for the period 20-25 Feb 1973 are therefore more likely to represent the normal wastewater characteristics. The analysis procedure for pesticides involves determining the concentration of some fifteen different pesticides. The concentrations of many of these individual pesticides is usually below our minimum detectible limit. In Tables VII and VIII the "maximum total pesticide" concentration is the summation of the concentration of all 15 pesticides when the concentration of pesticides present below the detection limit are assumed present at a concentration equal to the detection limit. The "minimum total pesticide" is the summation of the concentration of all 15 pesticides when the concentration of particular pesticides below the detection limit is assumed to be zero.

b. Tables XI and XII present the results of chemical analysis of samples obtained from Station A during the period 20-25 Feb and 26 Feb-2 Mar 73 respectively. Between the period of 26 Feb and 2 Mar the flow rate was recorded continuously. On 27 Feb heavy rainfall surcharged the sewer and precluded meaningful flow recordings. With the exception of 27 Feb the total daily flow in this line averaged 0.32 mgd with a high daily flow of 0.41 mgd and a low of 0.26 mgd.

c. Tables XIII and XIV present the results of chemical analysis of samples obtained from Station D during the sampling period. The total flow of this waste stream is independent of weather conditions since the piping system is pressurized from the transfer pit wet well of Bldg 2145 to the equalization basin of the treatment facility where the samples were obtained.

TABLE VII

CHEMICAL ANALYSIS STATION B - 20-25 Feb 1973

Analyses *	Date						
	20	21	22	23	24	25	Mean
TDS	2[illegible]7	288	290	283	248	264	278
VDS	88	80	80	98	48	74	78
SS	35	37	50	85	68	82	60
VSS	33	35	50	78	58	79	56
Surfactants	2.0	2.5	3.0	2.5	2.0	3.0	2.5
Cyanide	0.02	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Phenol	0.025	0.030	0.036	0.020	0.020	<0.001	<0.022
Spec. Cond. (μmho)	476	472	474	487	457	475	473
O & G	-	43.5	46	34.4	66	35	45
Max. Tot. Pesticides (μg/l)	4.378		10.334		1.260		5.324
Min. Tot. Pesticides (μg/l)	4.117		10.123		1.016		5.085
BOD/Filtered	105	110/67	146	116/66	120	94/50	115/61
COD	-	200	112	112	176	180	156
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.06	0.06	0.06	0.07	0.22	0.08	0.09
Iron	0.29	0.23	0.28	0.31	0.29	0.28	0.28
Lead	<0.01	0.01	0.01	0.01	0.02	<0.01	<0.01
Zinc	0.12	0.10	0.09	0.10	0.10	0.11	0.10
Boron	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Barium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01

* Except where otherwise noted all results are expressed in mg/l

TABLE VII (Cont.)

Analyses *	Date						
	20	21	22	23	24	25	Mean
Mercury (ppb)	<1.0	<1.0	<1.0	9.0	<1.0	4.0	<2.8
Nickel	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
Manganese	0.08	0.07	0.07	0.06	0.06	0.07	0.07
Sodium	41	44	44	44	41	45	43
Potassium	8.2	8.4	8.5	8.3	8.2	7.4	8.2
Calcium	23	23	23	23	22	22	23
Magnesium	12	11	11	11	11	19	12
NH_3-N	9.9	10.7	10.2	11.6	9.9	9.5	10.3
Org-N	0.8	1.7	0.5	0.1	<0.1	0.4	<0.6
Nitrates	0.8	0.7	0.9	1.0	0.8	1.1	0.9
Ortho-PO_4	13	14	14	11	14	12	13
Tot-PO_4	21	28	19	17	17	17	20
Sulfates	20	19	21	63	18	65	34
Sulfides	0.5	0.5	1.0	0.5	0.3	0.5	0.6
Alk ($CaCO_3$)	175	178	177	173	170	167	173
Chloride	47	45	46	47	46	45	46
pH (units)	6.6	6.5	6.6	6.5	6.6	6.9	6.6

* Except where otherwise noted all results are expressed in mg/l

TABLE VIII

CHEMICAL ANALYSIS STATION B - 26 Feb-2 Mar 1973

Analyses *	Date						Mean
	26	27	28	1	2		
TDS	196	173	178	215	242		201
VDS	87	44	29	39	46		49
SS	55	81	38	37	40		50
VSS	55	50	38	37	40		44
Surfactants	3.0	1.5	1.0	2.5	2.0		2.0
Cyanide	0.01	0.01	0.01	<0.01	<0.01		<0.01
Phenol	0.045	0.002	0.005	0.020	0.100		0.034
Spec. Cond. (μ mho)	363	241	285	347	393		326
O & G	17.4	14.2	5.2	10.6	15.2		12.5
Max. Tot. Pesticides (μg/l)	2.681		0.270		0.329		1.093
Min. Tot. Pesticides (μg/l)	2.546		0.087		0.118		0.917
BOD/Filtered	66	59/18	48	74/43	92		68/30
COD	88	96	256	64	140		129
Cadmium	<0.01	<0.01	0.01	<0.01	<0.01		<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Copper	0.10	0.06	<0.05	0.07	0.08		<0.07
Iron	0.65	1.00	<0.05	0.40	0.30		0.59
Lead	0.01	0.03	<0.01	<0.01	<0.01		<0.01
Zinc	0.10	0.09	107**	0.06	0.06		0.08
Boron	0.4	0.2	0.2	0.3	0.4		0.3
Barium	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0
Silver	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01

* Except where otherwise noted all results are expressed in mg/l

** High reading due to sample container contamination. Value not included in calculation of mean.

TABLE VIII (Cont.)

Analyses *	Date						Mean
	26	27	28	1	2		
Mercury (ppb)	4.0	<1.0	<1.0	1.0	<1.0		<1.6
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
Manganese	0.10	0.07	0.04	0.05	0.06		0.06
Sodium	32	17	23	24	30		25
Potassium	6.0	3.4	4.6	5.0	5.4		4.9
Calcium	19	16	16	19	21		18
Magnesium	8.7	6.8	7.4	9.3	0.2		6.5
NH_3-N	6.6	3.2	3.8	4.8	7.4		5.2
Org-N	1.4	2.7	1.4	2.0	1.8		1.9
Nitrates	0.9	1.9	1.7	1.2	1.2		1.4
Ortho-PO_4	9.0	4.4	4.1	5.5	7.8		6.2
Tot-PO_4	13.0	6.6	7.1	9.0	12.0		9.5
Sulfates	12	12	15	17	22		16
Sulfides	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
Alk ($CaCO_3$)	110	90	80	100	125		101
Chloride	33	11	26	32	37		28
pH (units)	6.3	6.5	6.5	6.6	6.7		6.5

* Except where otherwise noted all results are expressed in mg/l

TABLE IX

CHEMICAL ANALYSIS STATION C - 20-25 Feb 1973

Analyses *	Date						
	20	21	22	23	24	25	Mean
TDS	279	299	356	275	284	278	296
VDS	94	63	105	77	82	88	85
SS	-	9	13	11	11	13	11
VS	-	9	13	11	11	13	11
Surfactants	1.0	1.0	1.0	1.5	1.0	0.7	1.0
Cyanide	0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Phenols	0.01	0.01	0.002	0.01	0.018	<0.001	<0.01
Spec. Cond. (µmho)	400	426	454	426	443	436	431
O & G	1.5	0.9	0.7	1.0	1.0	1.5	1.1
BOD/Filtered	6	20	11	7/12	12	12/12	11/12
COD	30	81	30	30	84	38	49
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	<0.05	<0.05	<0.05	0.05	0.06	0.09	0.06
Iron	0.17	0.10	0.09	0.14	0.20	0.14	0.14
Lead	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	<0.02
Zinc	0.12	0.06	<0.05	0.07	<0.05	<0.05	<0.07
Boron	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Barium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury (ppb)	<1.0	<1.0	5.0	<1.0	<1.0	<1.0	<2.0
Nickel	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1

* Except where otherwise noted all results are expressed in mg/l

TABLE IX (Cont.)

Analyses *	Date						
	20	21	22	23	24	25	Mean
Manganese	0.03	0.02	0.03	0.02	0.02	0.03	0.02
NH_3-N	3.1	3.3	3.6	4.3	3.8	3.1	3.5
Org-N	<0.1	0.7	<0.1	1.6	0.9	0.8	0.7
Nitrates	22	21	21	23	24	24	22
Ortho-PO_4	17	18	17	17	19	17	18
Tot-PO_4	19	19	20	19	20	19	19
pH (units)	7.1	7.0	5.2	6.9	7.3	7.2	6.8

* Except where otherwise noted all results are expressed in mg/l

TABLE X

CHEMICAL ANALYSIS STATION C - 26 Feb-2 Mar 1973

Analyses *	Date						
	26	27	28	1	2		Mean
TDS	264	228	120	215	222		210
VDS	105	65	40	48	60		64
SS	11	9	14	4	9		9
VS	11	9	14	4	9		9
Surfactants	1.5	0.6	1.0	1.5	1.0		1.6
Cyanide	0.01	0.03	0.1	<0.01	<0.01		0.03
Phenol	0.015	<0.001	0.003	0.004	0.004		<0.005
Spec. Cond (μmho)	403	347	265	302	323		328
O & G	1.8	1.8	0.2	1.0	4.1		1.8
BOD/Filtered	12	14/16	25	17/15	13		16/16
COD	44	36	36	30	30		35
Cadmium	<0.01	<0.01	0.01	<0.01	<0.01		<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Copper	0.18	0.06	<0.05	<0.05	<0.05		<0.08
Iron	0.28	0.43	<0.05	0.65	0.30		<0.34
Lead	<0.01	0.04	<0.01	<0.01	<0.01		<0.02
Zinc	0.06	0.10	111**	<0.05	<0.05		<0.06
Boron	0.4	0.3	0.2	0.3	0.3		0.3
Barium	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0
Silver	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Mercury (ppb)	39.0**	<1.0	<1.0	4.7	<1.0		<1.9
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1

* Except where otherwise noted all results are expressed in mg/l

** High reading due to sample container contamination. Value not included in calculation of mean.

TABLE X (Cont.)

Analyses *	Date						
	26	27	28	1	2		Mean
Manganese	0.02	0.04	0.04	0.03	0.02		0.03
NH_3-N	3.2	1.7	3.6	2.3	2.1		2.6
Org-N	1.6	1.6	2.8	2.0	1.7		1.9
Nitrates	24.0	16.0	4.4	20.0	24.0		18.0
Ortho-PO_4	18.0	10.0	5.4	9.1	9.6		10.4
Tot-PO_4	19.0	11.0	7.5	9.9	11.0		11.7
pH (units)	6.7	7.0	6.6	6.8	7.0		6.8

* Except where otherwise noted all results are expressed in mg/1

TABLE XI

CHEMICAL ANALYSIS STATION A - 20-25 Feb 1973

Analyses *	Date						
	20	21	22	23	24	25**	Mean
TDS	214	207	214	225	195		211
VDS	73	61	53	61	65		63
SS	20	11	16	19	61		25
VSS	18	8	14	16	37		19
Surfactants	1.0	2.0	4.0	4.0	3.0		3.0
Cyanide	0.01	0.01	<0.01	<0.01	<0.01		<0.01
Phenol	0.030	0.005	0.032	0.024	0.018		0.022
Spec. Cond. (μmho)	312	320	333	327	-		323
O & G	6.4	4.1	13.2	20.8	13.4		11.6
BOD	30	23	74	38	51		43
COD	26	26	52	60	80		49
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Copper	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05
Iron	0.11	0.06	0.11	0.13	0.08		0.10
Lead	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Zinc	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05
Boron	0.2	0.2	0.3	0.3	0.2		0.2
Barium	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Mercury (ppb)	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0

* Except where otherwise noted all results are expressed in mg/l

** Changed the location of sampling Station A 25 Feb 73. No sample collected.

TABLE XI (Cont.)

Analyses *	Date						
	20	21	22	23	24	25**	Mean
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
Manganese	0.05	0.05	0.05	0.05	0.05		0.05
pH (units)	6.6	6.8	6.6	6.8	-		6.7

* Except where otherwise noted all results are expressed in mg/l

TABLE XII

CHEMICAL ANALYSIS STATION A - 26 Feb-2 Mar 1973

Analyses *	Date						
	26	27**	27	28	1	2***	Mean
TDS	271	161	99	208	235	219	199
VDS	49	47	31	44	77	64	52
SS	70	41	85	25	52	46	53
VSS	40	35	32	25	30	20	30
Surfactants	5.0	1.0	1.0	1.0	12.0	1.0	3.5
Cyanide	0.01	0.01	0.01	0.01	0.03	0.07	0.03
Phenol	0.066	0.022	0.016	0.043	0.071	0.25	0.078
Spec. Cond. (μmho)	366	228	141	381	352	370	306
O & G	25.0	5.6	33.0	24.4	7.4	4.1	11.1
BOD	12	31	74	27	52	30	38
COD	88	56	112	40	60	32	65
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	23.4****	0.07	<0.05	0.53	0.39	0.10	<0.23
Iron	0.40	0.30	0.40	0.15	<0.05	0.15	<0.24
Lead	0.01	0.01	<0.01	0.04	<0.01	<0.01	<0.01
Zinc	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.06
Boron	0.2	0.4	0.5	0.4	0.4	0.2	0.4
Barium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury (ppl)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

* Except where otherwise noted all results are expressed in mg/l

** Heavy rainfall surcharged the sewer line. Samples were composited hourly on a constant volume basis for two periods - 0700-1500 hrs and 1500-2300 hrs.

*** Sampler malfunctional at 1500 therefore samples were composited hourly proportional to flow from 0700-1500 hrs.

**** Sample contamination suspected. Not included in mean.

TABLE XII (Cont.)

Analyses *	Date						
	26	27**	27	28	1	2***	Mean
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese	0.08	0.06	0.07	0.05	0.05	0.04	0.06
pH (units)	6.3	6.5	6.3	6.6	6.8	7.3	6.6

* Except where otherwise noted all results are expressed in mg/l

** Heavy rainfall surcharged the sewer line. Samples were composited hourly on a constant volume basis for two periods - 0700-1500 hrs and 1500-2300 hrs.

*** Sampler malfunctional at 1500 therefore samples were composited hourly proportional to flow from 0700-1500 hrs.

TABLE XIII

CHEMICAL ANALYSIS STATION D - 22-25 Feb 1973

Analyses *	Date						
	22**	22	23	24	25		Mean
TDS	423	424	519	444			452
VDS	91	98	134	95	No		104
SS	16	13	31	50	Waste		28
VSS	16	13	31	37	Discharged		24
Surfactants	0.3	0.3	0.3	0.3			0.3
Cyanide (Free)	0.5	0.08	0.08	1.0			0.4
Total Cyanide	3.2	15.0	12.5	10.0			10.2
Spec. Cond. (μmho)	580	593	707	651			633
BOD	111	76	147	52			96
COD	144	180	320	188			208
Cadmium	<0.01	<0.01	<0.01	<0.01			<0.01
Chromium	<0.01	<0.01	<0.01	<0.01			<0.01
Copper	<0.05	<0.05	<0.05	<0.05			<0.05
Iron	1.2	2.4	2.5	1.4			1.9
Lead	<0.01	<0.01	<0.01	<0.01			<0.01
Zinc	<0.05	0.07	<0.05	<0.05			<0.05
Boron	5.0	4.9	7.3	4.9			5.5
Barium	<1.0	<1.0	<1.0	<1.0			<1.0
Silver	0.04	0.03	0.01	0.01			0.02
Mercury (ppb)	<1.0	<1.0	<1.0	<1.0			<1.0
Nickel	<0.1	<0.1	<0.1	<0.1			<0.1
Manganese	0.03	0.02	0.03	0.02			0.02

* Except where otherwise noted all results are expressed in mg/l

** Sample obtained at continuous rate between 0800 to 0930 hrs.

TABLE XIII (Cont.)

Analyses *	Date						
	22**	22	23	24	25		Mean
Sodium	65	68	70	86			72
Potassium	40	40	59	40			45
Calcium	16	16	17	15	No		16
Magnesium	9.6	11.0	12.0	11.0	Waste		11.0
Sulfate	86	96	104	112	Discharged		100
Sulfite	<1.0	<1.0	<1.0	<1.0			<1.0
Alk ($CaCO_3$)	140	140	169	145			124
Chloride	60	56	80	72			67
NH_3-N	10.4	9.2	10.7	8.3			9.6
Org-N	0.3	0.7	1.7	0.6			0.8
Nitrates	1.0	1.8	1.4	2.7			1.7
Ortho-PO_4	3.6	5.0	4.6	4.5			4.4
Tot-PO_4	5.7	8.5	7.7	6.5			7.1
pH (units)	6.8	6.9	6.7	6.9			6.8
Total Flow (thousand gal)***		192	166	84.8			148

* Except where otherwise noted all results are expressed in mg/l

** Sample obtained at continuous rate between 0800 to 0930 hrs.

*** Assumes transfer pump output is 140 gpm.

TABLE XIV

CHEMICAL ANALYSIS STATION D - 26 Feb-2 Mar 1973

Analyses *	Date						
	26	27	28	1	2		Mean
TDS	842	1358	404	298	250		630
VDS	170	350	99	59	57		147
SS	87	54	0	6	10		31
VSS	59	42	0	6	10		23
Surfactants	0.3	0.2	<0.2	0.2	0.4		<0.3
Cyanide (Free)	<0.01	<0.01	0.25	0.05	0.05		<0.07
Total Cyanide	**	20	**	5	2		9
Spec. Cond. (μmho)	1120	1710	601	439	345		843
BOD	117	**	130	104	45		99
COD	400	590	76	106	58		246
Cadmium	<0.01	<0.01	0.03	0.06	<0.01		<0.02
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Copper	<0.05	<0.05	<0.05	<0.05	0.05		<0.05
Iron	3.10	31.50	<0.05	1.00	0.95		<7.32
Lead	0.02	<0.01	<0.01	<0.01	<0.01		<0.01
Zinc	<0.05	<0.05	174***	<0.05	<0.05		<0.05
Boron	5.4	9.7	3.5	3.0	1.9		4.7
Barium	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0
Silver	0.04	0.13	0.02	0.06	0.03		0.06
Mercury (ppb)	<1.0	<1.0	<1.0	<1.0	<1.0		<1.0
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1
Manganese	0.03	0.07	0.01	0.01	<0.01		<0.03

* Except where otherwise noted all results are expressed in mg/l

** Not analyzed.

*** High value due to sample container contamination.

TABLE XIV (Cont.)

Analyses *	Date						
	26	27	28	1	2		Mean
Sodium	360	190	49	30	25		131
Potassium	40	140	40	31	20		54
Calcium	17	22	13	13	13		16
Magnesium	40.0	20.0	8.5	8.3	2.9		16.0
Sulfate	320	200	44	40	30		127
Sulfite	2	11	2	<1	9		<7
Alk ($CaCO_3$)	185	287	105	100	75		150
Chloride	-	380	76	60	41		139
NH_3-N	5.0	34.0	14.0	7.6	4.6		13.0
Org-N	6.6	<0.1	<0.1	0.4	1.0		<1.6
Nitrates	1.5	5.3	0.9	0.5	<0.5		<1.7
Ortho-PO_4	8.40	37.00	2.70	1.40	0.87		10.07
Tot-PO_4	15.0	47.0	4.1	2.7	1.9		14.1
pH (units)	6.9	6.6	6.7	6.6	6.8		6.7
Total Flow (thousand gals)****	79.8	96.6	33.6	85.7	50.4		69.2

* Except where otherwise noted all results are expressed in mg/l

** Not analyzed.

*** High value due to sample container contamination.

**** Assumes transfer pump output is 140 gpm.

d. Table XV presents the quantity and type of film processed each day during the survey period. On 23 and 24 Feb and on 2 Mar 1973 no film was processed. Wastewater generated on these dates was the result of unspecified machine maintenance and batch replacement of processing solutions.

3. Investigation of Major Wastewater Generating Activities.

During this phase of the wastewater survey most of the Field Maintenance Squadron (FMS) and Organizational Maintenance Squadron (OMS) facilities operated by the 9th SRW and the 456th Bomb Wing in the operations area were visited. The vehicle and POL vehicle maintenance facilities in the cantonment area were also visited. In spite of the fact that most supervisors queried stated that waste oils, solvents, and fuels were collected and removed to the fire training area it was obvious by observation at sampling Station A that a considerable quantity of these materials were disposed of by discharge into the sanitary sewerage system. Specific information worth noting and observed problem areas are listed below:

a. Oil Separator Operations and Maintenance:

(1) There is a general lack of knowledge among civil engineering personnel in regard to the location, operation, maintenance, and pumping schedule of base oil separators. As-built drawings were not readily available to determine construction details and the fate of the discharge from the underflow of each separator.

(2) Many of the shops in Facility 1086 have floor drains into which they dispose various wastes. Where these drains ultimately discharge could not be ascertained during the survey period. An inefficient oil separator is located below grade in the parking lot on the south side of Facility 1086. It is likely that many of the floor drains connect to this separator as a considerable quantity of waste oils and solvents were evident. Dye tablets introduced into the separator confirmed that the underflow discharges to the sanitary sewer.

(3) The sump portion of oil separators located on the north and south side of the fuel cell repair nose dock, Facility 1077, could not be visually inspected. Plans available indicate that the underflow from these separators discharges to the storm water drainage system.

(4) A visual inspection of the POL vehicle maintenance oil separator to the rear of Facility 2470 indicated that the separator underflow system was plugged with debris. All waste fuel and oil drained to

TABLE XV

9th SRW PHOTO PROCESSING WORKLOAD 20 Feb - 2 Mar 1973

Date	Film Characteristics			Quantity Processed	
	Type	Code	Width	Ft	Ft²
20 Feb	B & W	3414	9.5 in	157	124
			70 mm	736	169
21 Feb	B & W	2430	9.5 in	11,340	8981
			70 mm	12,654	2905
		3414	9.5 in	156	124
			70 mm	6,259	1437
	Color	242	9.5 in	1,694	1342
22 Feb	B & W	2430	9.5 in	7,451	5901
			5 in	9,780	4075
			70 mm	6,986	1604
		3414	9.5 in	185	146
			70 mm	254	58
23 Feb*					
24 Feb*					
25 Feb*					
26 Feb	B & W	2430	9.5 in	6,030	4776
			5 in	11,814	4926
			70 mm	2,730	627
		3414	9.5 in	542	429
			70 mm	741	170
27 Feb	B & W	2430	9.5 in	7,537	5969
			5 in	10,984	4580
			70 mm	6,904	1585
		3414	70 mm	625	144
28 Feb	B & W	2430	9.5 in	5,857	4639
			70 mm	5,564	1277
		3414	70 mm	60	14
1 Mar	B & W	2430	9.5 in	760	602
			70 mm	240	55
		3414	9.5 in	381	301
			70 mm	678	156
2 Mar*					

* No film processed

this separator flowed over the oil restraining baffle directly to the sanitary sewer. Absolutely no separation was achieved.

(5) The 9th FMS Aerospace Ground Equipment (AGE) repair facility located in the southwest corner of Facility 1025 has an indoor washrack where AGE is cleaned. A trailer was on blocks outside this facility over the manhole cover which allows access to the sewer leading from this section of the shop. The existence and condition of the oil separator serving this facility therefore could not be established.

b. The combined (456th FMS and 9th FMS) corrosion control facility generates a large quantity of aircraft washrack wastewater. During the survey period (20 Feb-2 Mar) this facility washed five KC-135 tanker aircraft and one T-29 aircraft. In addition, aircraft engine cowlings are washed every day. SSgt Hoyrst of the 456th FMS estimated that the washrack utilizes approximately 80 gals per week of cleaning solvent (PD 680) and 350 gals per week of aircraft cleaner (FSN 6850-935-0995).

The ramp of the corrosion control facility slopes to a below grade sump from which the aircraft washrack wastewater is pumped to an elevated separator. The separator appears to be undersized for the volume of waste which it handles. In addition, the separated solvent must be manually drained to 55 gal drums at frequent intervals for the separator to function at all. Corrosion control facility personnel utilize a vat of approximately 600 gals to dip aircraft parts for paint removal. This vat of water soluble paint stripper was batch dumped through the separator system which discharges to the sanitary sewer on the afternoon of 1 Mar 1973. An analysis of a grab sample of this waste as it entered the sanitary sewer indicated the following chemical properties:

Chemical	mg/l
COD	14,000
Cr^{+6}	70
NO_3	89
NH_3-N	1,100
pH	10.2

c. The SR-71 aircraft are parked in shelters parallel to Taxiway 10 on the southwest end of the operations area. These aircraft are unusual in that they constantly leak fuel. Drip pans are placed under the aircraft to catch the leaking JP-7 fuel, however there is always some lost to the shelter floor. The shelters have no floor drain system and therefore no effective way to trap and separate the fuel washed off the shelter floors. Oil slicks were clearly evident in the storm drains leading to Reeds Creek when this area was visited on 27 Feb 73.

d. The 9th SRW photo development facility retains, regenerates, and recycles the fixer used in black and white film processing. The fixer eventually reaches a stage where it is contaminated beyond reuse; it is then desilvered and discharged in a slug of approximately 700 gals. There is currently no system of desilvering or recycling process chemicals including bleach and fixer for the color processes. These wastes are discharged directly to the photo waste sewerage system as they are replenished. Color Processing Machine tanks are also dumped untreated as deemed necessary by quality control or required machine maintenance.

SECTION IV

CONCLUSIONS

1. A review of the rainy season maximum flow rates contained in the domestic STP operating logs minimizes the extent of the infiltration problem which exists at Beale AFB because bypassed flow is not measured. It was evident by observation during the survey period however, that infiltration is excessive and must be controlled if the STP is to be capable of efficient operation on a year round basis.

2. The practice of bypassing whenever the flow rate exceeds 3 mgd violates the discharge standards contained in RWQCB Resolution No. 129. Water quality degradation of Hutchison Creek in terms of toxicants and oxygen demand during the rainy season is probably insignificant due to dilution, however the public health implications are important since he bypassed wastewater is not disinfected.

3. Based on 5 years operating records the average daily wastewater flow from the 9th SRW photo processing operation amounts to 680,000 gals/month or 0.023 mgd. This amounts to 1.5 percent of the domestic STP average daily flow of 1.49 mgd. The average workload data presented in Table IV is based on past photo processing experience and is considered accurate. No substantial changes in this workload are expected.

4. When the pH traces obtained from Lift Station 1050 serving the operations area were correlated with flight line activities it was obvious that the activities of the augmentation water demineralization plant, Facility 1085, were responsible for the low pH readings and corrosion encountered in this portion of the sewerage system. Each time the demineralization plant regenerated exchange resins, a pH trace similar to the one depicted in Figure 2 was obtained. Each vertical division on the trace represents about 1 1/3 hours so it can be readily seen that each regeneration causes

the pH to fall below 2 for approximately an hour. During the entire time period that the pH meter was maintained in Lift Station 1050 there were no significant low pH readings except on those days that the demineralization plant regenerated ion exchange media.

5. A review of the results of chemical analyses at Stations B and C during the period 20-25 Feb 1973 indicates a STP removal efficiency of 90 percent for BOD, 72 percent for COD, 81 percent for SS, and a well nitrified effluent. The majority of the pesticide concentration detected at Station B during the survey period is attributable to Aldrin and Lindane. The source of these pesticides is unknown. Runoff from previously treated land infiltrating into the sewage system cannot be ruled out. The results of chemical analysis do not reveal the presence of any significant concentration of heavy metals.

6. The characteristics of the photo waste are dependent upon the type and quantity of film processed each day. The results of sample analysis from Station D indicate that the concentrations of cyanide, boron, silver, and occasionally sodium and potassium are sufficiently high to have water quality significance if this waste is discharged directly to a surface water without treatment. For any given photo processing workload, the chemical characteristics of the waste water can be approximated from a knowledge of the replenishment rates of the processing solutions and a knowledge of the rinse water rate coupled with the information in Table VI which was obtained from KODAK Publication J-28.

7. The base does not have an effective program to preclude the disposal of undesirable wastes into sewerage system. The occasional slug discharges of chemicals from the operations area can be prevented if an aggressive hazardous substances disposal program is initiated and maintained.

8. The operation, maintenance, and configuration of most base oil separators requires improvement. The malfunctioning separator to the rear of Facility 2470 is probably the source of much fuel that reaches the domestic STP. This source of fuel in the sanitary sewerage system was previously overlooked and all fuel spills were attributed to untraceable operations area activities.

SECTION V

RECOMMENDATIONS

1. The proposed project to upgrade the waste treatment facility at Beale AFB should be expanded to investigate and eliminate sources of infiltration or minimize its effects on waste treatment efficiency.

2. An auxiliary power supply for the STP should be installed that will activate automatically in the event of a power failure and the practice of bypassing untreated wastewater should be terminated.

3. The anticipated workload for the 9th SRW photo processing operations in Table IV should be reviewed by base personnel. Any inaccuracies or projected changes should be rectified immediately and conveyed to the Western Region, Regional Civil Engineering Office.

4. The concentration of cyanide and silver in the waste stream resulting from color photo processing should be reduced by bleach and fixer regeneration and recycle. In no case should fixer be discharged without treatment to recover silver.

5. Facility 1085, the augmentation water demineralization plant, should be provided with a neutralization tank to mix the spent acid and caustic prior to their discharge to the sewerage system. The neutralization tank should be provided with a pH meter and chemical feed pumps to enable operators to neutralize the waste prior to discharge.

6. The operational adequacy of all oil separators should be determined. This investigation should specifically include the separators located at the following facilities: 1062, 1069, 1075 East, 1075 West, 1076 East, 1076 West, 1077 South, 1077 North, 1086, 1096 North, 1096 South, and 2470. Inefficient separators should be replaced or repaired as necessary. Separators that discharge underflow to the storm water drainage system should be modified to discharge to the sanitary sewerage system.

7. A systematic pumping and maintenance schedule for all separators should be initiated. Adequate pumping equipment must be provided and an ultimate disposal method must be developed.

8. A hazardous substances disposal plan should be developed and implemented. Major constituents of this plan should include:

   a. Assignment of responsibility for implementation of the plan to a specific individual or group of individuals.

b. Development and publication of a sewer code that prohibits the discharge of toxic substances to the sewerage system except under stated conditions. The regulated substances should include, as a minimum, those materials containing: phenols, heavy metals, solvents such as carbon removal compound, trichloroethylene or PD 680, hydraulic and motor oils, nutrients and pesticides in significant concentrations.

c. An efficient disposal plan that provides a method for the shop supervisor to dispose of toxic wastes. The Redistribution and Marketing (R & M) activity should be included in this phase to maximize monetary return of waste products. A first step towards achieving an efficient disposal plan for used solvents and fuels on Beale AFB should include relocating the disposal storage area from the fire training area to the operations area where the majority of wastes are generated. Wastes are currently segregrated at the point of generation then placed in a common storage tank. The economy of storing and reselling the used solvents and fuels on a segregated basis should be investigated.

d. A continuing education program directed at all echelons of the maintenance organizations. This program should stress the importance of toxic waste control, the consequences of unauthorized disposal methods and what organization to contact to arrange for disposal of toxic wastes.

e. A periodic inspection of those shops utilizing toxic materials to verify that their disposal methods are in accordance with the hazardous substances disposal plan.

9. A floor drainage system should be designed and installed in the SR 71 aircraft shelters to preclude the runoff of JP-7 fuel to the storm drainage system.

10. The floor drains serving individual shops in Facility 1086 should be traced to determine where they discharge. Drains connected to the storm drainage system should be plugged or rerouted to the sanitary sewerage system. Appropriate controls should be placed on discharges to the sanitary system.

REFERENCES

1. Standard Methods for the Examination of Water and Wastewater, 13th Ed 1971, APHA, AWWA, WPCF.

2. Methods for Chemical Analysis of Water and Wastes - 1971, Environmental Protection Agency, Water Quality Office, Analytical Quality Control Laboratory, Cincinnati, Ohio.

3. Disposal of Photographic-Processing Wastes, KODAK Publication J-28, Eastman Kodak Company, 1969.

APPENDIX I

BASE POPULATION AND PROJECTED CHANGES

Population Location		Number Total	Number Effective
Military on-base in dormitories		2, 286	2, 286
Military on-base in housing area		1, 543	1, 543
Military on-base in trailers		220	220
Dependents on-base (estimated)		7, 032	7, 032
Military and Civilian living off-base		2, 172	724
Dependents off-base (estimated)		5, 500	-----
	Subtotal	18, 753	11, 805
Projected Population Changes			
Military on-base in housing area		+200	+200
Military on-base in trailers		+ 50	+ 50
Dependents on-base (estimated)		+900	+900
Military and Civilian living off-base		-250	- 83
Dependents off-base (estimated)		-900	-----
	Subtotal	0	1, 067
Adjusted Total Base Population		18, 753	12, 872

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(52-21)

CAMP BEALE AIR FORCE BASE

RESOLUTION NO. 129
MAY 15, 1952

RESOLVED, THAT THE FOLLOWING REQUIREMENTS SHALL GOVERN THE NATURE OF THE DISCHARGE FROM THE CAMP BEALE AIR FORCE BASE SEWAGE TREATMENT PLANT TO HUTCHINSON CREEK:

1. DISCHARGE SHALL BE ADEQUATELY DISINFECTED OR ITS EQUIVALENT.

2. DISCHARGE SHALL NOT HAVE A 5-DAY B.O.D. IN EXCESS OF 15% OF THE RAW SEWAGE.

3. DISCHARGE SHALL NOT PRODUCE VISIBLE GREASE OR SOLIDS RECOGNIZABLE AS OF SEWAGE ORIGIN IN HUTCHINSON CREEK.

4. DISCHARGE SHALL NOT CONTAIN MORE THAN 0.5 ML/LITER OF SETTLEABLE SOLIDS.

5. DISCHARGE SHALL NOT DEPRESS THE DISSOLVED OXYGEN CONTENT OF HUTCHINSON CREEK BELOW 5 PPM.

6. NEITHER THE PLANT NOR ITS EFFLUENT SHALL CAUSE A NUISANCE OR A POLLUTION.

IF, IN THE FUTURE, THERE IS A CHANGE IN THE CONDITIONS OR USE OF THE DISPOSAL AREA IT MAY BE NECESSARY FOR THE CENTRAL VALLEY REGIONAL WATER POLLUTION CONTROL BOARD TO REVISE THESE REQUIREMENTS TO CONFORM TO THE NEW CONDITIONS OR USE.

/s/ CARL M. HOSKINSON
CHAIRMAN

ATTEST:

/s/ JOSEPH S. GORLINSKI
EXECUTIVE OFFICER

REGIONAL WATER POLLUTION CONTROL BOARD STATE OF CALIFORNIA CENTRAL VALLEY

RESOLUTION
INDUSTRIAL WASTE DISCHARGE REQUIREMENTS
BEALE AIR FORCE BASE
PHOTOGRAPHIC PROCESSING PLANT
YUBA COUNTY

RESOLUTION NO. 65/66-114 ADOPTED: 4-15-66

WHEREAS, A PHOTOGRAPHIC PROCESSING PLANT IS BEING CONSTRUCTED AT BEALE AIR FORCE BASE; AND,

WHEREAS, INDUSTRIAL WASTES GENERATED BY THE PLANT WILL CONSIST OF DEPLETED PROCESSING SOLUTIONS, CHEMICAL DUMPS, FILM WASH WATER AND EQUIPMENT WASH WATERS; AND,

WHEREAS, THESE WASTES WILL CONTAIN A VARIETY OF ORGANIC AND INORGANIC CHEMICAL COMPOUNDS ASSOCIATED WITH BLACK AND WHITE AND COLOR FILM DEVELOPING, WHOSE IDENTITY AND DELETERIOUS LEVEL MAY BE DIFFICULT TO ASSESS; AND,

WHEREAS, GROUND WATERS OF THIS AREA FIND USE FOR DOMESTIC, AGRICULTURAL AND INDUSTRIAL PURPOSES; AND,

WHEREAS, SURFACE WATERS AT THE AREA ARE USED FOR IRRIGATION AND OTHER AGRICULTURAL PURPOSES; AND,

WHEREAS, SURFACE WATERS FARTHER DOWNSTREAM ARE USED FOR DOMESTIC AND AGRICULTURAL PURPOSES, RECREATION, AND FISH PROPAGATION; AND,

WHEREAS, IT IS THE INTENT OF THE CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD TO PROTECT THE GROUND AND SURFACE WATERS FOR THEIR INDICATED USES; THEREFORE BE IT

RESOLVED, THAT THE FOLLOWING REQUIREMENTS SHALL GOVERN THE NATURE OF ANY DISCHARGE FROM THE BEALE AIR FORCE BASE PHOTOGRAPHIC PROCESSING PLANT:

1. WASTES CONTAINING PROCESS MATERIALS SHALL BE DISPOSED OF IN SUCH A MANNER AS TO PREVENT THEIR ENTRY INTO USABLE GROUND OR SURFACE WATERS.

2. NEITHER THE WASTE DISCHARGE NOR THE DISPOSAL METHOD SHALL CAUSE A POLLUTION OF USABLE GROUND OR SURFACE WATERS.

3. NEITHER THE WASTE DISCHARGE NOR THE DISPOSAL METHOD SHALL CAUSE A NUISANCE BY REASON OF ODORS OR UNSIGHTLINESS.

RESOLVED, FURTHER, THAT THESE REQUIREMENTS SHALL BECOME EFFECTIVE ONE HUNDRED TWENTY (120) DAYS AFTER THE DATE OF THEIR ADOPTION; AND BE IT

RESOLVED, FURTHER, THAT BEALE AIR FORCE BASE WILL BE REQUIRED TO SUBMIT PERIODIC TECHNICAL REPORTS ON ITS WASTE DISCHARGE TO THE CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD IN ACCORDANCE WITH SECTION 13055 OF DIVISION 7, CALIFORNIA WATER CODE; AND BE IT

RESOLVED, FURTHER, THAT THE DISCHARGER SHALL REPORT PROMPTLY TO THE CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD ANY CHANGES IN THE WASTE DISCHARGE OR CHANGES IN THE CONDITIONS ASSOCIATED WITH ITS DISPOSAL.

IF, IN THE FUTURE, THERE IS A CHANGE IN THE CONDITIONS OF THE DISCHARGE, OR USE OF THE DISPOSAL AREA, IT MAY BE NECESSARY FOR THE CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD TO REVISE THESE REQUIREMENTS.

THESE REQUIREMENTS DO NOT CONSTITUTE A LICENSE OR PERMIT; NEITHER DO THEY AUTHORIZE THE COMMISSION OF ANY ACT RESULTING IN INJURY TO THE PROPERTY OF ANOTHER, NOR DO THEY PROTECT THE DISCHARGER FROM HIS LIABILITIES UNDER FEDERAL, STATE, OR LOCAL LAWS.

/s/ Dr. A. Frank Brewer
CHAIRMAN

ATTEST:

/s/ Joseph S. Gorlinski
EXECUTIVE OFFICER

11/9/65 PEJ